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Physical Activity and its Promotion in a Primary Care Population

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Submitted for the degree of Doctor in Philosophy

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January 2015

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Summary

The rising burden of non-communicable diseases signals a stark and growing threat to the world's health and physical inactivity coupled with an increasingly sedentary lifestyle are recognised as significant and persistent risk factors in their development. This presents a significant challenge to health systems particularly within the primary care arena, where there is a professional responsibility to promote and maintain health and wellbeing and prevent disease. This research was set in the context of the ongoing commitment from the Irish government to continue to develop Irish primary care services and within the current health strategy "Healthy Ireland" (Department of Health 2013b) in which physical activity is explicitly targeted as a means to prevent chronic disease and maintain health.

The overall aim of this thesis was to investigate the prevalence and patterns of physical activity and sedentary behaviour in a primary care population and to describe how health professionals incorporate physical activity promotion into their clinical practice.

Work for this thesis commenced by discussing the evidence for the effectiveness of physical activity promotion in primary care, followed by a detailed literature review on the knowledge and practice of primary care professionals in this task. This review highlighted a lack of studies that investigated the knowledge of health professionals regarding the physical activity public health recommendations and a paucity of detail describing what physical activity screening and counselling actually entails in clinical practice. Study I investigated the physical activity knowledge and promotional practices of Irish general practitioners and physiotherapists by means of a postal questionnaire.

Amongst the major findings of this study was the poor overall knowledge of both professional groups regarding the physical activity guidelines, with less than a third of general practitioners and half of physiotherapists reporting the correct parameters. Physical activity screening practices were varied with some differences reported between the professions. The largest proportion of general practitioners reported that they screened physical activity in an opportunistic manner (41%) or if it directly related to a patient's presenting complaint (37%). The largest proportion of physiotherapists reported that they screened physical activity in all patients (34%) or if it related to a person's presenting complaint (28%). The use of any formalised methods of screening, such as a validated questionnaire was reported by less than 5% of participants. Respondents reported that they were likely to provide counselling to patients with cardiovascular risk factors particularly obesity, but physical activity promotion, as a primary preventative strategy to healthy individuals, occurred less frequently.

Study II investigated physical activity from the perspective of the primary care patient. Accurate surveillance data is necessary in order to establish the prevalence and patterns of physical activity, which in turn, can help direct funding, as well as inform the development and targeting of promotional strategies. A literature review carried out to inform Study II, highlighted significant gaps in the surveillance data of the Irish population with a limited and outdated dataset for physical activity and almost no data on sedentary behaviour other than prevalence estimates for sitting. Study II therefore provided a detailed descriptive analysis of the prevalence and patterns of physical activity and sitting time in a large primary care

population which was stratified by urban/rural location and deprivation. Data was collected by means of the International Physical Activity Questionnaire.

Results from Study II suggested very high levels of physical inactivity amongst the primary care population, with 47% of all patients failing to meet the physical activity recommendations. Particular sub-groups of participants were more likely to be inactive, including females ($p=0.005$), older persons ($p=0.054$), people with lower levels of educational attainment ($p=0.006$) and people who classified themselves as having a disability or injury limiting their ability to be physically active ($p=0.009$). In addition to the high prevalence of physical inactivity, just under half (48%) of the sample reported sitting for more than four hours a day. Males were more likely to report higher sitting times ($p<0.001$) and sat for two hours more, per weekday, than females.

There were notable differences between physical activity and sitting times dependant on the urban/rural location and the deprivation status of participants. Participants attending the rural mixed deprivation centre were classified the least active ($p<0.001$) and participants attending the urban deprived centre, the most active ($p<0.001$). The difference in physical activity was accounted for by differences in the time spent walking each week ($p<0.001$), rather than differences in the amount of vigorous or moderate intensity activity. Patients attending the urban non deprived centre reported the highest weekday sitting times (median 345mins/day, $p<0.001$), which was two hours and 45 minutes longer than the least sedentary, rural sample.

In light of the poor findings in relation to the physical activity levels of the primary care population and the potential for improvement in the promotional practices of healthcare professionals, the final study of this research investigated the acceptability and feasibility of introducing a physical activity clinical pathway for use in Irish primary care services. Study III utilised the Delphi process to establish consensus on the component parts of a physical activity pathway that was developed by the Department of Health in England. Overall the physical activity pathway was accepted as a clinically feasible option by a purposive sample of primary care physiotherapists, with some suggested modifications and the support of additional resources. Education needs, particularly with respect to skills in motivational interviewing and population approaches to screening were identified as necessary to support the pathway.

Within the current governmental health strategy, there is increased focus on chronic disease prevention and the protection of health and wellbeing. As increasing staff and investment are prioritised towards primary care, there is a real opportunity to integrate effective physical activity screening and promotion into a newly configured primary care arena. Results from this research provide a timely and detailed analysis of the physical activity profile of the primary care population which may be used as a basis for public health planning. It also provides a comprehensive overview of the current physical activity practices of primary care professionals and outlines preliminary details of a framework that could potentially support and improve the delivery of physical activity promotion in primary care services.

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List of Tables

Table 1 Domains of Physical Activity 2
Table 2 Examples of Light, Moderate and Vigorous Physical Activities and Corresponding METs Values 3
Table 3 Physical Activity Guidelines for Ireland 19
Table 4 Overview of Studies Investigating Physical Activity Promotion by General Practitioners 34
Table 5 Overview of Studies Investigating Physical Activity Promotion by Physiotherapists 41
Table 6 Global and European Physical Activity and Sitting Prevalence Estimates, using the IPAQ and/or GPAQ 61
Table 7 Indexed Literature: Physical Activity and Sitting Prevalence Estimates for Ireland using the IPAQ 66
Table 8 Non Indexed Literature: Physical Activity and Sitting Prevalence Estimates for Ireland 68
Table 9 Summary of Questionnaire Changes Post Study I Pilot 88
Table 10 Study I Professional Details of Participants 110
Table 11 Percentage of General Practitioners and Physiotherapists Correctly Reporting Physical Activity Guidelines 111
Table 12 Likelihood of General Practitioners and Physiotherapists to Counsel Healthy and Cardiovascular Risk Patients 114
Table 13 Summary of Data Management of Study II 123
Table 14 Study II Socio-demographic Details of Participants by Primary Care Location 124
Table 15 Study II Self Reported Cardiovascular Risk Factors by Gender and Age 125
Table 16 Physical Activity Category according to Socio-demographic Variables and Primary Care Location 126
Table 17 Physical Activity Scores Presented as Median MET minutes/week according to Sociodemographic Variables and Primary Care Location 130
Table 18 Prevalence of Cardiovascular Risk Factors Exclusive and Inclusive of Physical Inactivity amongst Male and Female Participants 134
Table 19 Odds Ratios and Relative Risk of Cardiovascular Risk Factors in Participants Failing to Meet Physical Activity Guidelines 135
Table 20 Correlates of Low Physical Activity 137
Table 21 Weekday Sitting Times according to Socio-demographic Variables and Primary Care Location 141
Table 22 Correlates of High Sitting Time 143
Table 23 Study III Demographic and Professional Details 162
Table 24 Responses to Round One Questionnaire 164
Table 25 Statements Added to Round Two as a Result of Qualitative Analysis 166
Table 26 Responses to Round Two Questionnaire 168
Table 27 Responses to Round Three Questionnaire 170

List of Figures

Figure 1 Overview of Chapter One 2
Figure 2 Continuum of Physical Activity and Sedentary Behaviour and Assigned METs Values .. 4
Figure 3 Outline of Section Two 15
Figure 4 Outline of Section Three 24
Figure 5 Flowchart of Literature Search Strategy (General Practitioners) 31
Figure 6 Flowchart of Literature Search Strategy (Physiotherapists) 39
Figure 7 A Framework for Improved Health and Wellbeing 50
Figure 8 Outline of Section Four 53
Figure 9 Flowchart of Literature Search Strategy (Worldwide and Europe) 56
Figure 10 Flowchart of Literature Search Strategy (Ireland) 58
Figure 11 Physical Inactivity in Adults (15 and older) Worldwide in Men (A) and Women (B) .. 72
Figure 12 Proportion of People aged 15 years and Older who Sit for Seven or More Hours per Day by Country 74
Figure 13 Sampling Procedure Study II 84
Figure 14 General Practitioners Response Rate to Study Questionnaire 109
Figure 15 Physiotherapists Response Rate to Study Questionnaire 109
Figure 16 Knowledge of General Practitioners and Physiotherapists of the Physical Activity Guidelines 111
Figure 17 Physical Activity Screening Practices of General Practitioners and Physiotherapists 112
Figure 18 Physical Activity Counselling Practices of General Practitioners and Physiotherapists 113
Figure 19 Use of Physical Activity Interventions by General Practitioners and Physiotherapists 114
Figure 20 Physical Activity Category according to Gender 127
Figure 21 Physical Activity Category according to Age 127
Figure 22 Physical Activity Category according to Education 128
Figure 23 Physical Activity Category according to Primary Care Location 128
Figure 24 Total Weekly Physical Activity of Males and Females 129
Figure 25 Total Weekly Physical Activity of Males and Females according to Age 131
Figure 26 Total Weekly Physical Activity according to Primary Care Location 131
Figure 27 Total Weekly Walking according to Primary Care Location 133
Figure 28 Total Weekly Physical Activity according to Cardiovascular Risk Factor Prevalence in Males 136
Figure 29 Total Weekly Physical Activity according to Cardiovascular Risk Factor Prevalence in Females 136
Figure 30 Number of Hours spent Sitting by Male and Female Participants 139
Figure 31 Number of Hours spent Sitting according to Age 140
Figure 32 Number of Hours spent Sitting according to Primary Care Location 140
Figure 33 Daily Sitting Time of Males and Females 142
Figure 34 Daily Sitting Time according to Primary Care Location 143
Figure 35 Flowchart of Data Collection Process Study III 159

List of Appendices

Appendix I: **Letters of Ethical Approval**

Ethical Approval Study I

Ethical Approval Study II

Ethical Approval Study III

Appendix II: **Format of Focus Group and Follow up Interviews Study I Pilot**

Appendix III: **Proceedings of Focus Group and Follow up Interviews Study I Pilot**

Appendix IV: **General Practitioner and Physiotherapist Questionnaire Study I**

Appendix V: **Questionnaire Study II**

Appendix VI: **Questionnaires Study III**

Round I Questionnaire

Round 2 Questionnaire

Round 3 Questionnaire

Appendix VII: **Participant Letters Study I**

Pre-notice Letter

Introductory Letter

Follow up Letter Non Respondents

Final Contact Letter Non Respondents

Appendix VIII: **Participant Information Leaflets**

Participant Information Leaflet Study I

Participant Information Leaflet Study II

Appendix IX: **Introductory Session Study III**

Appendix X: **Physical Activity Clinical Pathway Study III**

Appendix XI: **Publications Relating to this Work**

Study I Publication: Journal of Public Health

Publications from the work of this Thesis

Published Papers

BARRETT, E. M., DARKER, C. D. & HUSSEY, J. 2012. Promotion of physical activity in primary care: knowledge and practice of general practitioners and physiotherapists. *Journal of Public Health,* 21**,** 63-69

Conference Proceedings: Oral Presentations

BARRETT, E. M., DARKER, C. D. & HUSSEY, J. 2012 Determining the physical activity profile of patients attending primary care. Irish Society of Chartered Physiotherapists, Platform, Conference proceedings.

BARRETT, E. M., DARKER, C. D. & HUSSEY, J. 2011 Physical activity screening and promotion in primary care. Association of University Departments of General Practice Ireland (AUDGPI) / Scottish Academic Primary Care (ADEGS) Scientific Meeting, Platform, Conference proceedings.

BARRETT, E. M., DARKER, C. D. & HUSSEY, J. 2011 Physical activity in the management of cardiovascular diseases in primary care. 16th International World Confederation of Physical Therapy Congress, Amsterdam, Platform, Conference proceedings.

Conference Proceedings: Poster Presentations

BARRETT, E. M., DARKER, C. D. & HUSSEY, J. 2012 Determining the physical activity profile of patients attending primary care. 5th School of Medicine Postgraduate Research Day,Trinity College Dublin, Poster, Conference proceedings.

List of Abbreviations

ACSM American College of Sports Medicine

BMI Body mass index

CHD Coronary heart disease

CI Confidence interval

CSO Central Statistics Office

CVD Cardiovascular disease

CVRF Cardiovascular risk factor

DALY Disability Adjusted Life Year

EU European Union

EUPASS European Physical Activity Surveillance System

GAPA Global Advocacy Council for Physical Activity

GMS General Medical Services

GP General Practitioner

GPAQ Global Physical Activity Questionnaire

GPPAQ General Practice Physical Activity Questionnaire

HDI Human Development Index

HSE Health Services Executive

ICCs Intraclass Correlation Coefficients

ICGP Irish College of General Practitioners

IPAQ International Physical Activity Questionnaire

IPAQ-LF International Physical Activity Questionnaire long form

IPAQ-SF International Physical Activity Questionnaire short form

IPSAH International Society for Physical Activity and Health

IQR Inter quartile range

ISCP Irish Society of Chartered Physiotherapists

MET Metabolic equivalent

NCD(s) Non communicable disease(s)

NERF National Exercise Referral Framework

NHS National Health Service (UK)

NICE National Institute of Health and Care Excellence

OECD Organisation for Economic Cooperation and Development

OR Odds ratio

PA Physical activity

PT Physiotherapist

QALY Quality adjusted life-year

UHI Universal health insurance

UN United Nations

US United States of America

RR Relative risk

RCT Randomised controlled trial

SAHRU Small area health research unit

SLÁN Survey of Lifestyle, Attitudes and Nutrition

SMD Standardised mean difference

STEPS STEPwise approach to population surveillance

TDO Transformation development officer

WHO World Health Organisation

Table of Contents

Chapter 1 Introduction **1**

1.1 Physical Activity 1

1.1.1 Definition and Classification of Physical Activity 2

1.1.2 Definition of Sedentary Behaviour 3

1.2 Health Benefits of Physical Activity 4

1.2.1 Physical Activity and Cardiovascular health 4

1.2.2 Physical Activity and All-Cause Mortality 6

1.2.3 Physical Activity and Cancer 7

1.2.4 Physical Activity and Mental Health 7

1.3 Non-Communicable Diseases: A Global Burden 8

1.3.1 Non-Communicable Diseases in Ireland 9

1.3.2 Cardiovascular Disease Worldwide 9

1.3.3 Cardiovascular Disease in Ireland 10

1.4 Physical Inactivity as a Risk Factor for Non-Communicable Diseases 10

1.4.1 Economic Implications of Physical Inactivity 11

1.4.2 Sedentary Behaviour as a Risk Factor for Non-Communicable Diseases 12

1.5 Population Approaches to Physical Activity Promotion 15

1.5.1 Preventative Medicine 15

1.5.2 Population Health 16

1.6 Development of the Physical Activity Public Health Recommendations 17

1.6.1 Physical Activity Guidelines 18

1.6.2 Physical Activity Guidelines in Ireland 18

1.6.3 Sedentary Behaviour Guidelines 19

1.7 Population Approaches to Physical Activity Promotion 20

1.7.1 Policy and Environment 21

1.7.2 Mass Media 21

1.7.3 Whole of School Programmes 21

1.7.4 The Workplace 22

1.7.5 The Community 22

1.8 Promotion of Physical Activity in Primary care 24

1.8.1 Introduction 24

1.8.2 Physical Activity Advice and Counselling 25

1.8.3 Exercise Referral Schemes and Exercise on Prescription Schemes 27

1.8.4 Cost Effectiveness of Interventions Delivered in Primary Care 29
1.9 Promotion of Physical Activity by GPs and Physiotherapists 29
1.9.1 Literature Search 30
1.9.2 Eligibility criteria 30
1.9.3 Search strategy 30
1.9.4 Results 30
1.10 Primary Care in Ireland 47
1.10.1 Primary Care Definition 47
1.10.2 Primary Care Structure 47
1.10.3 Current Reformation of Primary Care Services in Ireland 48
1.10.4 Healthy Ireland A Framework for Improved Health and Wellbeing 49
1.11 Public Health Surveillance of Physical Activity 53
1.11.1 Population Surveillance of Physical Activity 54
1.12 Prevalance Rates of Physical Activity and Sedentary Behaviour 55
1.12.1 Literature Search 55
1.12.2 Eligibility Criteria 55
1.12.3 Search Strategy 56
1.12.4 Results 56
Chapter 2 Methodology: Studies I and II 79
2.1 Introduction 79
2.2 Descriptive Design 79
2.2.1 Cross Sectional Study Design 80
2.2.2 Cross Sectional Surveys 80
2.3 Sampling Methods 81
2.3.1 Study I Sampling 82
2.3.2 Study II Sampling 83
2.4 Study I Questionnaire Design 85
2.4.1 Question Construction and Wording 85
2.4.2 Questionnaire Pilot Study 86
2.4.3 Questionnaire Focus Group and Telephone Interviews 87
2.5 Participant Introductory and Follow up Letters 89
2.6 Study I Determining the Survey Mode 89
2.7 Study I Survey Implementation 91
2.8 Study II Subjective Measurement of Physical Activity 92

2.8.1 Advantages and Disadvantages of Self Reported Physical Activity Measures.... 92
2.8.2 International Physical Activity Questionnaire 93
2.8.3 Measurement Properties of the IPAQ Short Form 94
Chapter 3 Methodology Study III 98
3.1 Introduction 98
3.2 Delphi Methodology 98
3.2.1 Question and Statement Generation 99
3.2.2 Reduction and Categorisation of Data 100
3.2.3 Iteration 100
3.2.4 Selection and Sampling of the Expert Panel 101
3.2.5 Analysis 103
3.3 Advantages and Disadvantages of the Delphi 104
Chapter 4 Study 1: Promotion of Physical Activity in Primary Care 106
4.1 Introduction 106
4.2 Methodology 106
4.2.1 Participants 106
4.2.2 Study Design 107
4.2.3 Questionnaire 107
4.2.4 Data Management and Analyses 108
4.3 Results 108
4.3.1 Response Rate 108
4.3.2 Demographic and Professional Details 110
4.3.3 Knowledge of the Physical Activity Guidelines 110
4.3.4 Physical Activity Screening Practices 111
4.3.5 Physical Activity Counselling Practices 112
4.4 Discussion 114
4.4.1 Response Rate 114
4.4.2 Knowledge of the Guidelines 115
4.4.3 Physical Activity Screening Practices 116
4.4.4 Physical Activity Counselling Practices 116
4.4.5 Use of Physical Activity Interventions 117
4.4.6 Limitations of the study 118
4.5 Conclusion 118
Chapter 5 Study II: The Physical Activity Profile of a Primary Care Population 119

5.1 Introduction 119
5.2 Methodology 120
5.2.1 Sampling 120
5.2.2 Study Tool and Procedure 121
5.2.3 Data Management and Analyses 122
5.3 Results 123
5.3.1 Socio-demographic Details 123
5.3.2 Cardiovascular Risk Factors 124
5.3.3 Physical Activity 125
5.3.4 Prevalence of No Physical Activity 133
5.3.5 Physical Activity over the Previous Six Months 133
5.3.6 Prevalence of an Injury or Disability Limiting Physical Activity 134
5.3.7 Physical Activity and Cardiovascular Risk Factors 134
5.3.8 Correlates of Low Physical Activity 136
5.3.9 Sitting Time 139
5.3.10 Physical Activity and Sedentary Time 144
5.4 Discussion 146
5.4.1 Response Rate and Demographic Variables 146
5.4.2 Physical Activity of Primary Care Patients 146
5.4.3 Sedentary Time of Primary Care Patients 151
5.4.4 Limitations of this study 154
Chapter 6 Study III: Feasibility of a Physical Activity Pathway for Primary Care 156
6.1 Introduction 156
6.2 Methodology 158
6.2.1 Expert Panel 158
6.2.2 Study Procedure 158
6.2.3 Study Questionnaires 159
6.3 Data Management and Analysis 161
6.4 Results 161
6.4.1 Professional Details 161
6.4.2 Round One Results 162
6.4.3 Round Two Results 167
6.4.4 Round Three Results 167
6.5 Discussion 171

6.5.1 Response Rate 171
6.5.2 Recruitment onto the Pathway 171
6.5.3 Modifications to the Pathway 172
6.5.4 Training Needs 173
6.5.5 Additional Considerations of Private Practitioners 174
6.5.6 Limitations 174
Chapter 7 Discussion 176
7.1 Summary of the Main Findings of this Research 176
7.2 Analysis of Key Points 179
7.2.1 Physical Inactivity: Not an Equally Distributed Risk 179
7.2.2 The Scope and Reach of Physical Activity Guidelines 182
7.3 Implications for Practice 184
7.4 Implications for Policy 192
7.5 Critical Appraisal of this Work 195
7.6 Implications for Future Research 198
7.7 Conclusion 199

Chapter 1 Introduction

1.1 Physical Activity

Evidence for the health benefits of physical activity (PA) has been accumulating since the 1950s, when Jeremiah Morris an eminent Scottish epidemiologist, undertook the first studies investigating PA and coronary heart disease (CHD) in employees of the London transport system (Morris et al., 1953). His findings led to the hypothesis that sedentary work was a factor in the development of CHD and spawned many of the epidemiological studies that today underpin our understanding of PA, as an important determinant of health.

There are now clearly documented benefits, with strong evidence, that PA can reduce the rates of all cause mortality, CHD, high blood pressure, type 2 diabetes, metabolic syndrome, stroke, breast and colon cancers and depression (US Department of Health and Human Services, 2008a, World Health Organisation, 2010a).

The rising burden of non communicable diseases (NCDs) signals a stark and growing threat to the world's health and physical inactivity is recognised as one of the most common and persistent risk factors in their development. This presents a significant challenge to health systems particularly within the primary care arena, where there is a professional responsibility to promote and maintain health and wellbeing and prevent disease.

The following thesis investigates the prevalence and patterns of PA and sedentary behaviour in a primary care population in Ireland and describes how health professionals incorporate PA promotion into their clinical practice. It is presented in seven chapters. The first chapter provides the background introduction to PA, chapters two and three present the study methodologies, chapters four, five and six present each of the three studies undertaken as part of this research and the final chapter discusses the findings and implications stemming from this PhD.

The introductory chapter is divided into four broad sections which are presented schematically in Figure 1. This is preceded by a general introduction to the definition and classification of PA and sedentary behaviour.

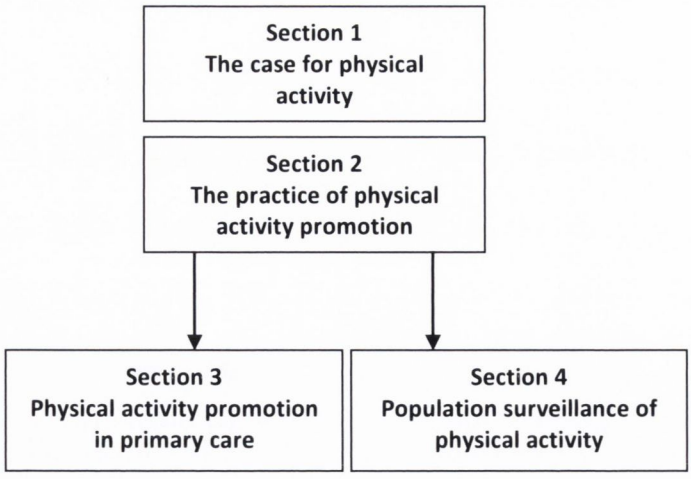

Figure 1 Overview of Chapter One

1.1.1 Definition and Classification of Physical Activity

PA is defined as any bodily movement produced by skeletal muscles that results in energy expenditure (Caspersen et al., 1985). PA in daily life can be categorised into a number of different domains; occupational, household, transport related and leisure time activity. Examples of each are given in Table 1.

Exercise is a subset of PA that is planned, structured, and repetitive and has, as a final or an intermediate objective, the improvement or maintenance of physical fitness (Caspersen et al., 1985). Incidental PA is usually not planned and is the activity that occurs as a result of activities related to housework, transport or the garden.

Table 1 Domains of Physical Activity

Domain	Example
Occupational	Work related: manual tasks during labour, farming, walking, carrying, lifting objects
Household or domestic	Housework, shopping, gardening, childcare, cleaning, vacuuming
Transport related	Purpose of going somewhere: walking, cycling, stair climbing
Leisure time	Recreational activities: sports, gym work, exercise, classes, dancing, swimming

There are four different measurement parameters associated with PA; mode, frequency, duration and intensity. The mode concerns the type of PA and may be defined either in the context of physiological or biomechanical demands, for example aerobic exercise, resistance or strength training, balance and flexibility. The frequency of the exercise/activity is the number of times it occurs in a specific time period, usually a week. The duration is the length of time during which the activity occurs and is expressed in terms of minutes or hours. The intensity of the activity may be classified as low, moderate or vigorous and is dependent on the metabolic demand of an activity.

The metabolic equivalent (MET) is a common unit used to express exercise intensity. One MET represents the resting energy expenditure during quiet sitting and is commonly defined as 3.5mL O2·kg^{-1}·min^{-1} or ≈250 mL/min of oxygen consumed, which represents the average value for a standard 70 kg person (Strath et al., 2013). As the intensity of an activity increases the level of oxygen consumption will increase, thus it may be quantified in terms of multiples of resting energy expenditure.

A compendium of physical activities has been developed and has gained widespread use as a resource to estimate and classify the energy cost of human PA (Ainsworth et al., 2000, Ainsworth et al., 2011). The compendium provides a comprehensive list of the different types and categories of PA and their associated MET(s) value (Ainsworth et al., 2000, Ainsworth et al., 2011). It is used as a reference for quantifying the types of activity that characterise sedentary behaviour (≤1.5 METs), light-intensity (1.6-2.9 METs), moderate-intensity (3-5.9 METs), and vigorous-intensity (≥6 METs) activities.

Examples of activities of low, moderate and vigorous intensity are given in Table 2 along with their corresponding METs value. Moderate intensity activity is generally equivalent to a brisk walk and noticeably accelerates the heart rate and vigorous intensity activity is exemplified by jogging and causes rapid breathing and a substantial increase in heart rate (Haskell et al., 2007).

Table 2 Examples of Light, Moderate and Vigorous Physical Activities and Corresponding METs Values

PHYSICAL ACTIVITY	METs
Light Intensity Activities	**< 3**
Sleeping	0.9
Writing, desk work, typing	1.8
Walking less than 2.0 mph (3.2 km/h), level ground, strolling, very slow	2.0
Moderate Intensity Activities	**3 – 6**
Stationary bicycling, 50 watts, very light effort	3.0
Calisthenics, home exercise, light or moderate effort	3.5
Bicycling < 10 mph (16 km/h) leisure, to work or for pleasure	4.0
Walking 3.5 mph, brisk, walking for exercise	4.3
Stationary bicycling, 100 watts, light effort	5.5
Vigorous Intensity Activities	**> 6**
Jogging, general	7.0
Calisthenics (e.g. push ups, sit ups, pull ups), heavy vigorous effort	8.0
Running, jogging pace	8.0

Reproduced from Compendium of physical activities: an update of activity codes and MET intensities (Ainsworth et al., 2000)

1.1.2 Definition of Sedentary Behaviour

Sedentary behaviours are defined as any waking behaviour characterised by an energy expenditure of ≤1.5 METs while in a sitting or reclining posture (Ainsworth et al., 2000, Owen et al., 2010). Traditionally in the exercise literature, sedentary behaviour has been used to represent a lack of PA or a failure to meet a certain threshold of moderate or vigorous PA (Church et al., 2009, Mullen et al., 2011). Hence studies often talk about recruiting "sedentary individuals" for a PA intervention. Contemporary research in this field does not accept the

position that sedentary behaviour is simply a lack of PA and instead define it as a separate behaviour characterised by sitting or lying and a very low level of energy expenditure (Pate et al., 2008, Sedentary Behaviour Research, 2012). Figure 2 presents the PA continuum, illustrating different intensities of movement from sedentary to vigorous, as well as their assigned METs values.

Similar to PA, sedentary behaviours can be categorised into home, work, school, transport and leisure related behaviours. Typical activities include watching television, using a computer and driving a car. Physical inactivity or the term "inactive" is used to describe those who are performing insufficient amounts of moderate or vigorous PA.

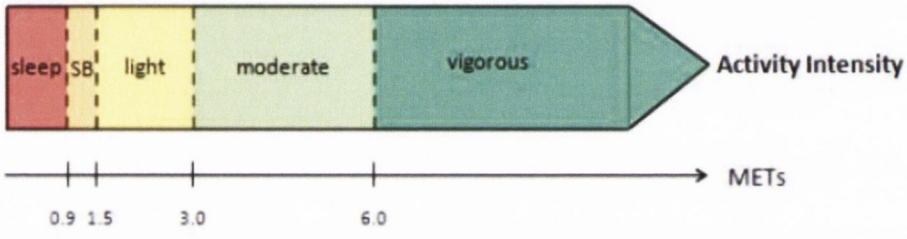

Figure 2 Continuum of Physical Activity and Sedentary Behaviour and Assigned METs Values

1.2 Health Benefits of Physical Activity

The first section of this chapter presents an overview of the evidence supporting PA in the prevention and management of a number of non communicable diseases.

1.2.1 Physical Activity and Cardiovascular health

PA has a twofold impact on cardiovascular health, the influence it exerts over the development of symptomatic disease such as stroke and heart attack and also its influence on modifiable risk factors such as hypertension, type 2 diabetes and obesity that are known to contribute to the development of disease (Richardson et al., 2004, Nocon et al., 2008).

Accumulating data from the literature continues to support a strong inverse relationship between the amount of habitual PA performed and CHD and cardiovascular disease (CVD) morbidity or mortality (Lovasi et al., 2007, Sundquist et al., 2005, Sattelmair et al., 2011). Conservative estimates suggest that persons reporting moderate amounts of PA have a 20% lower risk, and those reporting activity of higher amounts or intensity have approximately a 30% lower risk of CHD and CVD morbidity or mortality, than the least active persons (US Department of Health and Human Services, 2008a).

In a recent meta-analysis examining the dose response between PA and risk of CHD, Sattelmair and colleagues found evidence that individuals who engaged in the equivalent of 150 minutes

per week of moderate intensity leisure time PA had a 14% lower CHD risk (relative risk [1] (RR) 0.86; 95% CI 0.77 to 0.96) compared with those reporting no leisure time PA (Sattelmair et al., 2011). Those engaging in higher levels of moderate intensity leisure time PA, equivalent to 300 minutes per week, had an additional benefit with a 20% lower risk (RR 0.80; 95% CI 0.74 to 0.88).

Similar results were reported by Li et al in their meta-analysis of prospective cohort studies (Li and Siegrist, 2012). Using studies of high methodological quality and a sample size of more than 650,000 adults, their findings suggest that a high level of leisure time PA and moderate level of occupational PA have a beneficial effect on cardiovascular health by reducing the overall risk of CHD and stroke amongst men and women by 20% to 30% and 10% to 20%, respectively.

Significant benefits have been found regarding the protective effect of PA on cardiovascular risk factors (CVRFs). A recent meta-analysis of prospective cohort studies highlighted the inverse dose-response association between levels of leisure time PA and the risk of hypertension (Huai et al., 2013). The pooled RR from 13 studies which included 136,846 persons suggests that both high and moderate levels of leisure time PA were associated with decreased risk of hypertension (high versus low: RR 0.81; 95%CI 0.76-0.85, moderate versus low: RR 0.89; 95% CI 0.85-0.94). Endurance, dynamic resistance, and isometric resistance training have all been shown to lower both systolic and diastolic blood pressure (Cornelissen and Smart, 2013), with the most recent evidence suggesting that isometric training may have the largest impact at producing clinically meaningful blood pressure reductions (Carlson et al., 2014).

Regular PA is associated with reduced risk of metabolic syndrome and type 2 diabetes (US Department of Health and Human Services, 2008a, Jeon et al., 2007). In general, both cross-sectional and longitudinal cohort studies consistently show a lower incidence and prevalence, respectively, of metabolic syndrome among physically active individuals as compared with their inactive peers (US Department of Health and Human Services, 2008a).

In a meta-analysis of ten prospective cohort studies, a substantial inverse association was observed between PA of moderate intensity and risk of type 2 diabetes. Those who regularly engaged in PA of moderate intensity had a 30% lower risk of type 2 diabetes as compared with sedentary individuals (Jeon et al., 2007). A similar decrease in diabetes risk was observed when walking was specifically examined and the associations remained significant (17%) after controlling for body mass index (BMI). Exercise interventions combined with diet are also able to decrease the incidence of type 2 diabetes mellitus in high risk groups such as those with impaired glucose tolerance or the metabolic syndrome (Orozco et al., 2008).

Additionally, PA is a key determinant of energy expenditure, and thus is fundamental to energy balance and weight control. Overweight and obesity are linked to increased morbidity from CVD, respiratory disease, osteoarthritis and some cancers (Aleksandrova et al., 2013,

[1] Relative risk (RR) measures the magnitude of an association between an exposed and non-exposed group. It describes the likelihood of developing disease in an exposed group compared to a non-exposed group.

Cerhan et al., 2014, Aune et al., 2012, Chen et al., 2013, US Department of Health and Human Services, 2008a).

The role of PA on the long-term prevention of weight gain or maintenance of weight loss has been assessed in numerous studies in the literature (Besson et al., 2009, Droyvold et al., 2004). Prospective studies with follow up periods of up to six years have reported on the benefits of PA to prevent weight gain and/or result in weight loss (US Department of Health and Human Services, 2008a). In general, regular participation in moderate to vigorous PA is associated with weight maintenance over time (Chaput et al., 2011, Di Pietro et al., 2004) and coupled with calorific restriction may help to promote and maintain clinically significant weight loss in overweight individuals (Franz et al., 2007, Wu et al., 2009).

In overweight and obese individuals, diet and exercise interventions have produced greater long term weight loss in randomised controlled trials when compared with diet only interventions with a pooled weight loss of 1.14 kg (95% CI 0.21-2.07) more, for the diet and exercise group (Wu et al., 2009). Even in studies lasting two years or longer, diet-plus-exercise interventions provided significantly greater weight loss than diet-only interventions.

1.2.2 Physical Activity and All-Cause Mortality

Following an extensive review of the existing literature, the PA Guidelines Advisory Report to the US Department of Health and Human Services, found that the data very strongly support an inverse association between PA and all-cause mortality (US Department of Health and Human Services, 2008a). Reviewing the evidence from 73 epidemiological studies, the majority of which were prospective cohort studies, with a median follow up period of 11.7 years, there was strong evidence to support an inverse relation between PA and all-cause mortality rates.

The median RR, comparing the most with the least active participants was 0.69 across all studies, indicating a 31% risk reduction with PA. This was similar for older persons, men and women, across different races and ethnic groups and significantly for persons with existing coronary artery disease or at high risk, and among patients with diabetes.

Since the US Advisory Report was published there have been a number of systematic reviews and meta-analysis that have added to the strength of the evidence. For example, a systematic review in 2008 combined results from 33 cohort studies investigating the primary preventative impact of PA on all-cause and cardiovascular mortality with a follow up period ranging from four to 20 years(Nocon et al., 2008). PA was associated with a risk reduction of 35% (95% CI 30-40%) in cardiovascular mortality and a 33% (95% CI 28-37%) reduction in all-cause mortality.

There are consistent findings from the data to support an inverse dose response relation for the total volume of energy expended, with "some" PA promoting beneficial health outcomes, but "more" PA producing enhanced benefits to health (US Department of Health and Human Services, 2008a). Lollgen and colleagues (2009) investigated the effect of different levels of PA on all-cause mortality. For studies with three activity categories (mildly, moderately, and highly active) and multivariate-adjusted models, highly active men had a 22% (RR 0.78; 95% CI 0.72-

0.84) lower risk of all-cause mortality compared to mildly active men. For women, the RR was 0.69 (95% CI 0.53-0.90) (Lollgen et al., 2009). The results were also positive in moderately active persons compared to mildly active individuals (RR 0.81 for men and 0.76 for women). Similar to the US report, the inverse association between PA and all-cause mortality was also significant among persons aged 65 years and older.

Samitz et al (2011) also reported evidence to support an inverse relationship between increasing levels of total PA and all-cause mortality, with stronger associations for women than for men, and improved risk ratios for vigorous and leisure based activities versus occupational and transport related activity. The RR reported in this study, corresponding to 150 and 300 minutes per week of moderate to vigorous activity were 0.86 (95% CI 0.80-0.92) and 0.74 (95% CI 0.65-0.85) respectively (Samitz et al., 2011).

1.2.3 **Physical Activity and Cancer**

PA has a protective effect on the development of several cancers with the most consistent associations having been observed for colon (Samad et al., 2005, Wolin et al., 2009) and breast cancers (Monninkhof et al., 2007). Several studies provide consistent evidence supporting an inverse association between PA and colon cancer in both men and women (Samad et al., 2005, Wolin et al., 2009, Lee et al., 2007). Wolin and colleagues (2009) provide a formal estimate of the magnitude of this risk reduction as 0.76 (95% CI 0.71-0.82) for men; and 0.79 (95% CI 0.71-0.88) for women (Wolin et al., 2009). There is strong evidence to support an inverse relationship between PA and postmenopausal breast cancer risk in women (Monninkhof et al., 2007).

As well as a role in the prevention of cancer, PA has also been shown to have a positive influence on the mortality risk of breast and colorectal cancer survivors (Zhong et al., 2014, Schmid and Leitzmann, 2014). For example, breast or colorectal cancer survivors who increased their PA by any level from pre- to post-diagnosis showed decreased total mortality risk (RR 0.61; 95% CI 0.46-0.80) compared with those who did not change their PA level or were inactive/insufficiently active before diagnosis (Schmid and Leitzmann, 2014).

In addition, PA may play an important role in preventing, attenuating, or rehabilitating late and long-term effects of cancer treatment with for example, recent work exploring the efficacy of exercise as a non-pharmacologic intervention to reduce cancer-related fatigue among adult cancer survivors (Brown et al., 2011).

1.2.4 **Physical Activity and Mental Health**

Regular participation in moderate to vigorous PA is associated with improved aspects of mental wellbeing and reduced symptoms of several mental health disorders (US Department of Health and Human Services, 2008a).

PA has a protective effect on mental health with promising evidence to suggest that any level of PA, including low levels (e.g. walking <150 minutes per week), can prevent future

depression (Mammen and Faulkner, 2013, Teychenne et al., 2008). There is also some limited evidence to suggest that exercise may be moderately effective in the treatment of the symptoms of depression (Cooney et al., 2013). PA has also been found to reduce the symptoms of schizophrenia as well as to improve anthropometric measures, aerobic capacity, and quality of life among people with mental illness (Rosenbaum et al., 2014).

Evidence is also accumulating that exercise has profound benefits for brain function, including improvements in learning and memory as well as in preventing and delaying loss of cognitive function with aging or neurodegenerative disease (van Praag, 2009). In older persons, PA is associated with better mental health with evidence from randomised controlled trials and epidemiological studies showing significant reductions in depression and fear of falling amongst adults who participate in exercise programmes (Gogulla et al., 2012).

1.3 Non-Communicable Diseases: A Global Burden

Non-communicable diseases (NCDs) are defined as diseases of long duration and generally slow progression and they are the major cause of adult mortality and morbidity worldwide (World Health Organisation, 2005).

According to the World Health Organisation (WHO), NCDs comprising mainly of CVD, cancer, diabetes and chronic lung diseases were responsible for 36 of the 57 million deaths globally in 2008 (World Health Organisation, 2010a). This equated to 63% of all deaths that year and represents a sharp increase from just under 40% in 1990 (Murray and Lopez, 1997). Significant proportions (44%) of these deaths were premature, occurring in persons under the age of 70 and almost 80% occurred in low and middle income countries. NCDs are the most frequent cause of death in most countries in the Americas, the Eastern Mediterranean, Europe, South-East Asia, and the Western Pacific (World Health Organisation, 2011c).

NCDs also account for 48% of the healthy life years lost (Disability Adjusted Life Years–DALYs) worldwide (World Health Organisation, 2005). The disability-adjusted life year (DALY) is a measure of overall disease burden, expressed as the number of potential productive years lost due to premature ill-health, disability or early death. The World Health Organisation defines DALYs as *"The sum of years of potential life lost due to premature mortality and the years of productive life lost due to disability"* (World Health Organization, 2011). A DALY is a healthy life year lost.

The world's population is increasing, with United Nations (UN) projections estimating that the global population will increase by two billion by 2050 (United Nations Department of Economic and Social Affairs Population Division, 2014). As the population increases, the proportion of those aged 60 and over is also expected to rise and as NCDs disproportionately affect this age group, the incidence of these diseases is also predicted to accelerate.

Aligned with an ageing and expanding population, is the rising prevalence of the four key risk factors for NCDs; poor diet, insufficient PA, tobacco use, and the harmful use of alcohol. This is particularly relevant in people of lower income and in the developing world, where the prevalence of these risk factors is rising steadily as globalisation and urbanisation take greater

hold (World Health Organisation, 2011c). WHO projections estimate that the global death rate from NCDs will increase by 15% to 44 million between 2010 and 2020.

As well as the human and social cost, NCDs have a large economic impact, undercutting productivity and increasing healthcare spending. The Global Burden of Non-communicable Diseases report developed by the World Economic Forum and the Harvard School of Public Health, projected that the five leading NCDs could cost $47 trillion (US dollars) by the year 2030, a loss which equates to 75% of global gross domestic product in 2010 (Bloom, 2011). Amongst the leading causes of NCDs, CVD and mental health conditions are the dominant contributors to the global economic burden (Bloom, 2011).

1.3.1 Non-Communicable Diseases in Ireland

WHO figures estimate that 87% of all deaths in Ireland in 2010 were due to NCDs (World Health Organisation, 2011c). The largest proportions of these were as a result of heart disease (34%) and cancer (29%).

Figures released by the Institute of Public Health in Ireland predict that the number of adults with a chronic disease is expected to rise by about 40% by 2020 (Balanda, 2010). Relatively more of the burden will be borne by older adults and by persons living in deprived areas and of lower socioeconomic advantage.

Similar to the global pattern, the population in Ireland is ageing with the total number of over 65's increasing by around 20,000 persons every year (Department of Health, 2013a). Central Statistics Office figures predict that the number of persons over 65 will more than double over the next 30 years (Central Statistics Office, 2012b). At present, three quarters of people over 75 have at least one chronic condition in Ireland (Department of Health and Children, 2008). This, together with the ongoing high prevalence of lifestyle risk factors, has the potential to impact significantly on the future health of Ireland.

1.3.2 Cardiovascular Disease Worldwide

Over the past decade, CVD has become the single largest cause of death worldwide, representing nearly 30% of all deaths and about 50% of NCD deaths (World Health Organisation, 2011a). CVD refers to a group of diseases involving the heart, blood vessels, or the sequelae of poor blood supply due to a diseased vascular supply.

The WHO estimates that in 2008, CVD caused an estimated 17 million deaths worldwide and led to 151 million DALYs which represents 10% of all DALYs in that year. Modifiable risk factors such as physical inactivity, cigarette smoking and unhealthy diet explain nearly 80% of the CVD burden (Gaziano et al., 2010).

1.3.3 Cardiovascular Disease in Ireland

CVD remains the most common cause of death in Ireland, accounting for one-third of all deaths and one in five of all premature deaths in 2010 (Department of Health & Children, 2010). Mirroring global trends, the burden of CVD is predicted to increase in the Republic of Ireland (Balanda, 2010). For example, the prevalence of hypertension in Ireland in 2007 was 25.1%, which represents 852,000 adults. This is expected to rise to 28.3% or 1.19 million adults by 2020. This represents a 40% increase in the burden from hypertension in less than 15 years. Similar increases have been predicted for diabetes (type 1 and 2 combined) which is expected to rise by 62%, CHD predicted to increase by 50% and stroke by 48% (Balanda, 2010).

These increases are predicted despite the significant improvements seen in many areas of cardiovascular management since the introduction of the first National Cardiovascular Strategy in 1999 (Department of Health and Children, 1999). The most recent figures point to significant decreases in mortality rates from CVD. Age-standardised death rates from CVD have decreased by two-thirds over the past 30 years (Department of Health & Children, 2010).

However, the decreases in mortality attributed predominantly to improvements in treatment and the reduction in some risk factors such as smoking have the potential to be offset by increases in adverse population trends particularly related to the lifestyle risk factors of obesity, diabetes and physical inactivity (Bennett et al., 2006). If these adverse patterns continue, they have the potential to reverse some of the recent declines achieved in cardiovascular morality. Additionally, the benefits in decreased mortality rates are not equally spread throughout society with, for example, male professional workers living 6.1 years longer than their unskilled counterparts (Central Statistics Office, 2010).

Achieving relatively modest reductions in these major population level risk factors has the potential to generate twice as many life years as that achieved by modern cardiology treatments and thus becomes a public health priority (Kabir et al., 2007). As mortality rates decrease, the numbers of people living with a long term chronic disease will increase.

1.4 Physical Inactivity as a Risk Factor for Non-Communicable Diseases

As mentioned previously, common preventable risk factors underlie most NCDs. Most NCDs are strongly associated and causally linked with four particular behaviours: tobacco use, physical inactivity, unhealthy diet and the harmful use of alcohol (World Health Organisation, 2011c). Physical inactivity is one of the most common and persistent risk factors contributing to poor health throughout the world with the WHO ranking physical inactivity as the fourth leading cause of death globally (World Health Organisation, 2009a).

In 2002, physical inactivity was estimated to have led to 1.9 million deaths globally and to have accounted for 19 million DALYs (World Health Organisation, 2002). By 2010, the annual number of deaths attributed to physical inactivity was estimated to have increased to 3.2 million and to have accounted for more than 69 million DALYs (Lim et al., 2012) .This represents an increase of over 68% in the mortality figures and a 3.6-fold increase in the number of DALYs in just over one decade.

A recent study in the Lancet, highlighted physical inactivity as an even greater problem than that suggested by Lim and colleagues (Lee et al., 2012). The study aim was to quantify the effect of physical inactivity on the world's major NCDs, and estimate how much of these diseases could be averted if inactive people were to become active (Lee et al., 2012). Using population attributable fractions, they provided estimates of the proportion of new cases of a disease that would not occur if physical inactivity was eliminated.

The authors calculated that worldwide, physical inactivity caused 6% of the burden of disease from CHD, 7% of type 2 diabetes, 10% of breast cancer and 10% of colon cancer. For Ireland, the population attributable fractions for each disease were 8.8%, 20.9%, 15.2% and 15.7% respectively. The researchers estimated that inactivity caused 9% (range 5.1-12.5) of premature mortality, or more than 5.3 million of the 57 million deaths that occurred globally in 2008. Decreasing physical inactivity levels by 25% could avert 1.3 million deaths each year.

For specific diseases, the percentage of deaths attributable to physical inactivity is even higher, with for example 30% of deaths from ischaemic heart disease attributed to physical inactivity (World Health Organisation, 2009a).

1.4.1 Economic Implications of Physical Inactivity

There are significant economic consequences associated with physical inactivity, direct costs associated with increased healthcare utilisation and indirect costs associated with reduced productivity through lost workdays and premature mortality. The magnitude of the economic implications at a global level are uncertain at present, but studies examining the economic impact at a country level highlight some stark findings.

Physical inactivity is associated with significantly more increases to the number of hospitalisations, lengths of stay and healthcare visits (Woolcott et al., 2010, Sari, 2009). Liu-Ambrose et al found an inverse association between healthcare utilisation rates and current level of PA (Liu-Ambrose et al., 2010). A physically inactive person demonstrates increased use of physician and nurse services than an active person (Sari, 2009). On average, an inactive person spends 38% more days in hospital, uses 5.5% more family physician visits, 13% more specialist services, and 12% more nurse visits than an active person (Sari, 2009). Average healthcare costs of inactive persons are also significantly higher than their active counterparts (Woolcott et al., 2010).

In developed countries, physical inactivity is associated with considerable economic burden, with 1.5-3.0% of total direct healthcare costs being accounted for by physical inactivity (Oldridge, 2008). Estimations for physical inactivity related ill-health costs in the UK in 2006-2007 were calculated at £0.9 billion (GBP) (Scarborough et al., 2011).

In 2004, direct and indirect costs associated with physical inactivity in Canada were estimated at $1.6 billion (Canadian dollars) and $3.7 billion respectively which represented 2.6% of total healthcare costs that year (Katzmarzyk and Janssen, 2004). Updated figures in 2012 suggest that the economic consequences of physical inactivity in Canada had increased to $10.0 billion (Krueger et al., 2014). The annual economic burden of three risk factors combined; smoking,

excess weight and physical inactivity were estimated at $50.3 billion. Using population attributable fractions the authors estimated that a 1% relative annual reduction in each of the three risk factors would result in an $8.5 billion annual reduction in economic burden by 2031.

The WHO estimates that physical inactivity costs a country about €150–300 (Euro) per citizen per year (Cavill et al., 2006). To the author's best knowledge there are no estimations available regarding the economic burden of physical inactivity in Ireland.

1.4.2 Sedentary Behaviour as a Risk Factor for Non-Communicable Diseases

There is a growing body of evidence to suggest that sedentary behaviour may be a distinct risk factor, independent of PA, for multiple adverse health outcomes (Hamilton et al., 2007, Dunstan et al., 2011). Recent epidemiological studies suggest that sitting time has deleterious cardiovascular and metabolic effects, irrespective of whether an individual meets the recommendations for PA (Proper et al., 2011, Thorp et al., 2010, Thorp et al., 2011). Sitting for extended periods is distinct from a lack of exercise and as such, has its own unique metabolic consequences (Hamilton et al., 2008).

There have been two recent systematic reviews examining sedentary behaviour and health outcomes in adults (Proper et al., 2011, Thorp et al., 2011). Proper and colleagues (2011) reviewed 19 prospective studies of which 14 were judged to be of high methodological quality. The authors found strong evidence to support a relationship between sedentary behaviour and all-cause mortality and CVD mortality but no evidence for mortality from cancer. Results were inconsistent with respect to the causal effect of sedentary behaviour with insufficient evidence for body weight, CVD risk and endometrial cancer, but moderate evidence for a positive relationship between sitting time and the risk of type 2 diabetes. It is worth noting that the majority of these studies were based on subjective measures of sedentary behaviour with limited validity and different recall periods and the follow up periods varied considerably, all of which may influence the findings.

In the second systematic review, Thorp and colleagues (2011) reviewed 48 longitudinal studies reporting on the relationship between sedentary behaviour and health related outcomes in adults between 1996 and 2011. Similar to Proper's findings, there was convincing evidence to support a longitudinal relationship between sedentary behaviour and all-cause and CVD related mortality in men and women. They also reported consistent findings with respect to sedentary behaviour and increased risk from diabetes and site specific cancers including ovarian, colon and endometrial cancer. However they urged caution when interpreting the findings, as results were attenuated in four of the eight studies when adjustments were made for BMI and PA levels, suggesting that these are important potential confounders that warrant further study. The authors also found reasonable evidence to conclude that sedentary behaviour during childhood and adolescence is a strong predictor of obesity during adulthood, but there was limited evidence to support the relationship with weight gain and obesity in adults.

There is also emerging evidence to suggest that periods of prolonged sitting are more deleterious to health than sedentary time that is accumulated in shorter bouts. An

accelerometer study of 168 Australian adults showed accruing sedentary time in shorter periods, that is with more interruptions, was less detrimental for cardio-metabolic health than accruing sedentary time in prolonged periods with fewer interruptions (Healy et al., 2008). Independent of total sedentary time and moderate to vigorous intensity activity, increased breaks in sedentary time were beneficially associated with waist circumference (standardised beta = -0.16, 95% CI -0.31 to -0.02, p = 0.026), BMI (beta = -0.19, -0.35 to -0.02, p = 0.026), triglycerides (beta = -0.18, -0.34 to -0.02, p = 0.029), and 2-h plasma glucose (beta = -0.18, -0.34 to -0.02, p = 0.025).

A large population cross sectional analyses with 4757 participants (≥20 years) from the 2003/04 and 2005/06 US National Health and Nutrition Examination Survey (NHANES) was carried out to investigate the associations of prolonged sedentary time with cardio-metabolic and inflammatory biomarkers (Healy et al., 2011). Independent of potential confounders, including moderate to vigorous exercise, detrimental linear associations (p for trends <0.05) of sedentary time with waist circumference, HDL-cholesterol, C-reactive protein, triglycerides, insulin, HOMA-%B, and HOMA-%S were observed. Independent of potential confounders and sedentary time, breaks in sedentary time were beneficially associated with waist circumference and C-reactive protein (p for trends <0.05). The authors concluded that an important component to public health messages may be an emphasis on reducing and breaking up prolonged periods of sedentary time (Healy et al., 2011).

Further longitudinal studies using objective measures of sedentary behaviour are warranted with particular emphasis on understanding the dose response relationship of sedentary behaviour with specific metabolic biomarkers. However, at present there is sufficient evidence to support the view that time spent in sedentary behaviour may lead to adverse health outcomes in adults and thus should be included in public health strategy.

SUMMARY

Physical activity has proven and comprehensive health benefits with strong evidence to support an inverse association between physical activity and all-cause mortality.

Accumulating data supports a strong inverse relation between habitual physical activity levels and coronary heart disease and cardiovascular disease mortality and morbidity.

Physical activity has additional cardiovascular benefits and is associated with reduced risk of metabolic syndrome, hypertension, type 2 diabetes, overweight and obesity.

Physical activity has a protective effect on the development of some cancers, can help reduce the mortality risk of breast and colorectal cancer survivors and additionally may attenuate some of the long term effects of cancer treatment.

Regular participation in moderate to vigorous physical activity is associated with improved aspects of mental health and reduced symptoms of several mental health disorders.

Non-communicable diseases are the most frequent cause of death in most countries throughout the world and were responsible for 63% of global deaths in 2008. Cardiovascular disease accounts for 50% of these.

In Ireland, non-communicable diseases accounted for 87% of all deaths in 2010. The proportion of the population with a chronic disease in expected to rise by 40% by 2020.

Physical inactivity is one of the most common and persistent risk factors contributing to non-communicable diseases. It is estimated to cause 3.2 million deaths worldwide each year and to have accounted for more than 69 million Disability Adjusted Life Years.

There is a growing body of evidence to suggest that sedentary behaviour may be a distinct risk factor, independent of physical activity, for multiple adverse health outcomes. There is also emerging evidence to suggest that periods of prolonged sitting are more deleterious to health than sedentary time that is accumulated in shorter bouts.

There are significant economic consequences associated with physical inactivity, direct costs associated with increased healthcare utilisation and indirect costs associated with reduced productivity through lost work days and premature mortality.

1.5 Population Approaches to Physical Activity Promotion

The second section of this chapter discusses the population approaches to PA promotion and it is organised under two broad themes outlined in Figure 3 below. A brief introduction to the concept of population health and preventative medicine precedes this.

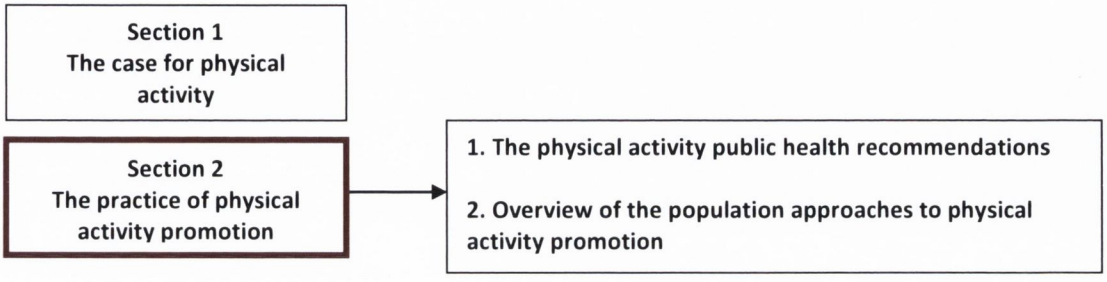

Figure 3 Outline of Section Two

1.5.1 Preventative Medicine

Preventive medicine focuses on the health of individuals, communities, and defined populations. It's goal is to protect, promote, and maintain health and well-being and to prevent disease, disability, and death (American College of Preventative Medicine, 2014).

An example of this is CVD prevention, which can be defined as a coordinated set of actions, at population and individual level, aimed at eradicating, eliminating or minimising the impact of cardiovascular diseases and their related disability.

Geoffrey Rose in his seminal article "Sick Individuals and Sick Populations" describes the two approaches to preventative medicine; that of targeting the individual or that of targeting the population (Rose, 1985). In the first "high risk" approach, the preventative strategy seeks to identify high risk, susceptible individuals and offer them some individual intervention. This has the advantage of being appropriate to the individual, thus improving participant, as well as provider motivation and is a cost effective use of resources. Rose argues that the disadvantages of this approach are the costs and difficulties associated with screening and the palliative or temporary results associated with failing to alter the underlying cause of the disease. This approach has a limited ability to predict future disease as some individuals with risk factors will remain well, limiting the impact of this "high risk" approach on prevention.

The second approach to prevention is the population strategy, which Rose (1985) describes as *"the attempt to control the determinant of incidence, to lower the mean level of risk factors, to shift the whole distribution of exposure in a favourable direction"* (p. 37).

The advantages of this approach are that first, it is attempting to identify and remove the underlying cause of the disease and thus has a large potential to impact on population health

as a whole. The approach is behaviourally appropriate attempting to change through education, social attitudes and norms. The difficulty with this approach is the small benefit it offers to individual patients leading to the "Prevention Paradox". "*This is a preventative measure that brings much benefit to the population but offers little to each participating individual*" (Rose, 1981) (p.38). This leads to problems with participant and provider motivation.

The WHO strategy for NCDs recommends that countries adopt an integrated strategy that incorporates population level disease prevention programmes as well as targeted disease management programmes that focus on individuals at high risk (World Health Organisation, 2008a). Despite this, the Organisation for Economic Cooperation and Development (OECD) estimates that only 3% of total healthcare expenditure goes towards population based disease prevention programmes (Balanda, 2010).

Using again the example of CVD, population based preventive strategies would seek to combine elements of wider public policy such as addressing the core determinants of health; poverty, education, food production and marketing, environmental and transport policies and primary prevention, which focuses on reducing the incidence of disease through factors that increase risk, such as cigarette smoking and high blood pressure.

High risk strategies in cardiovascular management would incorporate secondary prevention, or the detection and treatment of disease at an early asymptomatic stage, and tertiary prevention, which focuses on minimising the progression and/or complications of established disease (Rose, 1981). Prevention has traditionally been characterised as having three levels, namely; primary prevention, which seeks to prevent the onset of disease by risk reduction; secondary prevention, which aims to halt the progression of the disease and tertiary prevention, which is concerned with rehabilitation and minimising the impact of complications (The Association of Faculties of Medicine of Canada, 2011).

1.5.2 **Population Health**

Population health may be described as a conceptual framework for thinking about why some populations are healthier than others, as well as the policy development, research agenda, and resource allocation that flow from it (Young, 1998).

It has also been described as the health of a population as measured by health status indicators and as influenced by social, economic, and physical environments; personal health practices; individual capacity and coping skills; human biology; early childhood development; and health services (Dunn and Hayes, 1999).

Public health is described as the activities that a society undertakes to assure the conditions in which people can be healthy. These include organised community efforts to prevent, identify, and counter threats to the health of the public (Turnock, 2004). These functions are delivered together with co-operation from healthcare systems and other community sectors to establish effective prevention, control and management of diseases and chronic conditions (Institute of Medicine, 1988). Over recent years the remit of public health has broadened to include

interventions for injury prevention and control, chronic disease prevention and management, public policies prioritising health promotion, environmental supports for behaviour change and public education through the mass media (Beaulieu and Scutchfield, 2002).

1.6 Development of the Physical Activity Public Health Recommendations

The first public health recommendations on the minimum amount of PA required for health were released in 1995 by the US Centres for Disease Control and Prevention and the American College of Sports Medicine (ACSM) (Pate et al., 1995). Based on the best available evidence at the time, these recommendations stated that every US adult should accumulate 30 minutes or more of moderate intensity PA on most, preferably all, days of the week. These recommendations shifted the focus to lifestyle orientated or health enhancing PA as opposed to the exercise for fitness recommendations of the 70s and 80s (American College of Sports Medicine, 1978).

In 2007, these guidelines were updated further following an extensive review of the evidence by the American Heart Association and the ACSM, and, a year later, by the US Department of Health and Human Services (Haskell et al., 2007, US Department of Health and Human Services, 2008a).

The ACSM recommendations for PA state that in order to promote health, healthy adults aged 18 – 65, need moderate intensity aerobic PA for a minimum of 30 minutes on five days of the week or vigorous intensity exercise for a minimum of 20 minutes on three days each week (Haskell et al., 2007). Additionally, the PA recommendations may be met by performing combinations of vigorous and moderate intensity PA that accumulate to meet the recommendation. For example, a person may walk briskly for 30 minutes twice a week and then jog for 20 minutes on two other days to meet the recommendations. All moderate and vigorous activities, performed in bouts of at least ten minutes duration, accumulate towards the weekly target. This recommended amount of aerobic activity is in addition to routine activities of daily living such as self care, cooking and shopping.

In addition, these updated recommendations include a clear statement on the need to include muscle strengthening activities for a minimum of two days a week. They also emphasise that participation in aerobic and strengthening exercise above the minimum amount, provides additional health benefits and results in higher levels of physical fitness and may be required to prevent increases in body weight. The recommendation for older adults is similar for younger adults, but with additional considerations for fitness level and specific guidelines in relation to balance and flexibility (Nelson et al., 2007).

The US Department of Health and Human Services in 2008 also extended their recommendations to include specific population groups; children, middle aged adults, older people, people with disabilities and pregnant and post partum women.

There are slight differences between the ACSM and the US Department of Health and Human Services recommendations; one in relation to the duration of vigorous exercise and the second regarding the frequency of activity. The ACSM recommends 60 minutes of vigorous activity

per week and the US Department of Health and Human Services recommends 75 minutes. The ACSM recommendations state that PA should be carried out on five days of the week whereas the US recommendations do not stipulate a minimum frequency, but instead recommend that PA should preferably be spread throughout the week.

1.6.1 Physical Activity Guidelines

Public health recommendations have since been adopted extensively throughout Europe and the wider world, as well as being incorporated into several evidence based clinical guidelines for the management of specific chronic diseases.

In 2010, the WHO developed the "Global Recommendations on Physical Activity for Health" with the overall aim of providing national and regional level policy makers with guidance on the dose-response relationship between the frequency, duration, intensity, type and total amount of physical activity needed for the prevention of NCDs. The recommendations set out in this document, address three age groups: 5–17 years old; 18–64 years old; and 65 years old and above (World Health Organisation, 2010a).

In the UK, PA promotion features in the national clinical guidelines of 39 different medical conditions spanning specialties including gastrointestinal, cardiovascular, endocrine, urological, obstetrics and gynaecology, musculoskeletal and central nervous system (Weiler et al., 2012b). The WHO, the European Union and several EU countries have recently incorporated PA recommendations into their health policies and released PA guidelines of their own, based on the recommendations.

The WHO Regional Office for Europe recently reviewed all of the PA recommendations being utilised across the WHO European Region (Daugbjerg et al., 2009). A total of 49 national policy documents for 24 European countries were reviewed and all documents described the general recommendation of "at least 30 minutes of moderate intensity physical activity five days per week" for all adults, but not all documents contained specific recommendations for different age groups (younger people, adults and older adults) or for other special groups. There was also much diversity in how they disseminated the PA message. Some documents contained practical advice aimed at the population or at health professionals, with for example, advice to use the stairs or engage in outdoor activities with family. Other policy documents were aimed at informing policy makers on how to implement and disseminate the PA message.

1.6.2 Physical Activity Guidelines in Ireland

In 2008, the Health Service Executive (HSE) and Department of Health and Children released "The National Guidelines on Physical Activity for Ireland" to support the promotion of PA in Ireland (Department of Health and Children, 2009b). The guidelines which are based on best international evidence include specific recommendations for children, adults, older persons and people with disabilities. They also include recommendations on the parameters of PA required to maintain weight and for weight loss. A summary of the PA guidelines for Ireland are included in Table 3.

Table 3 Physical Activity Guidelines for Ireland

Guidelines for children (Aged 2-18)	All children and young people should be active, at a moderate to vigorous level, for at least 60 minutes every day Include muscle-strengthening, flexibility and bone-strengthening exercises 3 times a week
Guidelines for adults (Aged 18-64)	At least 30 minutes a day of moderate activity on 5 days a week (or 150 minutes a week) or vigorous activity for at least 75 minutes Add activities which increase muscular strength and endurance on 2 – 3 days per week
Guidelines for older persons (Aged 65+)	At least 30 minutes a day of moderate intensity activity on five days a week, or 150 minutes a week Focus on aerobic activity, muscle-strengthening and balance
Guidelines for adults with disabilities	Be as active as your ability allows Aim to meet adult guidelines of at least 30 minutes of moderate-intensity activity on 5 days a week
Weight control	To avoid gaining weight about 60 minutes of brisk walking or 30 minutes of jogging per day To maintain weight loss after losing a significant amount of weight 60 – 90 minutes of moderate activity To lose weight moderate physical activity for at least 60 – 75 minutes per day

1.6.3 Sedentary Behaviour Guidelines

There are yet no widespread or well accepted public health recommendations which quantify the limits of sedentary behaviour. Neither the European Union nor WHO guidance provides a quantified maximum amount of sedentary time (European Union, 2008, World Health Organisation, 2010a).

A number of countries, including Ireland, have made recommendations to limit sedentary time but do not quantify them. The "National Guidelines on Physical Activity for Ireland" include the recommendation to increase physical activity by replacing sedentary time – watching TV, playing computer games, talking on the phone – with active time (Department of Health and Children, 2009b).

A recent Department of Health report in the UK reviewed the international guidelines on sedentary behaviour with a view to informing recommendations for the UK (Biddle, 2010). The expert working group found that seven countries have issued guidelines for sedentary behaviour and/or screen time, of which three have set quantified limits. The guidelines generally focus on children and young people and recommend limiting the sedentary time to between one and two hours per day. They found insufficient evidence to set a quantified target for sedentary time in the UK and suggested the inclusion of a specific recommendation in the PA guidelines to state *"that children, young people, adults and older adults should aim to minimise the amount of time being sedentary each day"* (p.9).

1.7 Population Approaches to Physical Activity Promotion

In light of the substantial health benefits to be gained from promoting PA to whole populations as well as to at-risk individuals, it is not surprising to note that PA has become a well established goal for public health agencies and healthcare providers worldwide (Global Advocacy Council for Physical Activity (GAPA) the Advocacy Council of the International Society for Physical Activity and Health (ISPAH), 2011).

PA is influenced by multiple factors at a personal, social and environmental level, thus multisectoral approaches that work at several different levels concurrently, appear to be most effective (Trost et al., 2002, Bauman et al., 2012, Heath et al., 2012).

"Initiatives to promote PA can have increased effectiveness when health agencies form partnerships and coordinate efforts with several other organisations: schools; businesses; policy, advocacy, nutrition, recreation, planning and transport agencies; and health care organisations" (Heath et al., 2012) (p.272).

In 2004, the World Health Assembly adopted the "Global Strategy on Diet, Physical Activity and Health" in response to the growing burden of NCDs and recommended that member states develop national PA action plans and policies to increase PA levels in their populations (World Health Organisation, 2004a).

This priority was further underlined in the "Action Plan for the Global Strategy for the Prevention and Control of Non-communicable Diseases" that was endorsed by the World Health Assembly in May 2008 (World Health Organisation, 2008a). In its supporting document "Interventions on diet and physical activity: what works" the WHO outlined the best available scientific evidence on interventions, policies and structures that support and prioritise PA promotion at a population level, as well as in specific population groups (World Health Organisation, 2009b). Following the principles of "The Ottawa Charter for Health Promotion"[2] the strategies outlined are comprehensive, incorporating both policies and action and require a multisectorial, long-term perspective involving all sectors of society.

The evidence supporting effective interventions in PA promotion generally points to the following categories; policy and environment; mass media; school settings; the workplace; the community and primary healthcare (World Health Organisation, 2009b). A short overview of each category is given in the following sections. In general, interventions that are locally relevant and involved more than one component were found to be more successful (World Health Organisation, 2009b). The use of existing social structures such as schools or the weekly meetings of older groups reduced barriers to implementation.

[2] The Ottawa Charter for Health Promotion put forward five main strategies for health promotion: building healthy public policy; creating supportive environments; strengthening community action; developing personal skills; and reorienting health services (http://www.who.int/healthpromotion/conferences/previous/ottawa/en/).

1.7.1 **Policy and Environment**

The WHO encourages local and national Government to develop policies that promote active transport such as walking, cycling and other forms of non motorised transport. It includes the implementation of policies that influence land use with easy access to footpaths, cycle lanes and public transport, in combination with effective promotional programmes that encourage walking and cycling as a means of travel to school and work.

Evidence supports environmental interventions targeting the built environment that reduce barriers to PA, transport policies and policies to increase space for recreational use (World Health Organisation, 2009b). Urban planning and design should require mixed use zoning that positions shops, schools, services and workplaces close to residential areas with highly connected and well lit street networks that facilitate walking and cycling (National Institute for Health and Clinical Excellence, 2008, Heath, 2006).

1.7.2 **Mass Media**

Mass media provides an effective way of transmitting coherent, simple and clear messages about PA to large sections of the population (Wakefield et al., 2010). Public education campaigns should aim to raise awareness, increase knowledge, shift community norms and values and motivate the population to be more active (Global Advocacy Council for Physical Activity (GAPA) the Advocacy Council of the International Society for Physical Activity and Health (ISPAH), 2011).

Simple, direct messages need to be communicated on the quantity and quality of PA sufficient to provide sustainable health benefits and need to be appropriate to local culture, age and gender (World Health Organisation, 2009b).

1.7.3 **Whole of School Programmes**

"Whole of school" programmes have the potential to impact on the lives of the majority of children and are important in providing students with the knowledge and skills to develop lifelong healthy behaviours. Effective programmes are comprehensive, multi component with interventions targeting the school environment and the classroom curriculum (World Health Organisation, 2009b, Ribeiro et al., 2010). Many interventions combine diet and PA and encourage parental involvement (World Health Organisation, 2008b).

A "Whole of school" approach to PA involves prioritising regular, highly active physical education classes. It provides suitable physical environments and resources to support structured and unstructured PA throughout the day, for example, play before, during and after school, support of walk/cycle to school policies and enabling all of these actions through supportive school policy and engaging staff, students, parents and the wider community. (Global Advocacy Council for Physical Activity (GAPA) the Advocacy Council of the International Society for Physical Activity and Health (ISPAH), 2011).

1.7.4 **The Workplace**

National and local Governments are encouraged to frame policies to ensure that labour and workplace policies encourage and incentivise PA.

Successful interventions are primarily multi component and activities include environmental changes such as providing space for fitness, PA programmes, the adoption of healthy policies, and signs to encourage the use of stairs (World Health Organisation, 2009b, Schroer et al., 2014)

1.7.5 **The Community**

"Whole of community" approaches to PA across the life course are more successful than single programmes (World Health Organisation, 2010a). Strategies should be geared to changing social norms and improving community understanding and acceptance of the need to integrate PA into everyday life.

Key settings such as cities, local Governments, schools and workplaces should be targeted to integrate policies, and public education aimed at improving knowledge, attitudes and behaviour change (Centers for Disease Control and Prevention, 2011). Whole of community approaches where people live, work and recreate have the potential to reach large numbers of people (Brown et al., 2006).

Encouraging participation in sport is another important element of successful community programmes. A comprehensive sport system should provide a range of activities to match the varied interests of different genders and ages and supportive policies should reduce social and financial barriers to access and participation (World Health Organisation, 2011d).

The final category of interventions refers to those delivered in primary care and these shall be addressed in more detail in the following section.

SUMMARY

Public health recommendations for physical activity state that adults should accumulate a minimum of 150 minutes of moderate intensity exercise each week in order to maintain and promote health. These recommendations may also be met by performing an equivalent amount of vigorous activity.

These recommendations have been adopted extensively throughout the world, as well as being incorporated into evidence based clinical guidelines and into the national physical activity guidelines released by several different countries, including Ireland.

There are yet no widespread or well accepted public health recommendations which quantify the limits of sedentary behaviour. A number of countries have included advice to limit sedentary time, but do not quantify them.

As physical activity is influenced by multiple factors at a personal, social and environmental level, multisectorial approaches, involving several different sectors have been advocated.

1.8 Promotion of Physical Activity in Primary care

The third section of this chapter discusses PA promotion in primary care and Figure 4 presents a schematic representation of how the section is organised.

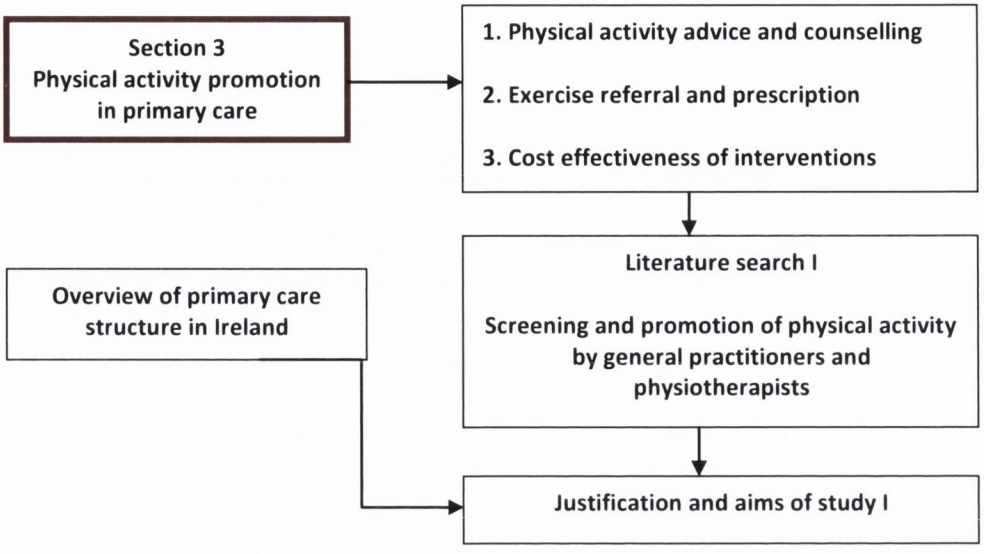

Figure 4 Outline of Section Three

1.8.1 Introduction

Primary healthcare professionals are the key influencers of patient behaviour and can play a significant role in the initiation of NCD prevention (Global Advocacy Council for Physical Activity (GAPA) the Advocacy Council of the International Society for Physical Activity and Health (ISPAH), 2011).

Health promotion is seen as an integral part of the primary care consultation and there has been increasing emphasis in recent years on the importance of the promotion of PA as a key task of a primary care clinician (Williams, 2011, Williams, 2010). In Ireland and elsewhere, large sections of the general population consult with a general practitioner (GP) every year and thus there is an opportunity for large scale promotion of PA across different age groups, genders, socioeconomic groups and health profiles (Morgan et al., 2008). Patients are interested in discussing health promotion issues with primary care professionals and consider them an important and credible source of information and support (Leijon et al., 2010, Robertson et al., 2011).

The WHO advises that PA assessment should be included as a regular and routine part of risk factor screening for NCD prevention in all primary healthcare consultations (World Health Organisation, 2010a). PA is also strongly endorsed in the European Guidelines on CVD Prevention as a very important non-pharmacological tool for primary and secondary cardiovascular disease (Perk et al., 2012, Graham et al., 2007). The American Heart Association considers PA assessment as a vital health measure that should be tracked regularly over time, similar to all other major modifiable CVRFs (Strath et al., 2013).

The most common interventions used to promote PA in primary care include the use of brief advice/counselling, the provision of written materials and exercise referral schemes (Williams, 2010).

1.8.2 **Physical Activity Advice and Counselling**

Evidence is accumulating that certain interventions delivered by healthcare staff in primary care are effective in increasing PA behaviours. In this section, the evidence for the use of brief advice and counselling by healthcare professionals in primary care is examined.

The National Institute of Health and Care Excellence (NICE) in the UK define 'brief advice' as verbal advice, discussion, negotiation or encouragement, with or without written or other support or follow-up. It can vary from basic advice to a more extended, individually focused discussion (National Institute for Health and Care Excellence, 2013). Counselling is usually of longer duration, more structured, more patient centred and based on theories of behaviour change, although in practice and throughout the PA activity literature the distinction between the terms are blurred and often used interchangeably (National Institute for Health and Care Excellence, 2007, Williams, 2010).

An evidence briefing paper, based on a synthesis of systematic reviews investigating the effectiveness of public health interventions, reports an increase in short term PA levels among healthy adults following brief advice from a doctor (NICE 2006).

A Cochrane review assessed the effectiveness of interventions designed to promote activity in community dwelling adults (Hillsdon et al., 2005). Nineteen randomised controlled trials, with a total of 2195 participants were included in the analyses. The authors reported a moderate positive effect on self reported PA (pooled standardised mean difference (SMD) random effects model 0.28 95% CI 0.15-0.41) and cardiovascular fitness (pooled SMD random effects model 0.52 95% CI 0.14-0.90) six months after the start of the intervention.

However, there was significant heterogeneity in the characteristics of the interventions which included combinations of one to one counselling or group counselling, self directed or prescribed PA, supervised or unsupervised PA and different forms of follow up including face to face support and telephone follow up. Only half the trials recruited participants from primary care locations so it is difficult to generalise the results to primary care, but overall, the evidence supported professional guidance about starting an exercise programme and the provision of ongoing support.

A later systematic review and meta-analysis examined whether trials of PA promotion delivered in primary care showed prolonged effects over a year (Orrow et al., 2012). Twelve of the 15 trials consisted of repeated advice or counselling sessions delivered in person or by phone (or both), together with the provision of written materials and three trials investigated exercise referral. The advice and counselling was provided by a wide range of primary care professionals with primary care doctors or nurses being involved in eight and physiotherapists being involved in two of the 15 trials.

The authors reported a small to medium positive intervention effect at twelve months in self reported PA for the counselling interventions (odds ratio (OR) 1.42, 95% CI 1.17-1.73; SMD 0.25, 0.11-0.38) with exercise referral producing a small but non-significant change at 12 months (OR 1.38, 95% CI 0.98-1.95; SMD 0.20, -0.21-0.61). Measures of cardiovascular fitness included in four studies did not demonstrate significant change.

The number needed to treat with an intervention, for one additional inactive adult to meet the recommended levels of PA at 12 months was 12 (7-33). This compares favourably to the estimated numbers needed to treat of 50 – 120 for smoking cessation advice (Stead et al., 2013). This systematic review had several strengths, including its use of only randomised controlled trials, all of which were delivered in primary care making its findings directly applicable to this environment. Only studies with a minimum follow up period of 12 months were included so the longer term impact of these interventions was determined. Previous reviews have also demonstrated positive results for PA interventions in primary care, but the inclusion of non-randomised controlled trials and shorter follow up periods (<6 months) limits the strength of their findings (Eakin et al., 2000, Smith, 2004).

Similar positive results have been reported for PA interventions directed to healthy and at risk adults aged 55 to 70 (Hobbs et al., 2013). Individually tailored PA interventions, delivered predominately by health professionals were effective at increasing self reported PA and step count, as measured by a pedometer, at 12 months but not at 24 months (SMD 1.08, 95% CI 0.16 -1.99, pedometer step-count approximating to an increase of 2,197 steps per day; SMD 0.19, 95% CI 0.10 to 0.28, self-reported PA). Neither the delivery mode of the intervention nor the intensity of the contacts were found to influence the effectiveness of the intervention.

Previous research supports these findings, with Greaves reporting no clear relationships between intervention setting, delivery mode, study population or delivery provider in his review of the effectiveness of PA and dietary interventions (Greaves et al., 2011). Orrow, in her systematic review also found some evidence to suggest that brief counselling may be as effective as more lengthy counselling (Orrow et al., 2012). However, the most recent review for the US Preventative Services task force reported that high to medium intensity counselling was associated with short term moderate increases in self reported PA, while the efficacy of shorter intensity counselling varied (Lin et al., 2010).

There is limited evidence available regarding the most effective components of advice and counselling interventions, mainly due to limited descriptions of the content and intensity of the intervention in the studies. Basing the intervention on a person's readiness to change their PA behaviour, tailoring the activity to personalised goals, individual PA preference and baseline PA behaviour, as well as providing information about local opportunities in the environment are all important elements in determining the effectiveness of an intervention (Hobbs et al., 2013, Heath et al., 2012, National Institute for Health and Care Excellence, 2013, Grandes et al., 2008a).

1.8.3 Exercise Referral Schemes and Exercise on Prescription Schemes

Exercise referral schemes were first introduced to primary care in the early 1990s and are widely available throughout the UK, Australia, New Zealand, Scandinavia and the US (Isaacs et al., 2007, Fox et al., 1997). These are usually multi agency interventions where inactive patients are identified through screening by a primary care professional and then referred to a programme of subsidised exercise at a local leisure centre, that may be either voluntary or private in nature (Sowden et al., 2008). NICE defines an exercise referral scheme as a process whereby a health professional directs someone to a service offering an assessment of need, development of a tailored PA programme, monitoring of progress and follow up. They involve participation by a number of professionals and may require the individual to go to an exercise facility such as a leisure centre. These schemes also target people who have established risk factors and diseases such as diabetes and asthma and as such, can provide a more supervised exercise programme for higher risk patients.

There are currently over 600 of these schemes in the UK (Pavey et al., 2011). In Ireland the scheme is known as the GP exercise referral programme and there were approximately 55 to 60 schemes in operation in 2014 (Health Service Executive, 2013b).

Although often referred to interchangeably within the literature and with many similar components, exercise on prescription schemes generally involve a health professional briefly counselling a patient on PA and then issuing a written prescription for exercise. This is usually faxed to a community based exercise professional who then provides ongoing support to the person in relation to activity choice, goal setting and overcoming barriers to behaviour change (Rome et al., 2009, Patel et al., 2012, Lawton et al., 2008).

A randomised controlled trial investigated the effectiveness of exercise on prescription with a follow up period of two years in middle aged women in New Zealand (Lawton et al., 2008). The intervention consisted of a brief discussion with a practice nurse with a six month follow up visit and telephone support over nine months. Results showed that while both the intervention and control group increased their PA from baseline, mean PA levels were higher and a greater proportion of the intervention group reached the target of 150 minutes moderate activity at 12 months (43% Vs 30%, $p<0.001$), and at two years (39% Vs 33%, $p<0.001$). Improvements in some quality of life measures assessed with the short form 36 (SF-36) were also reported in the intervention group. There were no significant differences between the groups in any of the secondary clinical outcomes which included blood pressure, weight and cholesterol. More falls ($p<0.001$) and injuries ($p=0.00$) were also reported in the intervention group over the two years.

In general, there have been inconsistent findings in the literature regarding the effectiveness of exercise referral schemes. A systematic review and meta-analysis of eight randomised controlled trials carried out primarily in the UK and including 5190 participants was conducted in 2011 (Pavey et al., 2011). Six of the trials compared exercise referral schemes with a usual care control group that consisted of no exercise intervention or brief advice on PA. Two of the trials compared exercise referral schemes with either a motivational counselling intervention or an instructor led walking programme. The duration of the follow up period ranged from two to 12 months.

Trials predominately recruited white middle aged adults with at least one CVRF. A small proportion of individuals with pre-existing conditions such as diabetes, depression or CHD were also included.

After pooling data across studies, the authors reported a modest 16% (95% CI 3% to 30%) increase in the RR of achieving 90 to 150 minutes of PA for exercise referral schemes, compared with usual care, at six to 12 months follow-up. There were no differences in outcomes between exercise referral schemes and the two other PA comparator groups. There was a lack of consistent improvements found on outcomes of physical fitness, psychological wellbeing, health related quality of life, and other health indicators such as blood pressure, serum lipid levels and indices of obesity. As outcomes were not separately reported for participants with pre existing medical diagnoses, it was not possible to measure the effectiveness of exercise referral in these subgroups.

Orrow et al (2012) in her systematic review also highlighted the limited effectiveness of exercise referral schemes when compared with other face to face PA interventions delivered in primary care. Results demonstrated small but non-significant increases in self reported PA at 12 months following exercise referral compared with small to medium positive effects for advice and counselling.

Similar results were also reported in an earlier systematic review which found that exercise referral schemes produced only a small increase in the number of sedentary adults becoming active (Williams et al., 2007). The small effect was partially explained by poor rates of uptake and adherence to the programme, both of which have been reported widely in the literature (Gidlow et al., 2005, Isaacs et al., 2007, Williams et al., 2007). Williams, for example reported participation rates of 26–92% attending the first exercise session, but less than half completing a full course of sessions (Williams et al., 2007).

The pooled rate of uptake to exercise schemes in 14 observational studies was 66% (95% CI 57%-75%) and the adherence rate was 49% (95% CI 40%-59%) (Pavey et al., 2012). When randomised trials were analysed the rate of uptake increased to 81% (95% CI 68% to 94%) and the adherence rate fell to 43% (95% CI 32% to 54%). Women were more likely to commence a programme but less likely to adhere than men (Pavey et al., 2012).

In 2006, NICE concluded that there was insufficient evidence to support the widespread adoption of exercise referral schemes, and recommended that the UK's National Health Service should only make these schemes available as part of a controlled research trial (National Institute for Health and Clinical Excellence, 2006). These guidelines were recently updated in 2014 and NICE recommended that practitioners only refer people who are sedentary or inactive and have existing health conditions or other factors that put them at increased risk of ill health (National Institute for Health and Care Excellence, 2014). Exercise referral is not recommended for sedentary healthy individuals.

Providing patients with individually tailored advice, supported by written materials which include details of local facilities, may be as effective as referral to supervised exercise classes as well as being a more cost effective option (Isaacs et al. 2007). This would certainly be true for adults who do not have a specific clinical need or established disease and are safe to

exercise in an unsupervised environment (National Institute for Health and Care Excellence, 2014).

1.8.4 Cost Effectiveness of Interventions Delivered in Primary Care

A systematic review of cost effectiveness studies, that were based on randomised controlled trials of interventions delivered in primary care, aiming to increase adult PA between 2002 and 2009 was carried out by Garrett and colleagues (Garrett et al., 2011). It was found that most interventions designed to increase PA were cost effective especially when direct supervision was not required. Unsupervised activity interventions such as walking, exercise groups, or brief advice delivered in person or by phone or mail had lower cost per quality adjusted life-year (QALY) compared with supervised gym based classes or instructor lead walking schemes.

Many PA interventions had similar estimates of cost-utility (QALY) to funded pharmaceutical interventions. The cost of moving one person from 'inactive' to 'active' at 12 months was estimated for four interventions, and ranged from €331 to €3673 (Euro). Based on the higher-quality studies, the authors concluded that it was possible to deliver a PA intervention for between €1120 and €15 860 per QALY gained, which is more cost-effective than many other currently-funded pharmaceutical interventions.

In the EXERT (Exercise evaluation randomised trial) trial, Isaacs (2007) evaluated the cost effectiveness of a leisure centre based exercise programme, an instructor lead walking group and an advice only group. Walking was as effective as the leisure centre programme as well as being more cost effective. Costs to the participants were estimated at £100 (GBP) for the leisure centre scheme and £84 for the walking scheme whilst provider costs were £186 and £92 respectively. Assessment and advice from a health professional was the most cost effective intervention and was effective in initiating PA.

Similar conclusions were drawn by the WHO who advocated providing patients with simple information and the necessary skills to facilitate behaviour change as a cost effective intervention capable of reaching large portions of the population (World Health Organisation, 2009b).

1.9 Promotion of Physical Activity by GPs and Physiotherapists

Based on the information discussed in this chapter, it is clear that PA positively influences health and that specific recommendations are widely available to clinicians detailing the amount and type of PA required for health. Together with the strong endorsement of PA as an integral part of NCD management, it highlights the importance of PA promotion as a key component of primary care. It is thus an important and relevant question to determine the extent to which PA guidelines are known by primary care staff and the extent to which PA screening and promotional practices are incorporated into routine practice by primary care clinicians.

1.9.1 Literature Search

The following section summarises the literature regarding the knowledge and practice of general practitioners (GPs) and physiotherapists (PTs) in relation to PA promotion. GPs were chosen as they are the key provider of primary care for the majority of a population's healthcare needs and account for the significant majority of primary care consultations. PTs were chosen as another prevalent member of the primary care team with background expertise in exercise therapy and a recognised role in exercise prescription.

1.9.2 Eligibility criteria

Studies were eligible for inclusion if they investigated the following aspects of PA as a primary study objective; participants' knowledge of PA and/or the PA guidelines, acceptability of PA promotion as part of their professional role or aspects related to the integration of PA into practice.

Searches were conducted separately for each profession. All applicable articles published in the English language up until August 2014 were considered for inclusion. Discussion and opinion papers, epidemiological studies, patient intervention trials and review articles were excluded. Studies which investigated lifestyle counselling, weight management strategies or referrals to exercise schemes as primary study objectives were excluded. Studies which described PA promotional practices from the patient's perspective were also excluded.

1.9.3 Search strategy

The scientific databases PubMed and Embase were searched using combinations of the following key terms; "Physiotherapist" OR "Physical therapist" OR "Physiotherapy" AND "Physical activity" OR "Physical activity promotion" OR "Physical Activity Counselling" AND "Primary care"; "General Practitioner" OR "GP" OR "Primary Care Physician" AND "Physical activity" OR " Exercise" OR "Physical Activity Promotion" OR "Health Promotion" OR "Physical Activity Counselling" AND "Primary Care". Reference citations from identified source articles were also examined for relevant publications.

1.9.4 Results

GPs

The search strategy is outlined in Figure 5 and identified 549 potentially suitable articles. When inclusion and exclusion criteria were applied, a total of 15 articles remained. Details of these studies together with the results are presented in Table 4.

The majority of studies were carried out in Europe, Australia and the United States of America. No studies from Ireland were identified. Data collection was predominately through the use of questionnaires, except for one study which used direct observation (Anis et al., 2004) and one

which used a mixed methodology employing a survey with follow up focus group and interviews (Puig Ribera et al., 2005). All of the studies were cross sectional, three were repeated at more than one time point (Buffart et al., 2009, van der Ploeg et al., 2007, Ma et al., 2004), and one was a prospective review of two national surveys (Ma et al., 2004).

Of those studies using surveys, four used questionnaires that were validated (Jorgensen et al., 2012, Puig Ribera et al., 2005, Bock et al., 2012, van der Ploeg et al., 2007) and the remainder used questionnaires that were either not validated or their procedures were unclear. The response rates to the surveys varied, ranging from 13.3% (Bock et al., 2012) to 80% (Attalin et al., 2012), but most were greater than 50%.

Only three studies used nationally representative samples (Smith et al., 2011, Petrella et al., 2007, Ma et al., 2004), the remainder used regional samples and a mixture of random and purposive sampling methods. Sample sizes ranged from 27 (Eley and Eley, 2009) to 13166 (Petrella et al., 2007). Three studies included healthcare workers other than GPs but it was possible to report some of the results separately (Douglas et al., 2006a, Puig Ribera et al., 2005, Ma et al., 2004).

All of the studies were based in primary care, but one also included hospital out-patient departments (Ma et al., 2004). Three of the studies specifically related to PA promotion in overweight or obese populations (Attalin et al., 2012, Smith et al., 2011, Eley and Eley, 2009), one concerned patients with CVRFs (Ma et al., 2004) and the remainder dealt with PA in terms of the wider primary care population.

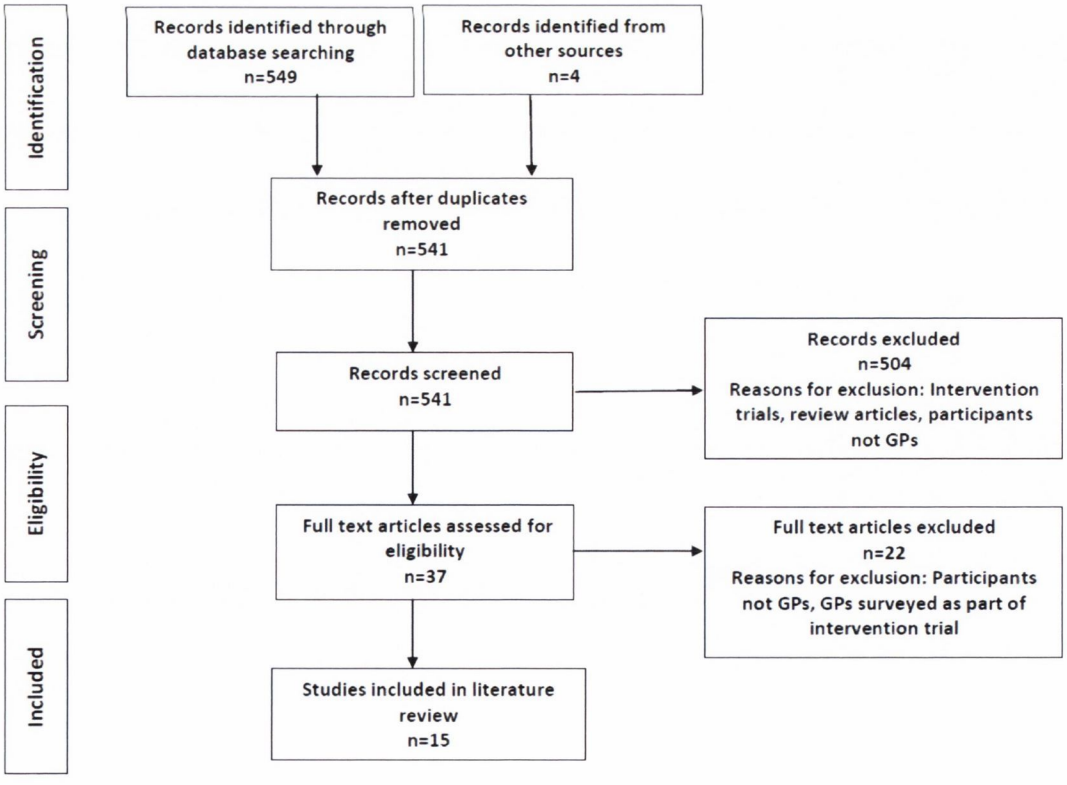

Figure 5 Flowchart of Literature Search Strategy (General Practitioners)

Physical Activity Knowledge

Six of the 15 studies described some measure of GPs' knowledge of PA, but only two studies specifically asked about the PA guidelines (Douglas et al., 2006a, Daley et al., 2008).

Knowledge of the PA guidelines was poor, with only 13% of GPs in Scotland describing them accurately (Douglas et al., 2006a). A later study by Daley (2008) also based on a population of GPs in the UK, found, that despite some aspects of the guidelines being more widely known, overall knowledge was poor. Inadequate knowledge of the guidelines amongst GPs in the UK has persisted despite the release of both the UK Chief Medical Officer's recommendations for PA and the National Institute for Clinical Excellence public health guidance on PA in 2004.

Two studies reported the PA knowledge of Australian doctors in repeated surveys delivered at two (van der Ploeg et al., 2007), and three (Buffart et al., 2009) time points. Knowledge was measured by asking participants to indicate their agreement with five statements regarding PA for health; however these statements were quite general in nature and could be open to interpretation. An increase in knowledge about the health benefits of PA were reported between the time periods of 1997 to 2000. These improvements were sustained in 2007 but did not increase further despite several Australian PA initiatives during this time period (Buffart et al., 2009). In 1997, 35% of participants reported having attended a seminar on increasing PA in the last 12 months; this increased to 44% in 2000 but did not improve further in 2007. Attendance at a seminar/training session was associated with increased likelihood of counselling patients, a finding also replicated in a German study (Bock et al., 2012).

Acceptability of Role

In general, the vast majority of GPs felt that PA promotion was part of their role and there was widespread acceptability of this aspect of health promotion. Whilst confidence in PA promotion was generally reported as high, almost paradoxically a lack of training, particularly in counselling skills were also reported as barriers to practice in a number of studies (Bize, 2007, Douglas et al., 2006a, Puig Ribera et al., 2005, Attalin et al., 2012). Other barriers reported, included a mixture of system barriers such as lack of time, educational materials, local resources and protocols; individual barriers such as not having the necessary training and skills to influence PA behaviour; and patient barriers such as low motivation and perceived non-compliance. Time constraints, lack of training and poor patient motivation were amongst those mentioned most frequently.

Integration into practice

All studies except one (Daley et al., 2008), reported some measure of how PA was integrated into routine clinical practice. However, a number of different measures were used making direct comparison between the studies difficult. Studies either reported the percentage of participants generally undertaking PA assessment or promotion in their practice or the percentages undertaking promotion using verbal descriptors such as "usually" or "often".

There were large discrepancies in the frequency of screening practices from study to study with the lowest rates reported in Australia where 31% of new and 27% of return patients were assessed (Buffart et al., 2009), and the highest rates reported in Canada at 85% (Petrella et al., 2007). Even studies within the same country and state had different estimates, for example, in two studies of Australian (New South Wales) GPs, screening rates varied from 57% in one study (Buffart et al., 2009) to 31% in another (van der Ploeg et al., 2007). Both of these Australian studies were based on repeated cross sectional data and one showed some improvements in screening rates from 1997 to 2000 (Buffart et al., 2009) while the other showed no improvement during the same time period (van der Ploeg et al., 2007). Differences in the reported estimates may be at least partially explained by the use of different outcome measures and the use of different sampling frames, with Buffart using a large regional sample and van der Ploeg using a smaller purposive sample of only five of the 37 divisions of general practice in New South Wales. Studies reporting PA practices within a specific patient population, such as those with obesity, also reported variable estimates of PA promotion but there is some evidence that patients who are obese are counselled more regularly than patients with other conditions (Douglas et al., 2006a, Ma et al., 2004).

Of the studies examining assessment of PA in new and return patients separately, the frequency of screening was always higher in new patients (Buffart et al., 2009, van der Ploeg et al., 2007, Bize, 2007). Verbal screening was the most common form of assessment with minimal use of any formalised method of screening such as validated questionnaires, which between 5% to 7% of GPs reported using (Smith et al., 2011, Attalin et al., 2012).

The use of several different descriptors to describe PA counselling practice make it very difficult to draw specific conclusions, but in general most of the studies in this review would indicate that PA is promoted by at least 50% of GPs. However, it is interesting to note that the only observational study included in the review, found that only 20% of their observed patient/physician encounters included advice on PA (Anis et al., 2004).

Verbal advice or counselling was the intervention used most frequently by GPs in this review. One study in Denmark investigated whether specific PA parameters such as duration and intensity were discussed during consultations and found that whilst 80% of participants gave advice on the type of exercise, advice on intensity was given only by 60% (Jorgensen et al., 2012). Similarly, a study in the UK reported that only 47% of GPs regularly promoted the PA guidelines (McKenna and Vernon, 2004). Puig Ribera et al (2005) in their qualitative work also highlighted the use of over generalised, over simplified and non individualised messages to patients.

Written materials were also used very infrequently by GPs and ranged from 10% to 40% (Attalin et al., 2012, Jorgensen et al., 2012). Some studies also mentioned onward referrals to other professionals such as PTs, exercise physiologists and gym trainers (Bock et al., 2012, Eley and Eley, 2009, Petrella et al., 2007, McKenna and Vernon, 2004). There were some differences found between the practices of male and female doctors, with females being more likely to counsel patients verbally and provide written instructions than their male counterparts (Smith et al., 2011, Petrella et al., 2007).

Table 4 Overview of Studies Investigating Physical Activity Promotion by General Practitioners

Authors Year Country	Study design/tool Number of participants	Area of work and/or patient population	Study measures	Knowledge regarding PA	Acceptability of role/barriers to practice	Integration of PA into practice
Attalin et al 2012 France	Cross sectional questionnaire n=203	Obesity	Beliefs, practices and barriers related to PA promotion	43% of GPs [*1] recommend PA consistent with guideline parameters	Diet advice used more frequently than PA promotion in management of obesity Barriers include lack of training 71% & patient non compliance 63%	76% report assessment of patients PA "usually" or "often" Verbal assessment 94% Validated questionnaires 5% 94% report prescribing PA "usually" or "often" Verbal advice 88% Written advice 10%
Bock et al 2012 Germany	Cross sectional questionnaire n=260	Primary care	Frequency and determinants of PA promotion	26.9% reported inadequate knowledge	High acceptability 36.7% felt they were unsuccessful at motivating patients to increase PA Physicians in large cities, with higher perceived success & regular training promoted PA more frequently	70.2% reported "always" or "frequently" assessing PA in new patients 67.8% report advising at least half of patients about PA 50% of physicians set PA goals 23.2% provided written materials or referred to other professions
Jorgensen et al 2012 Denmark	Cross sectional questionnaire n=223	Primary care	Practice and frequency of promoting specific parameters of PA to patients	Not included	80.2% felt that PA promotion was one of their work tasks 19.8% did not perceive it as their job or were in doubt Main barriers: Lack of patient motivation (125/223) Lack of time (98/223)	57% reported promoting PA daily 38.6% on a weekly basis 4.5% on a monthly basis Advice on type of PA 80% Advice on duration of PA 70% Advice on frequency of PA 70% Advice on intensity of PA 60% 40% provided written materials 60% addressed PA in follow up appointments
Buffart et al 2011	Repeated cross sectional	Primary care	Perceptions and practices of PA	Increase in knowledge & confidence reported	Majority of GPs felt giving PA advice was part of role	2007 57% of new & 46% of return

Australia	questionnaires 2007 n=646 2000 n=747 1997 n=511		counselling	between 1997 and 2000, no further increases in 2007		patients screened 2000 52% new & 40% return 1997 54% new & 43% return
Smith et al 2011 USA	Cross sectional questionnaire n=1211 adults (paediatric services included in survey but not reported here)	Primary care Obesity or overweight & normal weight patients	Practice of PA promotion and dietary advice	Not included	Females more likely to counsel than males	Almost half "always" provided counselling to patients with weight related disease Verbal screening of PA 94.3% Specific questions about type, duration & intensity 81.8% PA questionnaire 7% Sedentary behaviour assessed 64.4%
Eley et al 2009 Australia	Cross sectional questionnaire n=27	Overweight and obesity	Practice and barriers to PA promotion	Not included	Barriers included lack of patient motivation (16/27), lack of local facilities (8/27)	Verbal discussion 100% 16/27 referral to local gyms 6/27 referral to exercise physiologist/physiotherapist
Daley et al 2008 UK	Cross sectional questionnaire n=138	Primary care	Knowledge of the PA guidelines	Percentage getting each component correct PA duration 64.9% PA frequency 32.6% PA duration to prevent obesity 10.9% PA duration for children 16.7%	Not included	Not included
Petrella et al 2007 Canada	Cross sectional questionnaire n=13166	Primary care	Primary care physicians' behaviours with respect to counselling and prescribing PA	Not included	Female physicians more likely to provide verbal and written instructions to patients	85% reported asking patients about their PA levels 26.2% assessed patient fitness 10.9% referral to others for fitness assessment 69.8% verbal counselling 15.85 written prescription
Van der	Repeated cross	Primary care	Practice and	Improvements in	High acceptance of role	PA discussed with >10 patients

Ploeg et al 2007 Australia	sectional questionnaire 1997 n=325, 2000 n=397		knowledge related to PA promotion	knowledge reported from 1997 to 2000	Confidence in providing PA advice 1997 83% 2000 92%	per week 1997 43% 2000 47% New patients asked about PA 1997 31% 2000 31% Return patients asked about PA 1997 27% 2000 27%
Bize et al 2007 Switzerland	Qualitative - semi structured interviews n= 16	Primary care	Opinions and attitudes towards PA promotion in primary care	Sedentary physicians were sceptical about the health benefits of PA	Half the participants thought there were few barriers Remaining participants identified lack of time, lack of reimbursement and lack of clear guidelines Physicians were pessimistic about their effectiveness	PA screening occurred in new patients but not systematically Counselling more likely if cardiovascular risk factors present
Douglas et al 2006 Scotland	Cross sectional questionnaire GPs n= 376 Total n=757 (Other healthcare providers included in study, results not reported here)	Primary care	Practice and knowledge related to PA promotion	13% of GPs correctly described PA guidelines	High acceptability Majority of GPs felt they had sufficient knowledge Barriers included lack of time 48%, insufficient educational materials 57%, lack of training 47%, poor patient motivation 31%	62% of GPs indicated that they were "very likely" or "likely" to recommend PA to apparently healthy adults Overweight patients counselled more frequely than patients with other conditions
Puig Ribera et al 2005 Spain	Mixed-methods approach questionnaire n= 245	Primary care	Practice and barriers to PA promotion	Not included	Over 70% of physicians perceived PA promotion as "very important" Barriers: (GPs) work	84.1 % of physicians reported promoting PA during consultations Qualitative study identified

	n=145 physicians n= 92 nurses Follow up focus groups & semi-structured interviews n=18 physicians and n=15 nurses				conditions not favourable 55% Barriers: (GPs/nurses) PA promotion unimportant within current political climate 69% , lack of protocols 60.5%, very limited training in counselling skills 64%	opportunistic practices, the use of over generalised, over simplified, repetitive, non individual messages Practices of staff varied according to their PA attitudes
McKenna et al 2004 UK	Cross sectional questionnaire n=234	Primary care	Proportion of GPs promoting the PA recommendations and their promotion strategies	Not included	Not included	47.1% of GPs regularly promote PA guidelines Different patient centred counselling factors used, dependant on patients stage of change for example arranging follow up appointments or referral to GP exercise scheme
Anis et al 2004 USA	Direct observation of n= 4,344 physician–patient encounters n=38 GP practices	Primary care	Evaluation of physician counselling on dietary habits and PA during routine visits	Not included	Not included	Exercise counselling observed during 20% of encounters New patients received exercise counselling 50% more frequently than established patients 13 practices had brochures on exercise; this did not influence exercise counselling
Ma et al 2004 USA	Prospective review of serial cross sectional studies collecting national data collected between 1992 and 2000	Private Physician offices and hospital outpatient departments	Examination of national trends in diet and PA counselling in patients with cardiovascular risk factors	Not included	PA counselling more likely during visits by pt <75 years old, new patients and visits to cardiologist versus GPs Counselling correlated with the presence and	Rates of PA and diet counselling increased from 1992 to 2000 1992 PA counselling reported during 17% of visits 1997 PA counselling reported during 26% of visits No further increases noted to 2000

	Total n of visits not provided Mixed healthcare providers including physician/physician assistant & nursing staff				number of cardiovascular risk factors Obesity and hyperlipidemia associated with greater odds of counselling	≤30% of adults with hyperlipidemia/hypertension, obesity or diabetes counselled on exercise

*[1]GPs General Practitioners

Knowledge and Promotion of Physical Activity by Physiotherapists

The search strategy for PTs is outlined in Figure 6 and identified 437 potentially suitable articles. When inclusion and exclusion criteria were applied a total of ten articles remained. The details and results from these studies are presented in Table 5.

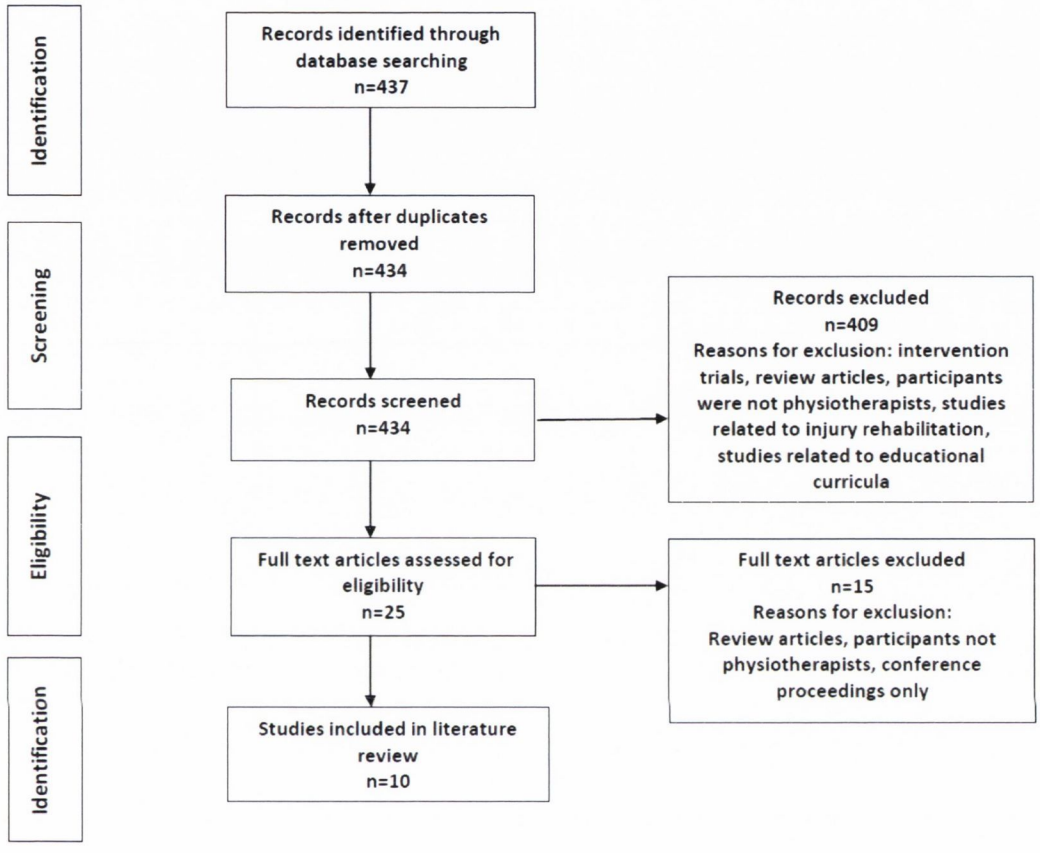

Figure 6 Flowchart of Literature Search Strategy (Physiotherapists)

In general, very little published research has examined the role of the PT in PA promotion. This was particularly relevant in the period prior to 2010 (when Study I was carried out) and it is only in recent years that the area of PA promotion by PTs is receiving increasing focus.

The majority of studies were performed in the developed world and only two related to developing countries (Aweto et al., 2013, Frantz and Ngambare, 2013). One study was carried out in Ireland (O'Donoghue et al., 2014).

Data collection was predominately through the use of questionnaires, except for one study which used a focus group discussion (Healey et al., 2012), and one which used an interview (Mulligan et al., 2011). The study carried out in Rwanda used a mixed methodology employing a survey and a follow up focus group (Frantz and Ngambare, 2013). Two of the questionnaires were developed by the researchers following pilot testing (Rea et al., 2004, Johansson et al., 2010) and the remainder were adapted from previous studies.

All studies used a cross sectional design, one of which used a repeated online questionnaire (Sassen et al., 2011). Sample sizes ranged from a minimum of nine (Mulligan et al., 2011) to a maximum of 417 participants (Rea et al., 2004). Two studies used nationally representative samples (Shirley et al., 2010, Aweto et al., 2013), the remainder used predominately purposive sampling methods and regional samples.

Only two studies specifically stated that PTs were employed in primary care services (Johansson et al., 2010, O'Donoghue et al., 2014). The remainder of the studies used a mixture of healthcare settings some of which are likely to be primary care based. As there is so little research in this area a decision was made to include these studies, but it is difficult to determine whether the results are truly representative of primary care PTs. A number of the studies only targeted PTs working within selective specialities such as neurology or gerontology, whereas a primary care PT often has a much more varied caseload which can range from healthy individuals with, for example an acute musculoskeletal injury to patients with established chronic disease and associated disability, such as following a stroke.

Five of the ten articles reported on some aspect of PTs knowledge of PA, but only one specifically asked participants to outline the PA guidelines of which a third of respondents answered correctly (Shirley et al., 2010).

In general there was very strong acceptance of the role of PTs in PA promotion and this was the most frequently practiced form of health promotion by these professionals. There was less acceptance however for other components of lifestyle counselling such as smoking or weight counselling which may be viewed as being outside the traditional remit of the PT (O'Donoghue et al., 2014). Many of the studies summarised the barriers to PA promotion, the most frequently cited of which was time constraints.

Only one study specifically asked about the frequency of PA screening in routine practice (O'Donoghue et al., 2014). There was very little information about how PTs integrated PA into their practice, but verbal advice or counselling was mentioned the most frequently, with two studies reporting that PTs felt it was most feasible to incorporate counselling into their regular consultations (Aweto et al., 2013, Shirley et al., 2010). Both of these studies, using the same questionnaire, reported on the percentage of participants that had counselled more than ten patients in the last month. Whilst both figures could be considered low, PA promotion by PTs was much more prevalent in Australia than in Nigeria.

Overall there is very limited information available about the knowledge and practice of primary care PTs within the role of PA promotion. The use of non representative populations, limited sample sizes and the use of mixed specialities and working environments make it difficult to get an accurate picture of primary care services in this area.

Table 5 Overview of Studies Investigating Physical Activity Promotion by Physiotherapists

Authors Year Country	Study design/tool Number of participants	Area of work and/or patient population	Study measures	Knowledge regarding PA	Acceptability of role	Integration of PA into practice
O Donoghue et al 2014 Ireland	Cross sectional questionnaire n=163	Primary care	Current practice of PTs[*1] in assessment and management of lifestyle related diseases	High self reported confidence in PA promotion Low expertise reported in counselling other cardiovascular risk factors	Other than PA, lifestyle counselling not viewed as traditional role of PT Other barriers included time constraints (74%) & uncertainty about services (66%)	PA was most frequently assessed risk factor at 78% Written advice 96% Educational materials 53%
Soundy et al 2014 UK	Cross sectional questionnaire n=151	Patients with schizophrenia	Barriers and facilitators to PA	Not measured	Frequently cited barriers were patients' lack of motivation (45%) & lack of priority given to PA by other healthcare professionals (28%) Facilitators included the provision of esteem support by healthcare professionals (28%) & the enjoyment and autonomy for patient (25%)	Not measured
Aweto et al 2013 Nigeria	Cross sectional questionnaire n=308	Public and private hospitals	Knowledge, attitudes & counselling practice	43% aware of PA guidelines 64% rated knowledge as high	High acceptability 94.8% Barriers included time constraints 60.7%	Brief counselling incorporated into regular consultations identified as most feasible 95.4% 36% counselled >10 patients in last month
Frantz et al 2013 Rwanda	Mixed methods questionnaire & focus group	Referral & district hospitals	PA health promotion practices	Not measured	4 barriers to practice: Poor organisation or support of PA policies Time constraints	65% had high PA promoting practices 32% moderate 3% poor

	Survey n=92 Focus group n=10				Cultural restrictions Environmental influences	Verbal advice 98% Written materials 9%
Healey et al 2012 USA	Qualitative focus group discussion n=14	In-patient, out-patient and home settings Older adults	Wider area of health promotion in older persons, not specifically PA promotion	Not measured	Health promotion is part of PTs practice Increased one on one time and longer episodes of care facilitate health promotion Time constraints and lack of reimbursement identified as barriers	PA and exercise is primary focus of health promotion practice
Sassen et al 2011 Netherlands	Repeated cross sectional online questionnaires n=278 60% PT 40% Nursing	University PT & Nursing department Patients with cardiovascular risk factors	Predictors of intention and behaviour in PA promotion	Not measured	Positive correlations between intention and behaviour Intention to promote PA strongly associated with attitudes, subjective norms & perceived behavioral control	56.8% of healthcare professionals promote PA
Mulligan et al 2011 New Zealand and Sweden	Qualitative interview n= 9 Patients with neurological conditions	Long term rehabilitation and community services	Experiences in promoting PA to pts with neurological disorders	PTs aware of and supported national PA policies	PT willing to incorporate PA promotion into role Barriers included lack of support from health system & lack of knowledge of disability issues within recreation arena	PTs described innovative methods of incorporating PA into practice
Shirley et al 2010 Australia	Cross sectional questionnaire n =321 PTs (Also surveyed PT students, results not included)	Public and private sectors	Knowledge, attitudes & counselling practice	1/3 correctly identified PA recommendations No difference between knowledge of PTs who promoted PA more frequently and those who did not	Majority of PTs felt PA promotion was part of their role	54% counselled >10 patients in last month Feasible to incorporate counselling into regular sessions rather than separate one on one or group

						sessions
Johansson et al 2010 Sweden	Cross sectional questionnaire n = 224 PTs (3751 health professionals surveyed in total, other results not included)	Predominately primary care services	Attitudes towards health promotion and disease prevention, not specifically PA promotion	Not measured	60% of PTs willing to focus more on health promotion 63% reported lack of time as a barrier	Not measured
Rea et al 2004 USA	Cross sectional questionnaire n= 417	In-patient, out-patient and home settings	Health promotional practices and confidence	20% had additional health promotion/education degree	PA promotion most common form of health promotion Positive correlations between PT self efficacy and frequency of PA promotion	54% of time spent assisting with PA

*[1]PT Physiotherapist

Conclusion

There are some limitations to the overall conclusions of this review due to the variety of design and sampling procedures and the quality of the included studies. There were notable differences in the sample sizes, the number of survey reminders sent to participants and the response rates achieved. However, based on the information provided it is obvious that GPs and PTs regard PA promotion as an important component of their role and there is general widespread acceptance of this task. There are consistent findings about barriers to practice although there is some evidence to suggest that these may differ to some degree amongst different health professionals and this warrants further investigation.

There is, however, a lack of detail about what PA counselling actually entails in clinical practice. Firstly, as few studies have investigated health professionals' knowledge of the PA guidelines it is unclear whether verbal counselling is based on promoting the correct parameters of PA as detailed in the public health recommendations. Since the last study examining this aspect of knowledge was carried out in 2008 for GPs and in 2010 for PTs there has been a significant expansion in the volume of publications and clinical guidelines incorporating this message (Daugbjerg et al., 2009, World Health Organisation, 2010a, Weiler et al., 2012b). It is thus appropriate and timely to establish whether this has improved awareness amongst professionals. More information is also needed about the use of follow up appointments and onward referrals to other professionals as few studies have addressed this aspect of practice.

There appears to be little consistency in the reported frequencies of PA screening by GPs. Some of this variation is likely due to the lack of standardised questioning as studies measure slightly different aspects of screening practice, but it is also possible that screening practices may be impacted by the structure of the local healthcare systems, available resources and packages of financial reimbursement. This limits the general conclusions one can draw about the screening practices of GPs as a profession and points to the need to establish practice in individual countries where primary care structure and resources may impact on a health professional's behaviour. It appears that very few GPs use formalised methods of assessment as is recommended best practice, however, as only two studies specifically sought this information this warrants further investigation (National Institute for Health and Care Excellence, 2013).

There are no details available about the frequency or practice of PA screening by primary care PTs and very limited details on their practice. Physiotherapy has traditionally worked within a "disease based" model, focussing on the restoration and maintenance of optimal function and quality of life in individuals with loss and disorders of movement (Verhagen and Engbers, 2009). However, in response to the growing pandemic of chronic disease there is increasing recognition that PTs, as experts in exercise prescription, need to become increasingly focussed on utilising their specialist skills to promote health and wellbeing across the lifespan (Dean, 2009). There is a particular need to establish how modern physiotherapy practice and in particular, the application of non-invasive interventions such as exercise can respond to global health priorities. More research in this area is needed.

Few studies have sought information on whether counselling practice varies according to different CVRFs other than in overweight/obese populations. It is also important to determine

the extent to which PA promotion is likely to occur in healthy populations as a primary preventive task, as there is some evidence to suggest that health professionals may be more likely to adopt a high risk approach to counselling (Bize, 2007, Douglas et al., 2006a).

The first study of this thesis sought to establish the PA screening and promotional practices of GPs and PTs working within primary care services in the Republic of Ireland.

The specific objectives of Study I were;

1. To determine GPs' and PTs' knowledge of the minimal PA guidelines;

2. To establish the likelihood of screening and counselling patients with and without cardiovascular risk factors;

3. To describe the PA interventions most frequently used by participants and;

4. To identify potential barriers limiting practice.

In order to understand the context of this research it is necessary to provide the reader with an overview of primary care structure in Ireland, together with an explanation of the ongoing strategic reform of its services. This is the backdrop against which this research takes place.

SUMMARY

Several expert groups including the WHO advise that physical activity assessment should be included as a regular and routine part of primary care consultations.

Intervention trials investigating PA advice and counselling in primary care have shown small to medium positive effects at six and twelve months. There is limited evidence regarding the most effective components of these interventions, but tailoring activity to the individual, providing written information and follow up support seem to be important considerations.

In general, there is insufficient evidence to support the widespread adoption of exercise referral schemes. Rates of uptake and adherence to this type of programme are generally very poor.

Physical activity interventions delivered in primary care are cost effective especially when direct supervision is not required. Many physical activity interventions have similar cost estimates to funded pharmaceutical interventions.

Physical activity promotion is accepted as an essential component of primary care practice amongst GPs and physiotherapists. Frequently reported barriers to practice include time constraints and poor patient motivation. Lack of training was also frequently cited by GPs.

Specific measures of primary care professionals' knowledge of physical activity such as knowledge of the physical activity guidelines were rarely examined in the literature. The three studies examining this parameter point to very low levels of awareness amongst GPs and physiotherapists.

The use of different questionnaires and varied question structure make it difficult to draw specific conclusions about the practice of physical activity screening and promotion in primary care.

There were large discrepancies in the reported frequency of physical activity screening employed by GPs which ranged from 27% to 85%. There is some evidence to suggest that the rate of PA screening of new patients is higher than that of return patients.

Verbal screening is the most frequent form of assessment used by GPs; the use of validated physical activity questionnaires was minimal.

There is no information on the physical activity screening practices of physiotherapists.

Verbal advice and counselling was the intervention used most frequently by GPs and physiotherapists. There is some evidence to suggest that when given by GPs, it is of a general nonspecific nature. Written materials are used more frequently by physiotherapists than GPs.

1.10 Primary Care in Ireland

1.10.1 Primary Care Definition

Primary healthcare was officially launched in 1978, when WHO member states signed the Alma-Ata Declaration. The Alma-Ata Declaration emerged as a major milestone of the twentieth century in the field of public health, and it identified primary healthcare as the key to the attainment of health for all (International Conference on Primary Health Care, 1978).

Primary healthcare was put forward as a set of values, principles and approaches aimed at raising the level of healthcare. It viewed health in a holistic manner and recognised that many root causes of ill health and disease are beyond the control of the health sector and thus must be tackled through a broad whole-of-society approach. It offered a way to improve fairness in access to healthcare and efficiency in the way resources were used, resulting in better health, less disease, greater equity, and vast improvements in the performance of health systems.

The most widely accepted definition of primary care is first contact, continuous, comprehensive and co-ordinated care provided to individuals and populations undifferentiated by age, gender, disease or organs system (Starfield, 1994).

For the purpose of the National Health Strategy detailed in the following section, the Irish Department of Health defines primary care as an approach to care that includes a range of services designed to keep people well, from promotion of health and screening for disease to assessment, diagnosis, treatment and rehabilitation, as well as personal social services. The services provide first-level contact that is fully accessible by self-referral and have a strong emphasis on working with communities and individuals to improve their health and social wellbeing (Department of Health and Children, 2001).

1.10.2 Primary Care Structure

The Irish Government first outlined its strategy to develop and prioritise primary care services in Ireland with the publication of "Primary Care: A New Direction" in 2001 (Department of Health and Children, 2001).

This strategy set out primary care as the central focus for the delivery of the majority of a person's health and social care needs. It acknowledged that the primary care infrastructure in Ireland was poorly developed with poor integration of primary and secondary care and an overreliance on acute hospitals and specialist services concerned with the diagnosis and treatment of disease. This was at the expense of preventative and rehabilitation services promoting health and wellbeing.

Within the primary care strategy, service provision was delivered by interdisciplinary teams, with each primary care team delivering services to approximately 3,000 to 7,000 of the local population. The composition of a primary care team comprised of GPs, nurses, speech and language therapists, occupational therapists, PTs, social workers, healthcare assistants, home helps, managers and administrative staff (Department of Health, 2012). Additional resources

such as dieticians and psychologists were provided, based on assessment of need, across a number of primary care teams. Each team ideally provided care from a single location in the community, providing a single site, point of access for users and allowing closer co-ordination and communication between service providers. This aimed to reduce hospital admissions and visits through the provision of home help and social care packages that would enable people to be cared for at home, as well as facilitating earlier discharge from hospital.

The Government strategy set out a target of establishing between 400 and 600 fully functioning primary care teams by the end of 2011, which was estimated to be two thirds of the full implementation. In its end of year report in 2013, the HSE reported that 467 primary care teams were in place, with 419 of these labelled as functioning by virtue of having regular team meetings (Health Service Executive, 2013a). However figures released by the HSE in previous years have been contested both by the then Minister for Health, Dr James Reilly TD, and by the Irish College of General Practitioners (Donnellan, 2011, Irish College of General Practitioners, 2011). In a survey of 423 of its members in 2011, the Irish College of General Practitioners found that 41.6% of those surveyed were not part of a primary care team although 10.1% indicated that they would be joining a team in the near future. A further report examining the management of chronic disease in general practice found that only 36% of their respondents reported being part of a functioning primary care team (Darker et al., 2011).

1.10.3 Current Reformation of Primary Care Services in Ireland

The Government has continued to build on this programme of transformation and its most recent programme of reform is outlined in "Future Health - A Strategic Framework for Reform of the Health Service 2012-2015" (Department of Health, 2012). Future Health is built on four key interdependent pillars of reform; health and wellbeing, service reform, structural reform and financial reform.

The priority of the Government's reformation programme is to help improve the overall health and wellbeing of Irish people. At its core, is the development of a single-tier health service supported by Universal Health Insurance (UHI). This aims to provide equitable access to healthcare for all of the population which is based on need, rather than income. All persons will be insured for a standard package of curative health services including primary care and hospital services, with social care services outside of UHI but integrated around the user.

GP care will be free at the point of use for all of the population. Health insurance, while mandatory, will be related to ability to pay with financial assistance for those who qualify. Health insurers will commission care for their members from primary care providers, independent not-for-profit hospital trusts and private hospitals. The current system of governance in the Irish hospital sector will be reformed, with public hospitals being organised into more efficient hospital groups and eventually into independent competing hospital trusts, each with its own governance and management which will deliver more cost effective services (Higgins, 2013).

Among the necessary steps that will facilitate UHI are the strengthening of primary care services, with removal of cost as a barrier to access and introduction of the "money follows the patient" funding mechanism (Department of Health, 2013d, Department of Health, 2013c). This involves moving away from block grant budgets to a new system where hospitals are paid for the actual level of activity undertaken and thus are funded based on the quantity and quality of the services they deliver.

As outlined, one of the major aims of the Programme for Government is to achieve universal primary care with free access to GP services for all (Department of Health, 2013b). This will be achieved in a phased manner, with free care for under-sixes scheduled for introduction in 2015 and the extension of free access to those aged 70 and over and to persons with disabilities and illness thereafter. This will require ongoing legislative change by the Attorney General's Office and the Department of Health. At present, almost two million of the Irish population have a means tested medical card/GP visit card which entitles them to free GP visits and the remainder of the population must pay out of pocket for each visit (Health Service Executive, 2013a).

A key priority of future primary care will be to address the increased incidence and prevalence of chronic disease through shifting the management of these conditions from hospitals to the community. A number of integrated chronic diseases management programmes are being prioritised in the areas of diabetes, stroke, heart failure, asthma and chronic obstructive pulmonary disease (Department of Health and Children, 2008). The focus of these programmes will be on primary prevention and early intervention aiming to reduce the onset of chronic disease. Models of shared care will outline the role and responsibilities of primary care and specialist services with an increased focus on clinical protocols and guidelines, together with the development of clinical information systems for evaluation.

In order to deliver on universal primary care, a new contract will have to be negotiated with GPs. The new contract will have increased emphasis on the management of chronic conditions with provisions for the enrolment of patients with their local primary care team, individual care plans, call/recall systems for disease monitoring and mechanisms to audit and report on outcomes. GPs will be required to provide care as part of integrated multidisciplinary primary care teams.

The Government has committed to a programme of capital investment in primary care centres and to the development of information and communication technology infrastructure. Staffing priorities have been identified with a commitment to the development of a number of new posts in public health and community nursing and across the allied health professionals.

1.10.4 **Healthy Ireland A Framework for Improved Health and Wellbeing**

In 2013 the Government released further details on its national framework for action to improve the health and wellbeing of the Irish population over the next decade with the release of "Healthy Ireland, A Framework for Improved Health and Wellbeing 2013 – 2025" (Department of Health, 2013b).

A schematic representation of the framework is provided in Figure 7. The framework sets out four central high level goals for improved health and wellbeing, with 64 targeted actions which are grouped under six broad themes. These actions form the basis of how a whole system approach to health and wellbeing will be delivered across multiple sectors. The framework also identifies the partners who have a role to play in delivering each action.

<table>
<tr><th colspan="6">Vision</th></tr>
<tr><td colspan="6">A Healthy Ireland, where everyone can enjoy physical and mental health and wellbeing to their full potential, where wellbeing is valued and supported at every level of society and is everyone's responsibility</td></tr>
<tr><th colspan="6">Goals</th></tr>
<tr><td colspan="2">Increase the proportion of people who are healthy at all stages of life</td><td colspan="2">Reduce health inequalities</td><td>Protect the public from threats to health and wellbeing</td><td>Create an environment where every individual and sector of society can play a part in achieving a healthy Ireland</td></tr>
<tr><th colspan="6">Framework of Actions</th></tr>
<tr><td>Theme 1
Governance and Policy</td><td>Theme 2
Partnership and Cross-Sectorial work</td><td>Theme 3
Empowering People and Communities</td><td>Theme 4
Health and Health Reform</td><td>Theme 5
Research and Evidence</td><td>Theme 6
Monitoring, Reporting and Evaluation</td></tr>
</table>

Figure 7 A Framework for Improved Health and Wellbeing

Adapted from Healthy Ireland (Department of Health, 2013)

The overall governance and implementation of Healthy Ireland is being overseen by the Cabinet Committee on Social Policy chaired by An Taoiseach. A multi-stakeholder Healthy Ireland Council will provide a national advisory forum to support implementation of the framework across sectors and a Health and Wellbeing Programme has been developed within the Department of Health to co-ordinate and monitor the framework.

Within the framework, PA is explicitly targeted by the Government under Theme two - Partnerships and Cross-sectorial work. It states *"Develop a plan to promote increased physical activity levels across the population, as an exemplar of how Healthy Ireland will work. The Healthy Ireland Council will be key in developing linkages with and between partners and advising on priorities"* (p.23). Included as partners are Government departments, statutory agencies, local authorities and all sectors including civil society. The development of a National Plan for Physical Activity is currently listed as an ongoing project on the Department of Health's website (Department of Health, 2014).

Implementation of physical education and active schools programmes, as well as creating activity friendly environments with cycle lanes, playgrounds and well lit pathways are actions under Theme three – Empowering People and Communities. Under Theme four – Health and Health Reform, there is an emphasis on promoting healthy behaviours and disease prevention

with specific health sector funding for health and wellbeing projects and service agreements which will reflect Healthy Ireland policy priorities.

Under Theme six, the importance of regular and accurate data monitoring and evaluation is outlined. An Outcomes Framework setting out specific indicators for each of the four goals is planned by the Government to allow for an objective assessment of the impact of Healthy Ireland and a number of preliminary key performance indicators pertaining to each goal were outlined. Within goal one - Increase the Proportion of People Who Are Healthy At All Stages of Life, there is a specific target to increase by 20% the proportion of the population undertaking regular PA.

SUMMARY

The Irish Government identified its strategy to develop and prioritise primary care services in Ireland in 2001.

Within this strategy, service provision is delivered by interdisciplinary primary care teams with each team delivering services to approximately 3,000 to 7,000 of the local population and ideally providing care from a single location in the community.

The most recent programme of reform (2012) sets out a target of a single tier health service, supported by Universal Health Insurance and free GP care for all.

To enable this, the Irish government has committed to the ongoing strengthening of primary care services through capital investment in infrastructure together with the development of new posts in public health and community nursing and across the allied health professionals.

Addressing the increasing prevalence of chronic disease has been identified as a key priority of future primary care. A number of integrated chronic disease management programmes focusing on prevention and early intervention are planned.

In 2013, the Irish Government released details of its national framework for action to improve the health and wellbeing of the Irish population over the next twelve years.

Within this framework, physical activity is explicitly targeted under a number of themes with a specific indicator to increase by 20% the proportion of the Irish population undertaking regular physical activity.

The importance of regular and accurate data monitoring and evaluation is highlighted as part of this process.

1.11 Public Health Surveillance of Physical Activity

The final section of this chapter discusses population surveillance of PA and Figure 8 presents a schematic representation of how the section is organised.

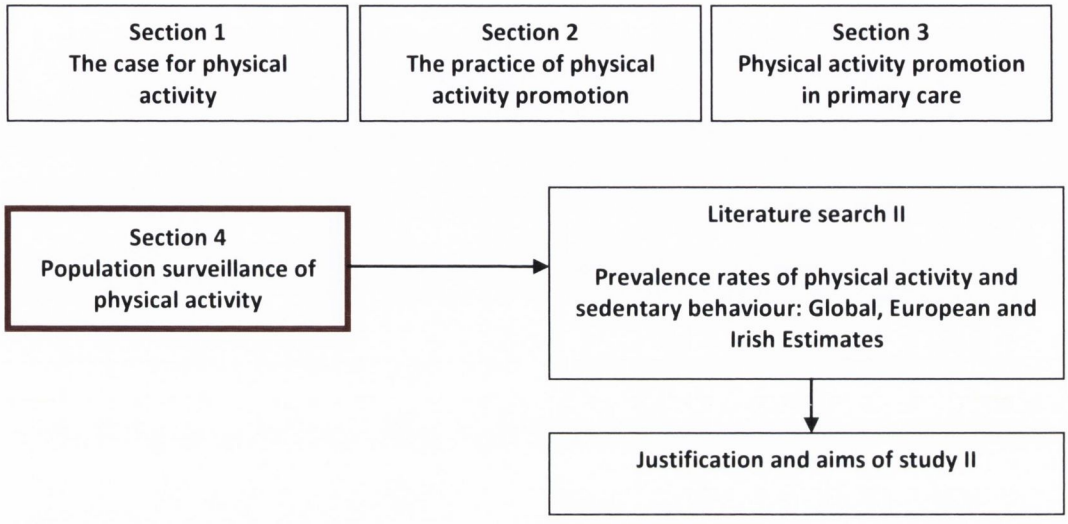

Figure 8 Outline of Section Four

Public health surveillance studies are designed to quantify and track the distribution of risk factors and health outcomes in the population as a basis for public health planning. It is argued by some that one of the most significant barriers to policy inaction on PA in many countries is the lack of national level data on rates of participation (Bull and Bauman, 2011).

Accurate data helps to describe and quantify the distribution of the problem while at the same time examining for associations and patterns. At a time when there is ongoing commitment to developing and expanding primary care services in Ireland, there is a unique opportunity to incorporate effective PA screening and intervention programmes into health provision. Within the Healthy Ireland Strategy, increased focus on disease prevention and health promotion points to an opportunity to prioritise PA programmes in line with governmental policy. In order to fully inform this process it is necessary to have current data that accurately describes the prevalence of inactivity and sedentary behaviour amongst the users of primary care services. The second study of this thesis was a descriptive analysis of PA prevalence rates and patterns of Irish primary care patients.

To fully inform this aspect of the research, a detailed literature review was undertaken to examine prevalence rates and patterns of PA and sedentary behaviour. Primary care patients by their nature are a very heterogenic group and may present with a vast spectrum of disorders ranging from healthy individuals with an acute injury for example, to persons with CVRFs, to persons with established chronic disease and long term disabilities. As such, a review of PA prevalence studies using general population data was deemed more relevant to this research than a review of studies using clinical populations, which are often limited to just one disease or condition. For clarity, a decision was taken to examine the literature with respect to global, European and Irish estimates.

1.11.1 Population Surveillance of Physical Activity

Accurate data from countries are vital to reverse the global rise in death and disability from NCDs (World Health Organisation, 2010a). As the evidence for the health benefits of PA accumulated the importance of developing accurate national and global surveillance of PA levels became more apparent. In some countries, such as the US and Canada standardised surveillance of the PA levels of the population have occurred for many decades (Centers for Disease Control and Prevention, 2003, Craig et al., 2004).

In 2001, 35 countries were identified as having national data on the PA levels of its population (Bull et al., 2005). Comparisons between countries and regions was not possible however, mainly due to the lack of a standardised measure that was suitable for international use (Hallal et al., 2012). PA questionnaires varied with respect to the questions asked, the recall periods and the domains in which PA was captured (van Poppel et al., 2010).

In the past, many instruments have predominately focussed on capturing leisure time PA or participation in sport and failed to capture the multiple domains in which PA can occur (Martinez-Gonzalez et al., 2001). This is of particular importance in lower income and developing countries where leisure time PA makes a smaller contribution to overall energy expenditure than both occupational and transport related activity (Hallal et al., 2003, Trinh et al., 2008).

In the last decade much progress has been made in population surveillance of PA mainly following the development of the International Physical Activity Questionnaire (IPAQ) by a group of academics in the late 1990s (Craig et al., 2003). Their goals were to establish a survey instrument that could provide cross nationally comparative data on PA levels that could be used for health monitoring and surveillance purposes. The reliability and validity of this measure has been established in 12 countries and it has since become one of the most widely used questionnaires to measure PA especially in Europe (World Health Organisation Regional Office for Europe, 2010). A full description of the IPAQ is given in Chapter 2 Section 2.8.2.

The Global Physical Activity Questionnaire (GPAQ) was developed in 2001 for the World Health Organisations STEPS surveillance system[3] (World Health Organisation, 2010b) and captures activity across three domains; leisure, work and transport (Armstrong and Bull, 2006, Bull et al., 2009). It incorporates show cards and culturally specific examples making it easy to administer and applicable across countries. As it applies the same cut off points as the IPAQ, results from both questionnaires are generally comparable. The major difference between the two questionnaires is that the GPAQ assesses PA behaviour separately for each of the work, leisure time and transport domains and the IPAQ short form asks about overall activity across domains (Armstrong and Bull, 2006). However, it should be noted that some studies point to the over reporting of PA with the IPAQ (Ainsworth et al., 2006, Rzewnicki et al., 2003). In countries such as the US where both the GPAQ and the IPAQ were used in large national

[3] The WHO STEPwise approach to chronic diseases risk factor surveillance is a set of standardised questions and protocols for monitoring trends both within and across countries. It was established in 2000 predominately to assist low and middle income countries to collect information about risk factors for NCDs.

surveys, the IPAQ almost always demonstrated higher PA outcomes (Centre for Disease Control and Prevention, 2014).

The GPAQ is recommended by the WHO as a risk factor data collection tool for PA and sedentary behaviour within the concept of STEPs. In 2010, the WHO global report on NCD status showed a marked improvement in the number of countries with PA surveillance with data available for over 100 countries (World Health Organisation, 2011c).

1.12 Prevalance Rates of Physical Activity and Sedentary Behaviour

1.12.1 Literature Search

Since the introduction of the IPAQ and the GPAQ a number of studies have compared the prevalence rates and patterns of PA for a large number of countries worldwide. The following section presents the results from a detailed review of the literature reporting on PA and sedentary behaviour.

The aim of the review was to examine the prevalence rates and patterns of PA and sedentary behaviour in the context of a global, European and Irish population.

1.12.2 Eligibility Criteria

The scope of the search was initially limited to published studies which reported the prevalence of PA and sitting time in multiple countries, either worldwide or within the European region. The inclusion criteria included studies providing PA or sitting time estimates using large nationally representative samples of adults, that used either the IPAQ or the GPAQ as a standardised measure.

Studies were included if they used either direct or indirect methods of data collection. Indirect methods consisted of secondary data analysis from several different sources including the World Health Survey (World Health Organisation, 2004b), the Eurobarometer Surveys (European Commission, 2014), the WHO's global health observatory data repository (World Health Organisation, 2011b) and the WHO STEPS survey (World Health Organisation, 2010b). All studies used data obtained from cross sectional studies.

This search strategy was repeated a second time to identify all of the published literature that included prevalence rates of PA and sedentary behaviour for Ireland. In order to ensure a comprehensive search of the Irish data, the search was broadened to include the grey literature and the criterion limiting the PA measure to the IPAQ and GPAQ were removed. The grey literature included national and international reports of both governmental and non-governmental organisations and their associated websites. Although not indexed in the medical literature these are an important source of data for population estimates and trends and a number of key documents were identified.

1.12.3 Search Strategy

The scientific databases PubMed and Embase were searched using combinations of the following key terms; "physical activity" OR "exercise" OR "physical inactivity" OR "sedentary behaviour" OR "sitting" AND "IPAQ" OR "International physical activity questionnaire" or "GPAQ" OR "Global physical activity questionnaire" AND "prevalence". The key term "Ireland" was added to the second search.

In addition, a manual search of the reference lists of each of the selected articles and relevant reports were conducted. All applicable articles published in the English language up until June 2014 were considered for inclusion.

1.12.4 Results

Worldwide and Europe

The search strategy is outlined in Figure 9 and identified 1348 potentially suitable articles. When inclusion and exclusion criteria were applied there were 12 articles providing global and/or European PA estimates and these are presented in Table 6.

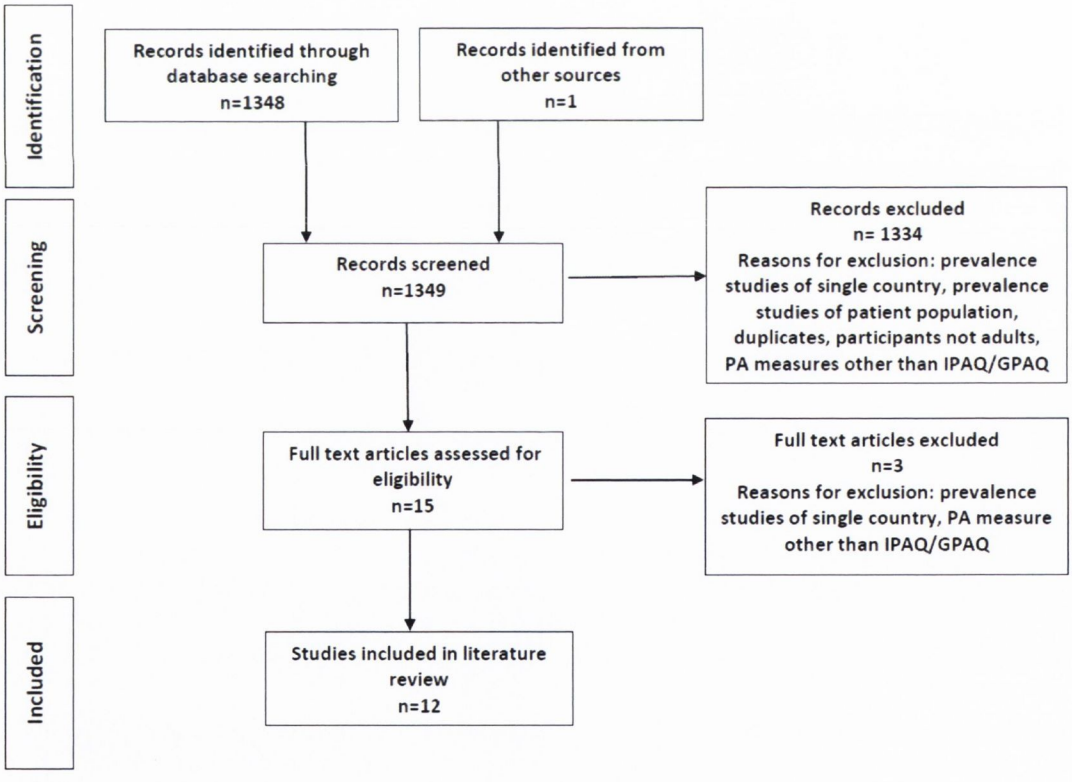

Figure 9 Flowchart of Literature Search Strategy (Worldwide and Europe)

Four of these studies dealt exclusively with European country statistics (Bennie et al., 2013, Sjostrom et al., 2006, Rutten and Abu-Omar, 2004, Rutten et al., 2003), two dealt with countries in the Asia Pacific region (Macniven et al., 2012, Ng et al., 2009), one with countries

from the Africa region (Guthold et al., 2011) and the remaining five provided statistics on countries worldwide (Guthold et al., 2008)

Data on sitting time were reported in a total of five studies, three of which were European country estimates (Bennie et al., 2013, Bauman et al., 2011, Hallal et al., 2012, Sjostrom et al., 2006, Rutten et al., 2003).

Three of the studies used primary data collected directly by the research team (Bauman et al., 2011, Bauman et al., 2009, Rutten et al., 2003) and the remainder used secondary data analysis from sources detailed in Table 6. Both of the studies by Bauman et al refer to the same dataset.

Despite limiting the indexed studies to those using the IPAQ and GPAQ, several different PA indicators and estimates were used, so these are presented as they are described in the original source documentation. However, all but two studies (Rutten et al., 2003, Rutten and Abu-Omar, 2004) report the percentage achieving or failing to achieve a threshold amount of PA, generally defined as meeting the public health recommendations of at least 150 minutes of moderate intensity PA per week. Where confidence intervals or standard deviations are reported, these are included in the tables.

Other PA indicators include the mean or median METs minutes or hours of PA per day or week or the percentage classified as low, moderate or high active as per IPAQ scoring protocol (The IPAQ Group, 2006). Sitting estimates are generally reported as minutes per day or per week, or as the percentage prevalence sitting more than a number of hours per day.

Ireland

The additional search strategy for Irish data is presented in Figure 10. For clarity the data for Ireland is presented in two tables; 7 and 8. Table 7 presents the results from the indexed literature based on studies using either the IPAQ or GPAQ. Table 8 presents the results from additional studies and national reports using a number of different PA measures and sourced predominately from the grey literature.

Four of the studies identified in the global/European search reported PA prevalence estimates for Ireland. This data were extracted and are presented in Table 7 (Bennie et al., 2013, Dumith et al., 2011, Sjostrom et al., 2006, Rutten and Abu-Omar, 2004). The second database search identified four further Irish studies (McKee et al., 2012, Livingstone et al., 2001, McCarthy et al., 2002, Conry et al., 2011). Of these, only one study met all of the inclusion criteria and thus was added to Table 7 (McKee et al., 2012).

Four studies or reports were identified from the grey literature and these are presented in Table 8 (European Commission, 2014, Irish Universities Nutrition Alliance, 2012, European Commission, 2010, Morgan et al., 2008), in addition to one study from the indexed literature which used a measure other than the IPAQ/GPAQ (McCarthy et al., 2002).

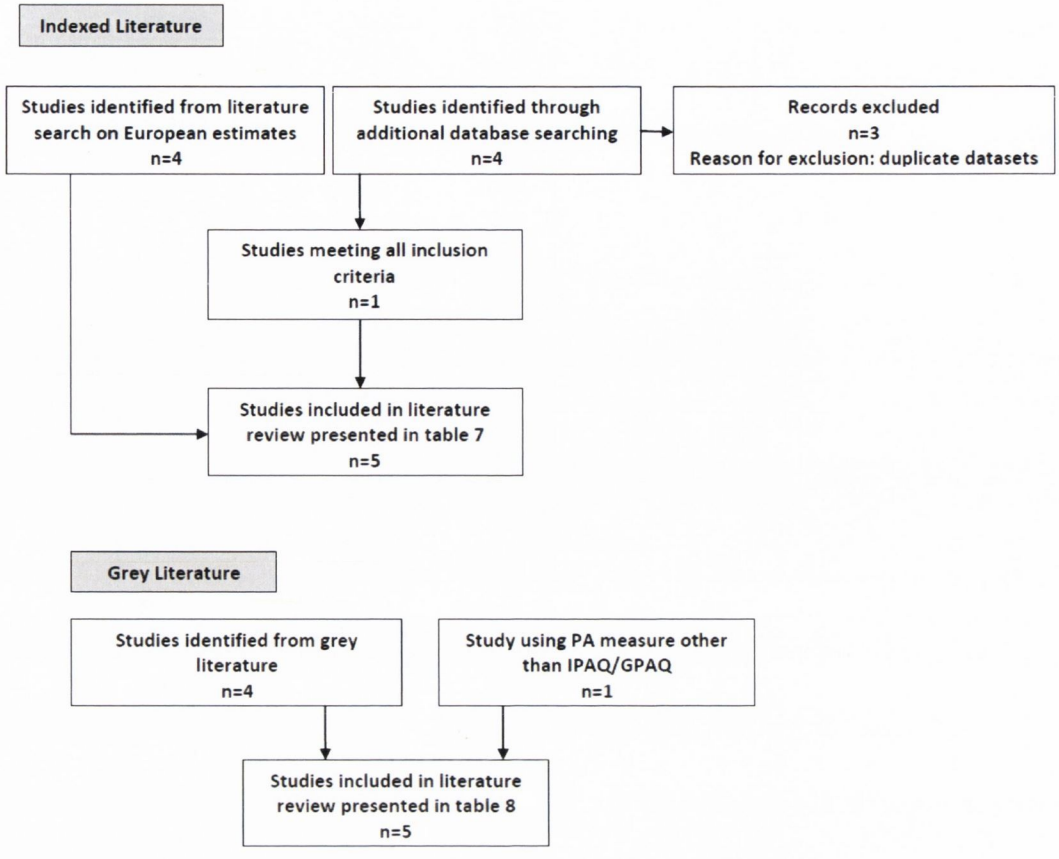

Figure 10 Flowchart of Literature Search Strategy (Ireland)

Worldwide Physical Activity Levels

The following discussion refers to studies presented in Table 6. The largest study to date, pooling data from 122 countries found that 31% of the world's population failed to meet the recommended amounts of PA for health (Hallal et al., 2012). The frequency of physical inactivity varied greatly between WHO regions. In general people of South East Asia demonstrated the lowest rates of inactivity and those of the Americas and Eastern Mediterranean demonstrated the highest. There was also a large variation seen among different countries with as few as 4.7% (95% CI 4.3-5.1) of the population in Bangladesh reported as inactive and as many as 71.9% (95 CI 31.0-87.2) in Malta. Two other studies pooling estimates from a large number of countries have reported worldwide inactivity prevalence rates of 17.7% and 21.4% (Dumith et al., 2011, Guthold et al., 2008). Both studies also reported a wide variation amongst different countries.

None of the studies reporting worldwide data provide an estimate for total PA carried out in a week. Although using data from studies based only in the Asia – Pacific region, Macniven provided an estimate for total PA of 694 Median MET mins/day for the 19 studies in their review using the IPAQ (Macniven et al., 2012).

Higher rates of physical inactivity were generally reported in countries of high income (Hallal et al., 2012, Dumith et al., 2011). The study by Guthold et al (2008) included countries predominately of low and middle income, which may go some way towards explaining the lower prevalence rate of inactivity reported. Dumith et al (2011) examined the association of physical inactivity with the human development index (HDI), an index which provides a composite measure of three dimensions of human development namely life expectancy, education and income indices (ul Haq, 1995). They found a higher prevalence of inactivity amongst those ranked in upper-middle or high income groups when compared with those of lower-middle or low income groups. Although not a linear relationship, the strength of the evidence verified a positive relationship between HDI and physical inactivity, with inactivity increasing as a function of HDI. Men and women of lower and middle income countries may have increased work and transport-related PA whereas the increased automation of work and use of motorised transport is likely to contribute to increased levels of inactivity in higher income countries (Guthold et al., 2011).

There are some exceptions to this, with for example, higher rates of inactivity, similar to those of devolved countries reported in the study of 22 predominately low income African countries (Guthold et al., 2011). Potential explanations for this include the use of regional samples and the predominately female gender distribution in this study.

European physical activity levels

The following discussion refers to studies presented in Table 6. Of the studies reporting pooled prevalence for PA within Europe, the most recent study estimated that 27.5% of Europeans were low active and 23.2% were high active (Bennie et al., 2013). This is much lower than the European inactivity prevalence rate of 34.8% reported by Hallal et al (2012), however it is worth noting that the former estimate is based on 2005 data and the latter is likely to include data collected much more recently, as part of ongoing revisions to the WHO global health observatory data repository.

Using the estimate reported by Hallal et al (2012), Europe has a much higher level of inactivity than Southeast Asia and Africa, is somewhat similar to the Western Pacific, and is almost ten percent lower than the Americas and Eastern Mediterranean.

Three of the studies in this review used data exclusively from the Eurobarometer surveys[4], two from the Special Eurobarometer 58.2 (Rutten and Abu-Omar, 2004, Sjostrom et al., 2006) and one from Eurobarometer 64.3 (Bennie et al., 2013). One additional study also used data from the Eurobarometer surveys, but in combination with several other PA databases, so it is unclear exactly what source data contributes to their reported prevalence (Hallal et al., 2012).

[4] The Eurobarometer are a series of surveys conducted since 1973, on behalf of the European Commission that provide cross national data on topics concerning European citizenship. Special Eurobarometer reports are more in-depth thematic studies. The Eurobarometer 58.2 and 64.3 dealt with questions on a number of health related issues, as well as using the IPAQ to assess PA.

Despite studies using the same dataset or obtained by the same methodology different interpretations of the IPAQ and the use of inconsistent PA indicators make direct comparisons between these studies very difficult.

Sjostrom et al (2006) used Special Eurobarometer 58.2 to determine the prevalence of "health enhancing PA" within 15 countries of the EU. As the IPAQ captures all daily activity including those routine low intensity tasks that are unlikely to contribute to health, it used a higher cut off point (see table 6) to classify sufficient activity. In this study the prevalence of health enhancing PA was 31.3% and those classified as inactive amounted to 31%.

Rutten and Omar (2004) analysed the same dataset two years earlier but reported the total time spent in PA which equated to a median of 24 MET hours/week of PA, across all member states. It also reported the total MET hours/week of PA for each of the 15 countries participating, which ranged from a median of 34.65 MET hours/week for Germany to 21.95 MET hours/week for Italy.

The EUPASS (European Physical Activity Surveillance System) study published by the same author a year earlier was one of the first studies to use the IPAQ in a European population (Rutten et al., 2003). The aim of the study was to compare PA measurements in eight European countries, and as well as highlighting the diversity of results provided by the different instruments, it also reported total MET minutes/week of PA for each of the countries.

There were large discrepancies between countries represented in both of these studies with for example, the EUPASS reporting a median of 67 MET hours/week for Belgium and the Eurobarometer study reporting 20.6 MET hours/week. Differences of similar magnitude were reported for most other countries. Some of the differences may be explained by seasonal variation in data collection, the superior sampling methods used by the Eurobarometer and its effort to maintain the cultural, metric and linguistic equivalence of the IPAQ on translation.

Table 6 Global and European Physical Activity and Sitting Prevalence Estimates, using the IPAQ and/or GPAQ

Study	Setting & number of countries	Date data gathered	Direct/indirect data Data Source	PA measure & method	Sample size & sampling procedure	Physical activity indicator & result	Sitting indicator & result
Bennie et al 2013	32 European countries	2005	Indirect data Eurobarometer 64.3	IPAQ*[1] Interview	n=27,637 Multistage random sampling Aged 15-98	Low PA 23.16% Moderate PA 49.38% High PA 23.16%	Total mins/weekday sitting median pooled sample 300 (IQR*[3] 180-420) Mean 309 (SD*[4] +/- 185) Countries within northwest Europe reported higher sitting than countries within southeast Europe
Macniven et al 2012	29 Asia-Pacific countries	2000-2010	Indirect data Multiple sources (n=59) Published studies Governmental and Non-Governmental Reports WHO Global Infobase (STEPS) World Health Survey International Prevalence study (Bauman et al 2009)	IPAQ 34% of sample GPAQ*[2] 37% of sample Other measurement tools 29% of sample (data not reported)	n not reported Sample size ranged from 586-42,500 Adults aged < 65 Nationally representative population based studies Large scale, sub-national population based studies	IPAQ Sufficiently active range 54% to 93% (median 90%, IQR 80-92%) Median MET mins/day PA 694 (IQR 143-1156) GPAQ Sufficiently active 7% to 89% (median 53.5%, IQR 44.5-80.5%) Median MET mins/day PA range 134-918 (Pooled median not reported)	Not reported
Hallal et al 2012	122 countries worldwide	Variable	Indirect data WHO global health observatory data repository	GPAQ or IPAQ or similar instrument	88.9% of world's population Population based surveys	Inactive pooled sample 31.1% (95% CI*[5] 30.9-31.2) Europe 34.8%	> 4 hrs/day sitting pooled sample 41.5% (95% CI 41.3-41.7) Africa 37.8% (95% CI

			WHO STEPS survey Eurobarometer Surveys		Sampling methods varied according to source data	(95% CI 34.5-35.1) Africa 27.5% (95% CI 27.3-27.7) Americas 43.3% (95% CI 43.0-43.6) Eastern Mediterranean 43.2% (95% CI 42.8-43.6) Southeast Asia 17% (95% CI 16.8-17.2) Western pacific 33.7% (95% CI 33.5-33.9)	37.4-38.2) Americas 55.2% (95% CI 54.3-56.1) Eastern Mediterranean 41.4% (95% CI 40.1-42.7) Europe 64.1% (95% CI 63.5-64.7) Southeast Asia 23.8% (95% CI 23.1-24.5) Western pacific 39.8% (95% CI 39.3-40.3)
Dumith et al 2011	76 countries worldwide	2002/2003	Indirect data Pooled analysis of three studies (Sjostrom 2006, Guthold 2008 & Bauman 2009)	IPAQ SF	n= 300,000 Aged 15 and over Majority of studies were nationally representative but some based on convenience sampling	Inactive pooled sample 21.4% (95% CI 18.4-24.3) Inactive males mean 18.9% (95% CI 16.2-21.7) Inactive females mean 23.7% (95% CI 20.4-27.1)	Not reported
Bauman et al 2011	20 countries worldwide International Prevalence Study	2002-2004	Direct data	IPAQ SF Self 8 Interview 6 Telephone 6	n=49,493 Age 18-65 Representative population sampling – mixed procedures	Reported in a separate publication (2009)	Total mins/day sitting mean pooled sample 346 (SD 203.6) Median 300 mins/day (IQR 180-480)
Guthold et al 2011	22 African countries predominately low income	2003-2009	Indirect data STEPwise approach to chronic diseases risk factor surveillance	GPAQ Interview	n=57,038 Age 25-64 In 11/22 countries nationally representative sample, others regional Stratified random sampling	72.8% of pooled sample met the PA guidelines 78.8% of men met PA guidelines 68.4% of women met PA guidelines	Not reported
Bauman	20 countries	2002/2003	Direct data	IPAQ SF	n=52,746	High PA range 21-63%	Reported in a

et al 2009	worldwide International Prevalence Study			Self report 8 Interview 6 Telephone 6	Age 18-65 Representative population sampling – mixed procedures	Low PA range 9-43% Low PA males 7-41% Low PA females 6-49%	separate publication (2011)
Ng et al 2009	5 Asian countries	2005	Indirect data Health and Demographic Surveillance System Survey	GPAQ	n= 18,494 Age 25-64 Regional sample, unclear sampling frame	Low PA females 35% Low PA males 25% Total median daily time in PA Males 300 mins Females 150 mins	Not reported
Guthold et al 2008	51 countries worldwide predominately low and middle income	2002/2003	Indirect data World Health survey	IPAQ SF Interview	n= 212,021 Age 18-69 Random national sampling except for 6 countries, multistage cluster design	Inactive pooled sample 17.7% Inactive males 15.2% Inactive females 19.8 %	Not reported
Sjostrom et al 2006	15 European countries	2002	Indirect data Special Eurobaromter Wave 58.2	IPAQ SF Interview	Aprox 1000 per country Aged 15 and over Multistage random probability sampling	Sufficiently active*[6] pooled sample 31.3% (95% CI 30.6-32.1) Sedentary pooled sample 31% (95% CI 30.3-31.8)	> 6 hrs/day sitting pooled sample 36.8% (95% CI 39.8-41.4)
Rutten et al 2004	15 European countries	2003	Indirect data Special Eurobarometer Wave 58.2	IPAQ SF Interview	n=16,230 Aprox 1000 per country Aged 15 and over Multistage random probability sampling	Mean 1.49 (95% CI 1.46-1.53) days/week with some vigorous PA Mean 2.70 (95% CI 2.65-2.74) days/week with some moderate PA Mean 4.25 (95% CI 4.21-4.29) days/week with walking Median MET hours/week PA 24.0	Not reported
Rutten et	8 European	1999/2000	Direct data	IPAQ SF	Aprox 600 per country	Mean 1.79 (SD 2.22)	Total mins/week

al 2003	countries EUPASS*[7] survey			Telephone	Age 18-65 Random sampling	days/week vigorous PA Total mins/week of vigorous PA 281.73 (SD 631.15) Mean 2.76 (SD 2.61) days/week moderate PA Total mins/week of moderate PA 318.74 (SD 115.49) Mean 5.72 (SD 1.98) days/week walking Total mins/week walking 600.31 (SD 878.32) Median 2970.00 METs/week	sitting pooled sample mean 2033.11 (SD 1115.67)

*[1] IPAQ SF International Physical Activity Questionnaire Short Version *[2] GPAQ Global Physical Activity Questionnaire

[3] IQR Interquartile range[4] SD Standard Deviation *[5] CI Confidence interval

*[6] Sjostrom et al defined sufficient activity as equating to the "high" PA category as per standard IPAQ scoring protocol. This is a higher cut off point than used by other studies who equate sufficient activity with the "moderate" PA category as per standard scoring protocol (Craig et al., 2003).

*[7] EUPASS European Physical Activity Surveillance System

Irish Physical Activity Levels

The prevalence of inactivity in Ireland was reported in three of the five indexed studies presented in Table 7.

Dumith et al (2011) provided separate estimates for the genders and reported that 28% of Irish males and 40% of Irish females were insufficiently active. This is higher than the worldwide pooled prevalence of 18.9% amongst males and 23.7% of females reported in the same study (Dumith et al., 2011).

Sjostrom et al (2006) reported an inactivity prevalence for Ireland of 34.7% for both genders combined. An inactivity prevalence of 31.8% has recently been reported in a large nationally representative sample of over 8000 adults aged 50 and over (McKee et al., 2012). This is very similar to reported estimates for pooled prevalence of inactivity (31%) throughout the European region (Sjostrom et al., 2006, Hallal et al., 2012). Examining the data provided by the Special Eurobarometer 58.2, Ireland ranked as the fifth most inactive country of the 15 European countries included in the analysis, however this survey was performed in 2002 (Sjostrom et al., 2006). Irish people engaged in a total of 23 median MET hours/week of PA (Rutten and Abu-Omar, 2004).

Reviewing the two most recent Eurobarometer suveys presented in Table 8, results indicate that the frequency of participation in sport as well as other forms of PA have decreased in the period from 2010 to 2014 (European Commission, 2010, European Commission, 2014). Another finding worth noting is the high percentage of Irish people who never take part in vigorous (52%) or moderate (43%) intensity PA. Although using the IPAQ to measure PA, the Eurobarometer reports do not provide cumulative totals or percentage prevalence of inactivity; it is therefore very difficult to compare them with the indexed literature.

The National Survey of Lifestyle, Attitudes and Nutrition (SLÁN) has reported on the PA levels of the Irish population at three time points in 1998, 2002 and 2007. Whilst there has been a small decrease in the percentage of people reporting no exercise in an average week, the numbers reporting regular activity at least three times a week has shown little change. In 2007 the IPAQ was introduced as part of the survey and results found that 29% of the population were categorised as low active.

Table 7 Indexed Literature: Physical Activity and Sitting Prevalence Estimates for Ireland using the IPAQ

Study	Direct/indirect data Data source	PA measure & method	Sample size & procedure	Date data gathered	Physical activity indicator & result	Sitting
Bennie et al 2013	32 European countries Indirect data Eurobarometer 64.3	IPAQ SF Interview	N=894 Multistage random sampling Aged 15-98	2005	Not reported	Total mins/weekday sitting median 240 (IQR 180-360) Mean 284 (SD 274-295) Proportion of people sitting for 7 hours or more a day 20-24.9% % of sample classified as high-sit/low-active*[1] 11.2% % of sample classified as low-sit/high-active*[2] 8.4%
McKee et al 2012	Indirect data The Irish Longitudinal Study of Ageing (TILDA)	IPAQ SF Interview	N=3449 adults Clustered random sample of all households in the Republic of Ireland Aged 50 & over	2009-2011	Low 31.8% Moderate 34.4% High 33.7% High PA declined with age Low PA increased with age	Not reported
Dumith et al 2011	Indirect data Pooled analysis of three studies	IPAQ SF	As per individual study (Sjostrom 2006, Guthold 2008 & Bauman 2009)	2002/2003	Inactive males 28% Inactive females 40%	Not reported
Sjostrom et al 2006	Indirect data Special Eurobaromter Wave 58.2	IPAQ SF Interview	Random probability sampling Aprox 1000 per country	2002	Sufficient activity 29% (95% CI 26.2-31.8) Sedentary 34.7% (95% CI 31.7-37.6)	Sitting > 6 hrs/day 33.4% (95% CI 30.4-36.3)
Rutten et al 2004	Indirect data Special Eurobaromter Wave 58.2	IPAQ SF Interview	Random probability sampling Approximately 1000 per country	2002	Mean 1.46 (95% CI 1.32-1.60) days/week with some vigorous PA Mean 2.33 (95% CI 2.17-2.50) days/week with some moderate PA Mean 4.23 (95% CI 4.07-4.40) days/week with some walking Median MET hours/week	Not reported

					PA 23.10 (95% CI 21.7-24.63)	

*[1] high-sit/low-active calculated by being in the low active group assessed by the IPAQ and the highest quartile of sitting (420-960 mins/day)

*[2] low-sit/high-active calculated by being in the high active group assessed by the IPAQ and the lowest tertile of sitting (0-211 mins/day)

Table 8 Non Indexed Literature: Physical Activity and Sitting Prevalence Estimates for Ireland

Survey author, name & year	Data collection method	Age	Key physical activity measurement items	Results for Ireland
European Commission Special Eurobarometer 412 Sport and Physical Activity 2014	Interviewer administered questionnaire	15 and over	1. Frequency of exercise/sport in a week Regularly means the respondent exercises at least 5 times a week; with some regularity means 1 to 4 times a week; and seldom means 3 times a month or less often.	16% regularly 36% with some regularity 14% seldom 34% never
			2. Frequency of physical activity outside of sport (cycling from one place to another, dancing, gardening)	14% regularly 34% with some regularity 23% seldom 39% never
			3. Days on which vigorous PA was reported in the last 7days	21% 4 to 7 days 27% 1 to 3 days 52% none
			4. Days on which moderate PA was reported in the last 7 days	27% 4 to 7 days 30% 1 to 3 days 43% never
			5. Frequency of walking for at least 10 minutes in the last 7 days	69% 4 to 7 days 21% 1 to 3 days 10% never
			6. Amount of time spent sitting in a usual day	20% 2 hrs 30 mins or less 48% 2 hrs 31 mins to 5 hrs 30 mins 23% 5 hrs 31 mins to 8 hrs 30 mins 7% 8 hs 31 or more 2% don't know

Irish Universities Nutrition Alliance National Adult Nutrition Survey 2011	Self administered questionnaire Objective measure of physical activity using an actigraph*[1]	18 and over	1. Time spent watching TV or videos on an average weekday/weekend day/holiday in the last year 2. Average hours per week spent on active recreational pursuits 3. Participation in walking at least once a week 4. Overall time spent in vigorous activity per week	Average 18 hours a week Average 5.3 hours/week 63% Women 44% Men 18 minutes/week Women 54 minutes/week Men
European Commission Special Eurobarometer 334 Sport and Physical Activity 2010*[1]	Interviewer administered questionnaire	15 and over	1. Frequency of exercise/sport in a week Regularly means the respondent exercises at least 5 times a week; with some regularity means 1 to 4 times a week; and seldom means 3 times a month or less often. 2. Frequency of physical activity outside of sport (cycling, walking from a place to another, dancing, gardening)	23% regularly (Highest in the EU) 35% with some regularity 15% seldom 26% never 33% regularly 41% with some regularity 13% seldom 12% never
National Survey of Lifestyle, Attitudes and Nutrition 1998 2002 2007	Interviewer administered questionnaire	18 and over	1. Percentage reporting no exercise in an average week 2. Engaging in moderate and/or strenuous physical exercise 3 or more times a week for at least 20 minutes 3. IPAQ SF 2007 only	23% 1998 28% 2002 19% 2007 38% 1998 40% 2002 41% 2007 Low 29% Moderate 47% High 24%
McCarthy et al 2002	Self administered questionnaire	18 - 64	1. Activity at home, work and recreation	Men twice as active as females in work & recreational activity (139.7 (SD 83.9) h/week Vs 68.5 (SD49.8) h/week) Women three times as active as men in household pursuits (65.9 (SD 58.7) h/week Vs 22.6 (SD 24.6) h/week)

			2. Time spent sitting, TV viewing	19 h/week for men and women 25% of population spent at least 25 h/week TV viewing

*[1]Personal communication with researchers actigraph data not published

Physical Activity and Gender

There is a difference between the PA levels of men and women, with consistent findings that women are less physically active than men (Bauman et al., 2009, Hallal et al., 2012, Sjostrom et al., 2006, Dumith et al., 2011, Guthold et al., 2011). Hallal et al (2012) reported the worldwide prevalence of inactivity amongst women as 33.9%, compared with 27.9% of men. Other studies have reported rates of 23.7% for women compared to 18.9% of men (Dumith et al., 2011), 31.6% for women compared to 21.2% of men (Guthold et al., 2011) and 15.2% and for women compared to 19.8% for men (Guthold et al., 2008). In general, studies comparing estimates for males and females have demonstrated a mean difference in the region of 4 to 5 percentage points.

Based on data from the World Health Survey, in all but seven of 51 countries included in the analysis, females were more inactive than men and in some countries this difference was greater than 10% (Guthold et al., 2008). This was also true of another study reporting on 22 lower income African countries where again 10% more women were classified as low active compared with men. In the International Prevalence Study, males were physically more active in all but three of the 20 countries included (Bauman et al., 2009). This gender difference was especially marked in younger age groups with younger men more likely to be categorised as high active than younger women. There is less variation between the genders with increasing age, mainly due to a larger decline in the PA levels of men. Men of every age were also more likely to participate in vigorous exercise more often compared to women (Sjostrom et al., 2006, Hallal et al., 2012).

Similar patterns have emerged in the Irish population (Sjostrom et al., 2006, Dumith et al., 2011) with the last SLÁN survey showing 26% of Irish males and 31% of Irish females as inactive (Morgan et al., 2008). Irish males were also more likely than females to be categorised within the high PA category (32% Vs 16%).

A figurative representation of the worldwide prevalence of physical inactivity in men and women is shown in Figure 11.

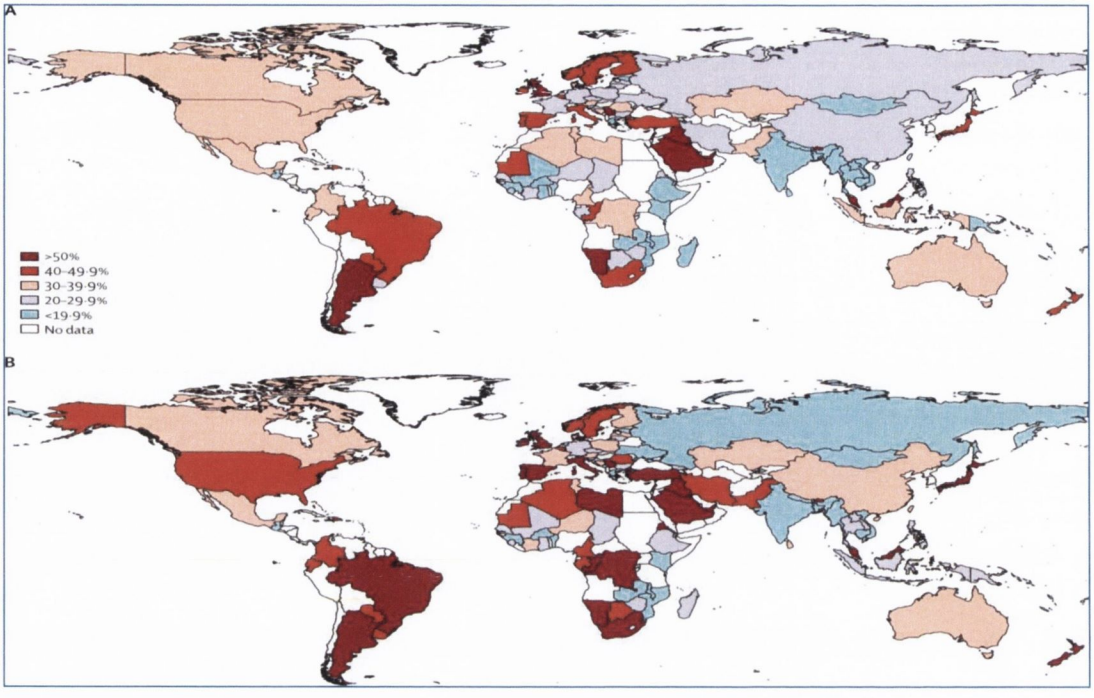

Figure 11 Physical Inactivity in Adults (15 and older) Worldwide in Men (A) and Women (B)

Reproduced from: Global physical activity levels: surveillance progress, pitfalls and prospects (Hallal et al, 2012)

Physical Activity and Age

Hallal et al (2012) found evidence to support a linear relationship between PA and age, with PA levels declining with increasing age in each of the five WHO regions. Bauman et al (2009) found a general decline in PA across all age groups with a difference of at least 10% between those classified as high active in older compared to younger age groups.

Despite this relationship, significant heterogeneity exists. Adults from southeast Asia, aged 60 and older, were much more active than adults of the same age from other regions (Hallal et al., 2012). They were in fact more active than younger adults (aged 15 to 29 years) from the Americas, the eastern Mediterranean, Europe and the western Pacific.

In one study examining the total activity per week using data from the Eurobarometer series, people aged 15 to 24 years had a median of 33.7 MET hours per week PA compared with a 13.95 MET hours per week for people aged 65 and older (Rutten and Abu-Omar, 2004).

Irish adults also demonstrate decreasing amounts of PA as they age, with the percentage of adults classified as high active reducing from 32% in the 18-29 group to 10% in the over 65's (Morgan et al., 2008). Similarly the percentage classified as low active increases as people age, with 44% of all those over 65 classified as inactive.

Prevalence of Sitting

Studies reporting prevalence estimates for sitting are presented in Tables 6, 7 and 8. To date, there has been very little published data on the patterns of sedentary behaviour in different countries. Often, sitting time is reported as a secondary indicator in studies examining PA behaviour (Sjostrom et al., 2006, Rutten et al., 2003).

Overall, the proportion of adults worldwide who sit for four or more hours a day is estimated at 41.5% (Hallal et al., 2012). There is a large variation in the distribution of sitting across WHO regions with the European region reporting the highest estimates at 64.1%. This is almost three times higher than the value for South East Asia.

To date, there have been two large studies providing a detailed descriptive analysis of sitting across multiple countries (Bauman et al., 2011, Bennie et al., 2013). The first compared the sitting behaviour of 20 countries, as part of the International Prevalence study (Bauman et al., 2011). Adults aged 16 to 68 reported sitting for a mean of 346 minutes a day, which equates to between five and six hours per day. There was marked variation between countries with Japan and Saudi Arabia reporting the highest median values at 420 minutes and Portugal the lowest, at 150 minutes a day.

No clear pattern emerged between the sexes. Younger adults (<39) and persons with more than 13 years of education reported higher sitting periods. The authors also reported a linear inverse relationship between decreasing levels of high PA and increasing sitting time (Bauman et al., 2011).

The second study analysed data from the Eurobarometer 64.3 to determine the prevalence and correlates of sitting across 32 European countries (Bennie et al., 2013). Overall the mean weekday sitting time was 309 minutes per day, again with large variations between individual countries. The authors observed a broad geographical pattern, with some of the highest levels of sitting occurring in countries of northern Europe and some of the lowest levels of daily sitting in countries of the south and east. Figure 12 shows the proportion of the European population aged 15 years and older, who sit for more than seven hours a day.

In contrast to findings from the International Prevalence Study, Bennie et al (2013) reported differences between the genders, with males reporting higher sitting times than females. However, in agreement with the International Prevalence Study, they also reported higher sitting times in younger age groups (age 15 to 25) and in those with higher levels of education. The relationship between PA and sitting was also examined as part of Bennie et al's study. People with low and moderate levels of PA were more likely to be in the highest sitting quartile compared with the high active group.

Sitting times for Ireland were reported by Bennie et al (2013) using data from the Eurobarometer 64.3. The mean weekday sitting time for Ireland was reported as 284 minutes using a sample of 894 adults. This equates to between four and five hours sitting a day and is somewhat lower than the European mean of 309 minutes per day.

Data from the most recent Eurobarometer 412 suggests that 30% of Irish adults sit for more than five and half hours per weekday (European Commission, 2014). This is relatively similar to

the findings from the first Special Eurobarometer 58.2 in 2002, in which 33.4% of adults sat for greater than six hours a day (Sjostrom et al., 2006).

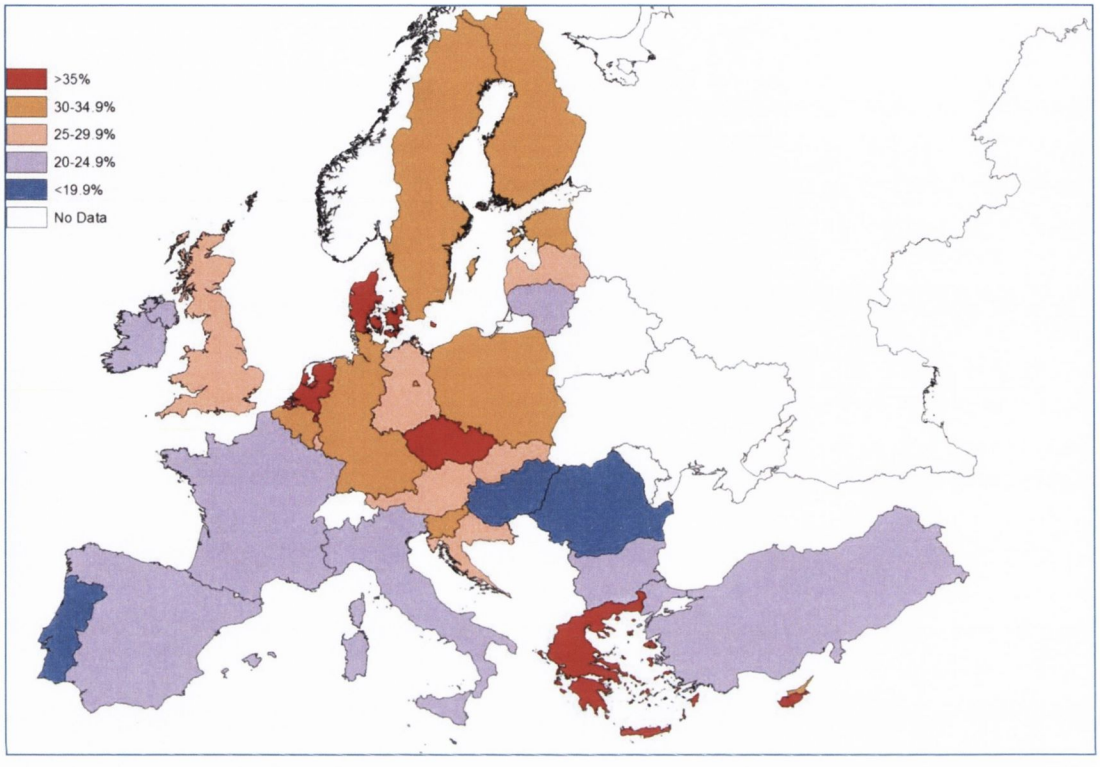

Figure 12 Proportion of People aged 15 years and Older who Sit for Seven or More Hours per Day by Country.

Reproduced from: The prevalence and Correlates of Sitting in European Adults - Comparison of 32 Eurobarometer Participating Countries (Bennie et al, 2013)

Conclusion

The previous section provided an overview of the literature examining the prevalence rates of physical inactivity and sedentary behaviour in the context of global, European and Irish populations. Although not within the scope of this literature review to examine all of the correlates of PA, several patterns have emerged.

There is a clear economic influence on PA, and gender and age also demonstrate relatively consistent associations with activity. Evidence is also now beginning to accumulate regarding the prevalence of sitting throughout the world and we are beginning to gain some insight into its correlates.

Patterns in PA and sitting behaviour have only become apparent with the use of standardised instruments such as the IPAQ, which captures PA across all domains and allows comparison

across and within countries. However, differences in sampling procedures, the use of national and regional populations, the inclusion of participants with different ages, and cultural differences in questionnaire interpretation make true comparisons between countries difficult.

Different cut off points have also been used with the IPAQ, with earlier studies using much higher cut off points to define sufficiently active. Also the criteria used to categorise PA and inactivity vary amongst the different studies with no consistent method of reporting the results. The use of different recall periods – often not stated by authors, different ways of administering the questionnaire; telephone versus face to face, all limit comparability of studies. Other sources of data used various indicators that are not directly comparable with the IPAQ and thus have limited scope for ongoing surveillance where comparisons with international populations are useful.

In general, there is evidence for high levels of inactivity coupled with prolonged periods of sedentary time within both European and Irish populations. There are however, several gaps in the surveillance data regarding the Irish population. The European studies detailed in Table 7, whilst providing useful prevalence estimates for Ireland and allowing for direct comparisons amongst EU member countries, do not provide detailed analysis on the patterns of PA behaviours for individual countries. In addition, the majority of the studies use datasets that are over ten years old and thus may not reflect the most up to date behaviours of populations (Dumith et al., 2011, Sjostrom et al., 2006, Rutten and Abu-Omar, 2004). The SLÁN study provided a more detailed analysis of the PA levels of the Irish population; however its analysis and reporting of the IPAQ data was limited and would benefit from further expansion (Morgan et al., 2008). A more up to date and detailed analysis of Irish PA levels is required.

Estimates for sitting time were not provided as part of the SLÁN survey, and there is almost no descriptive analysis of sitting or sedentary behaviour in the Irish population. In view of the increasing evidence, establishing sedentary behaviour as an independent risk factor for several chronic diseases, this is an area which needs urgent attention (Proper et al., 2011, Thorp et al., 2011).

Section 1.10 outlined the Irish government's primary care strategy and highlighted the increased focus on chronic disease prevention and the protection of health and wellbeing. As increasing investment and staffing are prioritised towards primary care services and in line with the government's performance indicator to increase the number of Irish adults being regularly physically active, there is a real opportunity to integrate PA screening and promotion into a newly configured primary care arena. In order to reach this target it will be necessary to establish precise baseline measures that reliably capture PA levels and that are suitable for ongoing monitoring and evaluation. At present, little is known about whether national level PA data is an accurate reflection of the population that accesses primary care. National level data is representative of the whole population and thus includes people who are fit and healthy and regularly take exercise and play sport. While primary care by its very definition, is available to all of the population, it is likely that a higher proportion of persons with risk factors, chronic diseases and disability access its services, so there is a need develop a dataset that accurately captures PA and sedentary data for this specific population.

The aim of the second study of this research was to describe the prevalence and patterns of PA and sedentary behaviour specifically in a primary care population.

The specific objectives of Study II were;

1. To determine the percentage of patients attending primary care who failed to meet the minimal PA recommendations;

2. To describe the PA patterns of primary care patients according to socio-demographic and cardiovascular variables;

3. To determine whether there was an association between primary care location and PA patterns;

4. To establish the prevalence of daily sitting time amongst primary care patients;

5. To describe the patterns of sitting behaviour amongst primary care patients according to socio-demographic and cardiovascular variables;

6. To establish whether there was an association between daily sitting time and PA.

The third and final study of this research was developed in response to the findings from Studies I and II. Study III, therefore will be introduced and described in full in Chapter 6, once the results from Studies I and II have been presented and discussed.

A schematic summary of the overall aim of this thesis, together with the aims and objectives of each of the three studies is included on page 78.

SUMMARY

Pooled prevalence estimates of worldwide inactivity levels range from 17.7% at best, to 31% at worst. Large variations between countries have been reported. In general, people of South East Asia demonstrated the lowest rates of inactivity and those of the Americas and Eastern Mediterranean demonstrated the highest.

Pooled prevalence estimates of European inactivity levels range from 27% at best, to 35% at worst. It is estimated that total weekly physical activity carried out across European Union member states equates to a median of 24 MET hours per week.

Inactivity prevalence rates for Ireland were estimated as ranging from 29% to 35%. Using data from 2002, Ireland was ranked the 5th most inactive state in the European Union. Irish people carried out a total of 23 median MET hours per week of physical activity.

There is a positive relationship between HDI and physical inactivity, with inactivity increasing as a function of HDI.

There is a difference between the physical activity levels of men and women, with consistent findings that women are less physically active than men. The gender difference is especially marked in younger age groups with younger men more likely to be categorised as high active than younger women. Men are also more likely to participate in vigorous exercise more often than women.

Worldwide prevalence of inactivity for women has been estimated as ranging from 15% at best, to 34% at worst. For men, estimates range from 19% to 28%. In Ireland, 26% of Irish males and 31% of Irish females were classified as inactive.

With some exceptions, there is evidence to suggest that physical activity levels decline with increasing age.

Overall, the proportion of adults worldwide who sit for four or more hours a day is estimated at 41.5%. The European region reports the highest estimates for sitting with 64% of the population sitting for four or more hours a day.

The mean sitting time for adults has been reported as ranging from 309 to 346 minutes per weekday which equates to between five and six hours each day.

30% of Irish adults sit for more than five and a half hours per weekday. The mean weekday sitting time for Ireland was reported as 284 minutes, which is lower than the European average.

There is limited evidence to suggest that males sit for longer periods than females. People of younger age (<25 yrs) report higher sitting times. People with higher levels of education report higher sitting times.

There is some evidence to suggest a relationship between decreasing levels of physical activity and increasing amounts of sitting, although this warrants further investigation.

Thesis Aim

The overall aim of this research was to describe the physical activity profile of the primary care population in Ireland and to investigate how health professionals incorporate physical activity promotion into their clinical practice.

Study I: Promotion of Physical Activity in Primary Care

The aim of this study was to describe the current practice of GPs and PTs in the screening and promotion of PA in primary care.

Study Objectives

- To determine GPs' and PTs' knowledge of the PA guidelines;
- To establish the likelihood of screening and counselling of patients with and without cardiovascular risk factors;
- To describe the PA interventions most frequently used by participants and;
- To identify potential barriers limiting practice.

Study II: The Physical Activity Profile of an Irish Primary Care Population

The aim of this study was to describe the prevalence and patterns of PA and sedentary behaviour specifically in a primary care population.

Study Objectives

- To determine the percentage of patients attending primary care who failed to meet the minimal PA recommendations;
- To describe the PA patterns of primary care patients according to socio-demographic and cardiovascular variables;
- To determine whether there was an association between primary care location and PA patterns;
- To establish the prevalence of daily sitting time amongst primary care patients;
- To describe the patterns of sitting behaviour amongst primary care patients according to socio-demographic and cardiovascular variables and;
- To establish whether there was an association between daily sitting time and PA.

Study III: Feasibility of a Physical Activity Clinical Pathway for Use in Irish Primary Care

The overall aim of this study was to agree, through a Delphi consensus process, a PA pathway suitable for use by physiotherapists in Irish primary care services.

Study objectives

- Agree criteria for recruitment onto the PA pathway;
- Seek consensus for each of the component parts of the PA pathway;
- Determine if there are additional training needs and resources required to support implementation of the PA pathway.

Chapter 2 Methodology: Studies I and II

2.1 Introduction

This chapter will describe the methodology employed in the first two studies of this research. The third and final study utilised the Delphi approach which will be described separately in the following chapter.

The first study of this thesis investigated the PA screening and promotional practices of GPs and PTs working within primary care services in the Republic of Ireland. The aim of the second study was to describe the prevalence and patterns of PA and sedentary behaviour in a primary care population. A schematic summary of the overall aim of this thesis, together with the aims and objectives of each of the studies is included in Chapter 1 page 78.

A cross sectional study design was used for studies I and II and will be described briefly. Details on the sampling procedures used for both studies will be presented individually. The criteria used to design, create and distribute the questionnaire used in Study I will be discussed, with reference to the literature underpinning best practice in this methodology. The International Physical Activity Questionnaire was used as a measure of PA in Study II and details of its reliability, validity and scoring protocol will be presented. Further details on the individual methodological applications will be presented in each of the study chapters. The data analysis procedures for each study will be described in the individual study chapters.

Ethical approval was granted for each of the studies. The Research Ethics Group of the Faculty of Health Sciences, Trinity College Dublin granted ethical approval for Study I and the Research Committee of St James's and Tallaght Hospitals granted ethical approval for Study II (Appendix I).

2.2 Descriptive Design

This research used a non-experimental approach in which the researcher observes and describes phenomena as they occur in their natural setting. This type of study design is distinguished from experimental design as it does not involve any intervention or attempt to control the independent variable. The major purpose of non-experimental research is to describe phenomena, and to explore and explain the association between variables as they occur in their natural setting (Brink et al., 2012). One of the major types of non-experimental design is the descriptive study.

Descriptive studies are typically used to explain current practice, to identify problems with current practice or to make judgements to determine what other professionals are doing in similar situations (Burns and Grove, 2011). Descriptive research can encompass both quantitative and qualitative methods and is concerned with gathering data from a representative sample of the target population primarily through the use of questionnaires, surveys and interviews. Comparative descriptive studies allow for the evaluation of individual

variables, as well as the differences observed between two or more groups. Studies I and II of this research adopted a comparative descriptive design.

2.2.1 Cross Sectional Study Design

A descriptive study approach consisting of a cross sectional design was used in Studies I and II. A cross sectional study measures the prevalence of health outcomes or determinants of health, or both, in a population at a point in time or over a short period. Cross sectional studies allow the researcher to examine the association between the exposure (for example physical inactivity) and the outcome (for example cardiovascular disease), but cannot infer cause and effect.

This type of study provides a "snapshot" of the frequency and characteristics of the outcome of interest, in a given population, at a particular point in time and can be used to assess the prevalence of the characteristic of interest in a population (Riffenburgh, 2012). It is particularly useful in the assessment of burden of disease or to determine the particular health needs of a population and is therefore widely used in public health to help inform the planning and allocation of health resources (Jekel et al., 2007).

Advantages of cross sectional studies are that they are relatively inexpensive and quick to conduct as data is collected on one occasion only (Jekel., 2007). Large amounts of data on multiple variables can be collected making the results more readily applicable. Also, unlike in longitudinal studies there is no loss to follow up. Among the disadvantages is the lack of causal inference; the outcomes of interest are measured at one point of time only, so determining the causality or the direction of associations is not possible (Riffenburgh, 2012). Also, it is not possible to predict if the results would be same if a different time frame was used.

2.2.2 Cross Sectional Surveys

A cross sectional survey is suitable when attempting to reach a large population of interest and to collect data that is both factual and opinion based (Jekel et al., 2007). As the same information is collected from all individuals, surveys should be comparable, if repeated. Cross sectional surveys are conducted in natural settings, therefore, random population sampling is easier to achieve than in experimental surveys (Dillman, 2007). Statistical inferences and generalisations can therefore be made about the larger population of interest, increasing the external validity of the study (Dillman, 2007). There are also benefits in terms of the anonymity of participants.

One of the limitations of cross sectional surveys is that it is not possible to probe participants on a particular topic. The motivation of participants to respond may be an issue and low response rates are often attributable to the lack of personal contact between the researcher and the participants (Dillman, 2007).

There are four major sources of survey error, most of which can be influenced through careful design of the questionnaire and the implementation methods (Dillman, 2007). Sampling error

occurs as a result of trying to survey some, and not all of the units in the survey population. Coverage error occurs when the list from which the sample is drawn, does not include all elements of the population. Poor question wording or construction can result in measurement error; a respondent's answer to the question may be inaccurate, imprecise or cannot be compared in a useful way. Non-response error occurs when a significant number of people do not respond to the survey and have different characteristics from those who reply.

Efforts must be made to reduce all four sources of error. Most important are the latter two (Dillman, 2007), but through careful design of the questionnaire and appropriate implementation methods, much can be done to reduce these sources of error. Details of the steps taken to minimise each of these error types will be outlined in the following sections.

2.3 Sampling Methods

In order to ensure the accuracy of the results, the sampling procedures used in research must be carefully considered to ensure the sample chosen is representative of the population of interest. The term population refers to all members of a defined group and the term sample to a subset of the population. In order to make reliable generalisations about certain characteristics, the sample must be representative of the population in those characteristics. With probability sampling, all elements in the population have some opportunity of being included in the sample, and the mathematical probability that any one of them will be selected can be calculated (Stewart, 2010). With non-probability sampling, in contrast, population elements are selected on the basis of their availability or because of the researcher's personal judgment that they are representative.

A number of different sampling procedures exist, designed to increase the representativeness of the sample dependant on the study design and variables being measured. Simple random sampling is used to describe the approach in which any member of the population is as likely to be drawn as another (Bailey, 1997). This approach may be useful when the population of interest is very small or there are extensive resources available for the study. However when the population of interest is very large, this may be an impractical method. In this case systematic sampling may be used. This relies on arranging the target population according to some ordering scheme and then selecting elements at regular intervals through that ordered list (Stewart, 2010).

Where the population contains a number of distinct categories, the frame can be organised into separate "strata." Each stratum is then sampled as an independent sub-population, out of which individual elements can be randomly selected. This is known as stratified random sampling where every unit within specific strata has an equal chance of being selected (Fox et al., 2007). Cluster sampling involves dividing the population into clusters of homogenous units and selecting a sample from such clusters (Fox et al., 2007). With this method, the sampling units are the groups rather than the individuals and all units from the selected clusters are studied.

Convenience sampling is a type of non-probability sampling which involves the sample being drawn from that part of the population which is readily available and convenient. It is not

possible to scientifically make generalisations about the total population from this sample because it would not be sufficiently representative (Bland, 2000). However, it is a useful method of sampling for pilot testing. Finally, in purposive sampling the researcher chooses the sample based on who they think would be appropriate for the study (Stommel and Wills, 2004). This is used primarily when there are a limited number of people that have expertise in the area being researched.

2.3.1 Study I Sampling

The pilot phase for Study I consisted of a convenience sample of 21 GPs based in three Dublin city postal areas and ten PTs based at a single primary care service in Dublin city. The primary care manager and physiotherapy manager for the relevant areas were contacted to supply a list of eligible participants working in that area. Participants of the pilot study were subsequently excluded from the formal study phase.

For Study I the research participants were recruited from the population of interest which included all GPs registered with the state run General Medical Services (GMS) programme and all primary care PTs employed by the HSE. Consideration was given to conducting a national study but there were concerns that it would be difficult and time prohibitive to accurately identify and recruit such a large target population. This posed a significant threat of introducing sampling error to the research which occurs as a result of trying to survey some, and not all of the units in the survey population. For this reason, the study population was limited to GMS GPs and PTs working in the region of Dublin Mid Leinster. This geographical region is the largest of the four operational areas of the HSE in the Republic of Ireland and was chosen for its good mix of rural and urban locations. Up to date mailing lists were generated by contacting each of the relevant primary care and physiotherapy managers in the region.

Eligible participants were limited to those registered or working with the HSE, as there is no central register of GPs and PTs available in Ireland. However, a report into the structure of general practice in Ireland found that only 4% of their sample were not registered with the GMS Programme (O' Dowd et al., 2006) suggesting that this is a representative sample of all GPs working in this region. There are no similar data available for PTs. The PT sample, therefore, was limited to those working within the primary care services of the HSE to ensure accuracy of mailing lists and thus minimise the risk of coverage and sampling error.

Several different methods of obtaining mailing lists were considered in order to minimise the possibility of coverage error. The Irish Council of General Practitioners (ICGP) was initially contacted to request a list of their members, however, there were concerns regarding the accuracy of their members' database which was in the process of being updated at the time. Also, membership of this professional body is on a voluntary not obligatory basis and often includes members such as occupational health physicians who do not fall within the target population.

The HSE website was also consulted as a means of identifying potential participants but this was found to contain out of date information and incomplete records. Therefore, individual

primary care and physiotherapy managers were contacted in an attempt to obtain the most recent and complete contact lists and to maximise the recruitment of all potential participants.

2.3.2 **Study II Sampling**

Stratified random sampling was used to identify the sample for the main phase of Study II. The population of interest for this study were patients attending Irish primary care services. Since it was not possible to gain access to every patient attending primary care, an accessible target population was identified. The accessible population was limited to patients attending co-located primary care centres in the Dublin Mid Leinster region. Co-location refers to the housing of multiple primary care professionals usually within a purpose designed building and represents the optimal configuration of primary care services (Department of Health, 2012). Within primary care services in Ireland, health professionals are assigned to work in multidisciplinary primary care teams providing healthcare to the local community within specific geographical boundaries. By specifying that primary care services were to be co-located, participants were representative of all patients attending primary care and not limited to patients attending one professional such as the GP.

The primary care manager for Dublin Mid Leinster was contacted and an up to date contact list of all functioning primary care teams in the region was requested. The primary care manager was also asked to identify which of these teams were co-located.

This listing contained details of 139 teams in total, 20 of which were highlighted as being co-located. This listing was further verified by contacting the transformation development officer (TDO) of each of the nine geographical regions within the Dublin Mid Leinster area. Officers were asked to verify that the teams were in fact co-located and to supply a list of the geographical regions covered by each team. This revealed that only 16 of the 20 teams were actually co-located at the time of study.

In this study, the use of random sampling to identify one or two primary care locations would have increased the chance that the distribution of the sample would differ significantly from that of the general population. Two significant factors, namely the geographic location of the primary care centre and the deprivation index of the area were identified as important characteristics that had the potential to influence the outcome of the study. Therefore, stratification using these criterions was used, to increase the representativeness of the sample.

Each of the 16 co-located teams were stratified based on the urban/rural location of the primary care centre in which they worked and the national deprivation index of its local community. The SAHRU (small area health research unit) National Deprivation Index is a score given to each of the electoral districts in Ireland that is calculated through four census based indicators widely thought to represent material disadvantage (Kelly and Teljeur, 2007). The census based indicators are unemployment, social class, type of housing tenure and car ownership. Each electoral district is allocated a score between one and ten, where one represents the least deprived and ten the most deprived. Using this index it was possible to group the primary care centres into the following three classifications; urban deprived locations, urban non deprived locations and rural locations of mixed deprivation.

Computer generated randomisation was used to identify three primary care sites, one of which was an urban non-deprived location, the second of which was an urban deprived location and the third was a rural location with mixed deprivation scores. A flowchart representation of the sampling procedure is presented in Figure 13.

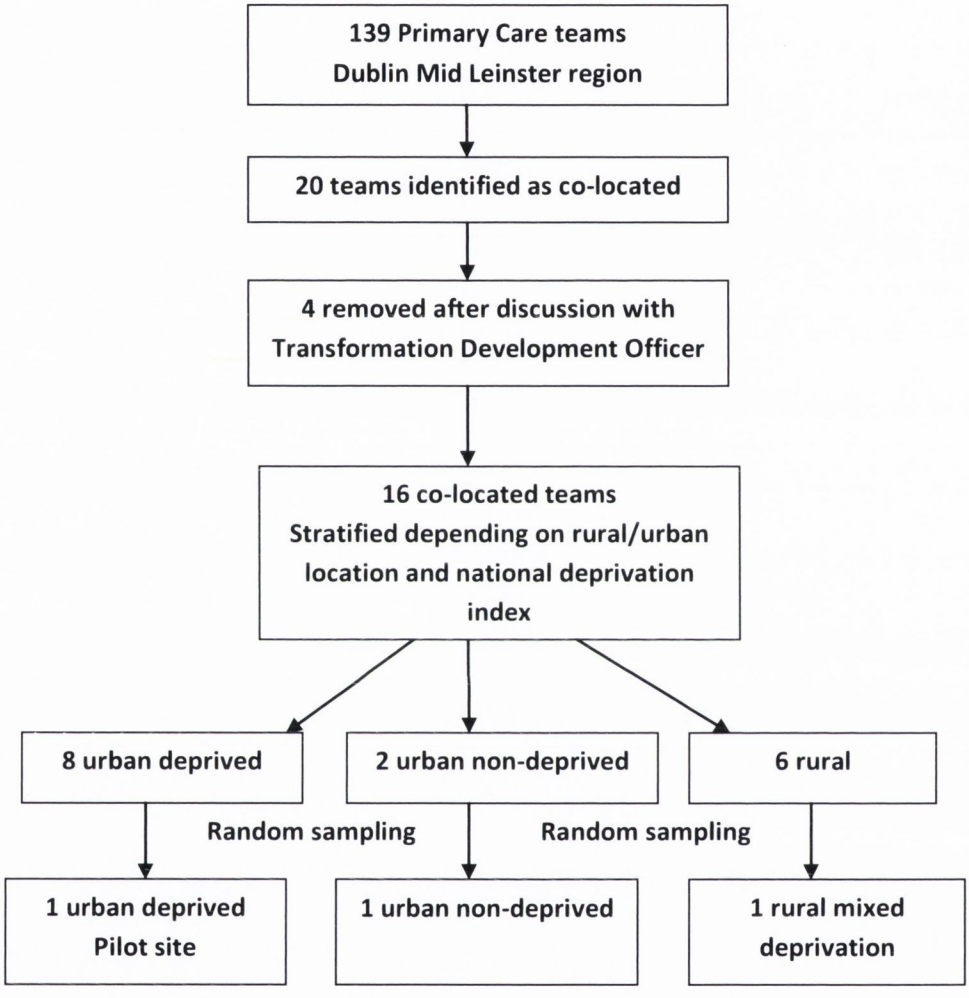

Figure 13 Sampling Procedure Study II

A pilot study to determine the suitability of the study tool was initially carried out in the urban deprived centre as it was geographically closest to the research centre. Patients who met the inclusion and exclusion criteria were consecutively recruited by the researcher as they presented for their appointment. Inclusion criteria included consenting people between the ages of 18 to 69 years, who were able to complete the questionnaire in English. Exclusion criteria included patients who did not fit the age criteria, were unable to complete the questionnaires in English or who were attending a supervised HSE exercise programme (for example cardiac or pulmonary rehabilitation). The data was collected over the course of five consecutive working days at the end of August 2011. This time frame was chosen to ensure

participants were representative of all clients attending primary care clinics which are generally scheduled on a weekly basis. A total of 159 participants were recruited during this time.

As there were no changes to the data collection tool or data collection procedure following the pilot, data from the 159 participants in the pilot study were deemed suitable for inclusion in the main study. The study sample was then drawn equally from each of the three primary care centres.

2.4 Study I Questionnaire Design

Study I used a self-administered questionnaire to collect data on the PA assessment and promotional practices of participants. There is growing evidence in the literature about the most effective ways to maximise response rates from questionnaires from both the general population and from medical practitioners (Scott et al., 2011a, VanGeest et al., 2007). These include incentive based approaches such as the use of money, gifts and prizes and design based approaches such as the length of the survey, its content and follow up procedures. The final consideration influencing response rates is the mode of distributing the survey.

In addition, a Cochrane systematic review conducted in 2009 (Edwards et al., 2009) identified several methods to improve response rates to questionnaires. The authors found the odds of response were substantially higher with pre-notification (1.45; 95% CI 1.29 to 1.63; $P < 0.001$), follow-up contact (1.35; 95% CI 1.18 to 1.55; $P < 0.001$), unconditional incentives (1.61; 1.36 to 1.89; $P < 0.001$), shorter questionnaires (1.64; 95% CI 1.43 to 1.87; $P < 0.001$), providing a second copy of the questionnaire at follow up (1.46; 95% CI 1.13 to 1.90; $P < 0.001$) and university sponsorship (1.32; 95% CI 1.13 to 1.54; $P < 0.001$). Having an interesting questionnaire topic doubled the chance of response (2.00; 95% CI 1.32 to 3.04; $P = 0.06$).

The key factors identified as influencing medical doctors' decision to respond to a survey are the cost of their time, their trust that the survey results will be used appropriately and their perceived relevance of the survey (VanGeest et al., 2007). Whilst financial and ethical considerations deemed the use of incentive approaches unsuitable for this study, all of the known design and distribution principles were adhered to in order to maximise the study response and minimise the risk of measurement error and non-response error. These will be highlighted in the following sections.

2.4.1 Question Construction and Wording

Four main types of question structure were considered when designing the survey; completely open ended, closed ended with scalar categories, closed ended with unordered categories and partially closed ended question with an "other" choice.

Closed questions, which present ordered categories or scalar responses limit the amount of mental effort required by participants and thus may improve response rates. Similarly, questions presenting categories from which participants pick their response are less

burdensome than open ended questions (Dillman, 2007). One of the limitations levelled at surveys primarily based on closed questions however, is that they do not allow the probing of opinions or thoughts around a subject. Offering partially closed ended questions with an "other" choice is a means of capturing additional data that a participant may volunteer, however, it is likely that fewer people will mention other choices if they are not listed (Dillman, 2007). Also, data captured under the "other" category does not lend itself well to the construction of variables for analysis, unless it is frequently occurring.

After consideration of these question choices, the structure of the survey consisted primarily of closed and partially closed questions, together with an "other" category to capture additional opinion where appropriate. The closed and partially closed questions consisted of either, a single tick box design, requiring a single response only, or multiple tick box options where more than one response could be chosen. Additionally, seven of the closed questions were based on scalar responses indicating agreement. When using scalar responses, equal numbers of positive and negative categories were used to avoid the midpoint of categories being interpreted as the neutral point. Also, care was taken to state both sides of an opinion in attitude scale questions, for example; "How likely or unlikely are you to screen PA". Only stating one side of the opinion, for example; "How likely are you" may encourage people to think of the scale ranging from "not at all" to "strongly agree". Substituting agree or disagree conveys to respondents that the scale has a greater range and lets the respondents know that disagreement is an acceptable answer.

The layout and design of the questionnaire may have an important influence on a person's decision whether to complete it or not (Dillman, 2007). It is important that the burden on respondents is minimised whilst still maintaining interest and motivation to complete the process. The questionnaire was divided into four distinct sections to assist with clarity. The ordering of the questions was such that the more interesting questions were positioned at the start of the questionnaire and the more routine questions like demographics were placed at the end. Further detail outlining the content of the questionnaire is provided under Study 1 in Chapter 4 Section 4.2.3.

2.4.2 **Questionnaire Pilot Study**

Once the draft questionnaire was finalised it was distributed to a number of colleagues for comment and also circulated to a number of researchers with previous experience in survey implementation. Following this, the draft questionnaire was formally piloted in April 2010. The purpose of the pilot study was to explore the suitability of the questionnaire in terms of its ability to capture data on the defined topic and to determine its clarity and usability.

Following ethical approval, verbal consent for the pilot study was sought by contacting the transformation development officer of the HSE Dublin Mid Leinster primary care area. Once verbal agreement was granted, the transformation development officer was requested to supply the researcher with a list of eligible persons working in that area. Persons of interest were GPs and PTs employed in a primary care role. A convenience sample of 21 GPs based in

Dublin postal areas 6/8/10 and ten PTs based at a single primary care service in Dublin city were selected by the researcher.

Participants were contacted via post by a PT unconnected with the study and received the following study pack;

1. An introductory letter outlining the study aims and requesting their participation in the pilot study
2. A copy of the questionnaire
3. A stamped addressed envelope in which to return the questionnaire
4. A participant information leaflet outlining the study aims and protocol in greater detail
5. A contact slip requesting the name and contact details of the participant, to be returned, if they were willing to participate in the follow up phase

Participants were asked to return the completed questionnaire within two weeks and to record the amount of time it took to complete the survey. Nine of ten PTs and four of 21 GPs returned the questionnaire within the two week deadline. Non-responders in the GP group were sent a reminder letter, again requesting their participation and including another copy of the questionnaire. A further eight GPs returned completed questionnaires following this second wave. This corresponded to a response rate of 90% for the physiotherapy group and 57% for the GP group.

The survey responses were analysed for problems with wording and comprehension and the questionnaires amended appropriately prior to the follow up discussions. Participants consenting to the follow up phase of the pilot study were subsequently contacted to take part in either a focus group discussion or a telephone interview. GPs who consented to give feedback on the questionnaire were followed up by a phone-call with the researcher. The PTs were followed up by means of a focus group discussion.

2.4.3 Questionnaire Focus Group and Telephone Interviews

The aims of the follow up discussion were to; firstly determine if there was any relevant content omitted from the questionnaire, secondly to receive feedback regarding the outline and clarity of the questionnaire and finally to discuss any particular issues that presented following analysis of questionnaire responses. Telephone interviews were carried out by the researcher with each of the consenting GPs (n=4) and a focus group discussion was arranged with the consenting PTs (n=6). Telephone interviews were chosen with the GP group to facilitate workload schedules and the different geographical locations of workplaces. The PTs were all located at a single workplace location therefore a focus group was a more appropriate means of follow up. The researcher facilitated the focus group discussion which was taped, transcribed and its content verified by an independent moderator. An outline of the focus group format and a schedule of the questions used by the researcher in the follow up sessions are included in Appendix II.

All participants were asked to comment on individual questions and highlight those that were misleading or unclear. Opinion was sought on the length of time taken to complete the questionnaire and whether respondents felt motivated to continue. The content and relevance of the introductory letter and information leaflet were also discussed and participants were asked to comment on the most acceptable mode of survey delivery. Focus group participants were asked to complete the questionnaire again and timed by the researcher to ensure an accurate time estimation.

A summary of the main amendments made to the draft questionnaire following the pilot study are highlighted in Table 9. In general, the layout and content remained unchanged from that described in Section 2.4.2. A number of questions were removed as they were either repetitive or weakly linked to the study aims, thereby improving the length of time it took to complete the questionnaire. The majority of participants indicated a preference for a postal survey mode.

Table 9 Summary of Questionnaire Changes Post Study I Pilot

Summary of main amendments to the questionnaire following pilot study	
Length and content of introductory letter	Length of the participant information letter was decreased PT letter - Emphasised that most research to date has concentrated on professions other than physiotherapy (identified as motivating factor)
General layout and length of questionnaire	Maintain current sections 1 to 4 as clarity generally reported as good Length reported as good by participants – 4 to 5 minutes when timed Use of double sided printing was appropriate – questionnaire looked shorter Use of colour encouraged by participants
Omissions from questionnaire	Nil reported
Clarity of questions	Removed 5 screening questions from section 2 - identified as repetitive with questions in section 3 Removed a further 2 questions from GP questionnaire and 3 questions from PT questionnaire (lack of relevance) Changed answer format from "Yes"/"No" format to "Tick all that apply" in 2 questions One additional question added to section 3 asking participants to highlight most important PA promotional activities
Mode of survey	Majority indicated preference for postal questionnaire

More detailed summaries of the taped proceedings from the focus group, the follow up telephone calls with the GPs and the recommended changes to the questionnaire are included in Appendix III.

Final amendments were then made to the questionnaire in response to the comprehensive feedback from the pilot study. Printing of the final questionnaires was outsourced to a professional company. High gloss was used to ensure a professional appearance together with

the inclusion of the TCD School of Medicine logo. Questionnaires were double sided and printed in three different colours to reflect the different contact waves and allow for easier data management. A final copy of both the GP and PT surveys are included in Appendix IV.

2.5 Participant Introductory and Follow up Letters

The design and wording of the accompanying introductory and follow up letters were also given consideration, in order to maximise the potential response rate. Care was taken to show positive regard for a person's opinion and to indicate that all views were important even if participants felt their knowledge was limited or that PA was not directly related to their role. Follow up letters to non responders were changed slightly in terms of appearance and content. Non responders were informed that many of their peers had already responded and were given some brief information on the preliminary findings with the aim of encouraging motivation and interest. All letters were personally addressed to the individual on formal letterhead stationery and signed by hand by the researcher as personalisation is known to be an important factor for increasing responses (Dillman, 2007).

2.6 Study I Determining the Survey Mode

The mode of distributing a survey can have significant effects on response bias, item non response as well as the overall survey response rates (Scott et al., 2011a). The use of online and web based surveys is growing and is often seen as an attractive option for the researcher as printing and data entry costs are generally lower than other methods (Scott et al., 2011a). These surveys are often distributed by email where they are either embedded in the text of the email or are added as an email attachment. Mixed mode surveys consist of a combination of postal and online surveys. They may use a sequential mixed mode sequence, where an initial postal questionnaire is followed up with an online version or vice versa. In a simultaneous mixed mode, potential participants are mailed a copy of the questionnaire which also contains details of an online version, together with login criteria should they prefer to respond by that mode.

There is some evidence to suggest that email surveys if delivered in the same way as postal surveys i.e. with multiple communications and personalised correspondence can achieve similar response rates whilst being cheaper to administer (Treweek et al., 2012, McPeake et al., 2014). Also, email surveys tend to be returned quicker and item non response tends to be lower (Dillman, 2007). However, the ease of discarding an email questionnaire may encourage people to dispose of it more quickly than postal questionnaires.

Within the medical community email surveys have generally resulted in lower response rates than mailed surveys (Aitken et al., 2008, Dobrow et al., 2008), which some authors hypothesise may be partly due to a lack of trust in the security of transmitting information over the internet (Scott et al., 2011a). Health professionals responding to web based surveys tend to be younger, male and with fewer years experience than those responding to mail surveys (Lusk et al., 2007), leading to a significant risk of response bias. A randomised controlled trial (RCT)

examining the effect of three different modes of survey on response rates amongst a sample of doctors found that a sequential mixed mode produced the best response rates when compared with a simultaneous mode and an online mode (Scott et al., 2011a). The sequential mode used in the trial consisted of a mail invitation letter containing details of an online survey, followed by a postal copy of the questionnaire which was included with a reminder letter three weeks later. However, response rates in general were very poor ranging from 20.7% at best to 12.95% for the online mode.

A number of different distribution modes were explored in order to determine the best method of conducting this research. The first survey mode considered was to contact all potential participants via postal questionnaire. It was likely that this mode would minimise the risk of coverage error, as up to date mailing lists could be secured from the physiotherapy and primary care managers. The body of research outlining the principles of design and implementation to improve motivation and response rates from postal surveys is well established and at a more advanced level than that governing web based surveys (Dillman, 2007). Concerns associated with the postal method were the high costs of printing and postage and the possibility of losing a certain proportion of younger participants who may be more likely to respond to an email survey.

The second option was to conduct a survey entirely by email. Full email details were available for the physiotherapy sample via the physiotherapy managers. However, the contact list of GPs available from the primary care manager was incomplete; email addresses were available for approximately 50% of its listing. The remaining GPs either, did not have an email address recorded, did not use email routinely or chose not to disclose their addresses. The editor of the Irish Medical Directory was contacted to determine whether email addresses are generally listed in this publication. He indicated that the majority of GPs do not wish their email details listed; on occasion a practice email is listed. The most common route to secure email details for GPs was through the ICGP. Concerns about sampling and coverage error associated with this option have already been highlighted in Section 2.3.1.

Another possibility was to use a mixed modal survey and contact participants whose email details were available electronically and the remainder by post. However, as outlined, mixed modal surveys may result in bias, dependant on the survey mode and there is also concern when comparing the data received from two different survey modes, as to date very little research has been done comparing the differences (if any) to questionnaires delivered via post and email (Dillman, 2007).

The final option to consider was that of a simultaneous mixed mode where all participants are initially contacted by post with the choice to complete the survey online. As this would require participants to actively type in a URL address, it was seen as an additional step that could negatively influence their decision to respond. There are also strict privacy regulations that govern the use of electronic survey tools such as survey monkey that prohibit the sending of unsolicited emails. As it was not possible to ensure that all were willing to receive email communications from the researcher, there may have been a problem receiving ethical approval for an email survey.

In determining the most suitable survey mode, expert opinions were also sought from researchers who had previously surveyed both PTs and GPs in Ireland to benefit from their experience. All of the factors discussed, together with the sampling considerations outlined previously and the feedback received from participants in the pilot phase, resulted in the decision to conduct this study entirely by means of a postal questionnaire.

2.7 Study I Survey Implementation

The data collection phase for the Study I took place between the months of June to August 2010. The survey implementation process consisted of the tailored design method described by Dillman (2007). This method involves multiple contacts and follow up correspondence with non-responders as a means to maximise survey response rates.

For the purpose of this research a survey implementation process consisting of four phased contacts was chosen:

Contact 1

A personalised pre notice letter was sent to all potential participants by the researcher briefly informing them of the study and requesting their participation (Appendix VII).

Contact 2

A study pack was sent to all eligible participants three working days later.

This included;

1. A personalised letter of introduction outlining the study aims and method, sent on behalf of the researcher by an independent PT acting as gatekeeper to the study (Appendix VII)

2. A copy of the questionnaire (Appendix IV)

3. A stamped addressed envelope in which to return the questionnaire

4. A participant information leaflet outlining the study aims and protocol in greater detail (Appendix VIII)

Participants were requested to return the completed questionnaires within two weeks. All correspondence and questionnaires contained email and telephone contact details for the researcher in case of any queries. Participants' identities were protected by means of coded questionnaires, used for return purposes only. Completion of the questionnaire was voluntary and implied consent. All questionnaires included an opt-out option which allowed participants to indicate their decision to withdraw from the study. These participants received no further communication from the researcher.

Contact 3

After the two week time frame had elapsed, non-respondents were sent a reminder letter (Appendix VII) from the researcher and another copy of the questionnaire in the post. The

colour of the questionnaire was changed to indicate that it was a second wave questionnaire. Participants were requested to return the completed questionnaires within three weeks.

Contact 4

A final reminder letter (Appendix VII) and questionnaire was sent by the researcher to the remaining non- respondents once the three week time frame had elapsed. The letter highlighted that it was the final call for participation and that there would be no further correspondence on the study.

2.8 Study II Subjective Measurement of Physical Activity

Study II was a cross sectional study utilising the International Physical Activity Questionnaire (IPAQ) to describe PA levels in a primary care population. The measurement of population levels of PA is an important indicator of public health and is necessary to guide health promotion initiatives as well as inform policy in this area. The most frequently used methods of measuring PA subjectively in adults involve questionnaires, interviews or activity diaries. Many questionnaires have been developed to measure PA and instruments vary with regard to the questions asked, the domains in which activity is measured, target population, recall periods, as well as in their format and ease of use. In addition to this, it is important to evaluate the methodological quality of studies on the measurement properties of such instruments such as their validity, reliability and responsiveness. All of this adds to the complexity of choosing the correct measure for a specific purpose.

2.8.1 Advantages and Disadvantages of Self Reported Physical Activity Measures

The relative benefits of questionnaires are their ability to collect data from a large number of people at low cost. They are generally thought to be practical, acceptable and have a low participant burden (Dishman et al., 2001). Recall questionnaires do not alter the behaviour under study, and it is possible to assess all dimensions of PA, so patterns of behaviour can be examined (Sallis and Saelens, 2000). Self reported measures can be used to assess PA in a variety of ages and changes can be made to fit the cultural, social and economical patterns of the targeted population. It is important however, to ensure that the validity and reliability of the tool has been proven in the particular target population.

There are a number of known limitations of self reported questionnaires, including their ability to both over or under estimate true PA energy expenditure and PA rates (Prince et al., 2008). Social desirability bias can lead to over-reporting of PA (Adams et al., 2005). Self report methods are often limited by issues of recall and response and the inability to capture the absolute level of PA (Prince et al., 2008). Recalling PA is a highly complex task and instruments vary in their cognitive demand, there may be additional recall problems with children or older populations (Sallis and Saelens, 2000). The recall period for PA questionnaires differ, with most referring to PA performed in the past day, past seven days or a typical seven day period. Some refer to longer timeframes such as a month, year or a lifetime but evidence exists that recall

error increases with the duration of recall time (Ainsworth et al., 2012). Reasonable correlation coefficients have been reported for both of the seven day reference periods (Craig et al., 2003). Van Poppel et al (2010) in their systematic review of the measurement properties of PA questionnaires reported higher correlations for those asking about the past week (r=0.41) instead of a usual week/usual PA/current PA (r=0.26)or about the last year (r= 0.30).

Another source of error is the ambiguity surrounding terms describing the intensity of activity such as vigorous or moderate and also in the classification of what constitutes as PA. Self report questionnaires are generally reasonably accurate capturing vigorous intensity exercise which is usually a structured form of planned or premeditated exercise such as an exercise class or run (Craig et al., 2003, van Poppel et al., 2010). However, habitual or non-planned lower intensity exercise such as household activities or walking throughout the day, may be more difficult to recall, yet can make a substantial difference to the total daily energy expenditure (Donahoo et al., 2004). It is important to note that the types of activities performed may also be influenced by factors such as the time of day, month or season during the year (Eason et al., 2002). This would be a factor with most questionnaires assessing PA over the short term.

Despite these noted limitations, PA questionnaires still represent the most feasible approach for conducting population-level surveillance (van der Ploeg et al., 2010), where the aim is to identify what proportion of a population is meeting a set of parameters such as PA recommendations. The IPAQ was created and evaluated as a standardised instrument for this purpose and was the measure chosen to capture the PA data of participants in Study II (Craig et al., 2003). The following section will provide a detailed description of the IPAQ and specific details of its measurement properties will be addressed in Section 2.8.3.

2.8.2 International Physical Activity Questionnaire

The IPAQ was developed in 1998 to facilitate population surveillance of PA based on a global standard (Craig et al., 2003). It has since become the most widely used PA questionnaire with two versions in use, the long form (IPAQ-LF) with a total of 36 items, or the nine item short form (IPAQ-SF). The original authors recommend the IPAQ-SF based on a recall period of the last seven days for PA surveillance studies, partly due to the reduced time burden required of participants.

The IPAQ-SF calculates the total PA behaviour in a week and includes measures of frequency, intensity and duration of PA, in all of the different activity domains (Appendix V). As a goal of this research was to establish the overall PA levels of adult patients attending primary care services, as well as to determine the percentage meeting the minimal PA guidelines it was important that the chosen measure was capable of fulfilling both these criteria.

The self administered version of the IPAQ-SF was used to collect data on the level of activity undertaken in the previous seven days. This questionnaire was used to collate information on vigorous and moderate intensity exercise, as well as walking across the four domains of leisure, work, transport and domestic/gardening related PA. In addition, the IPAQ-SF

(hereafter referred to as the IPAQ) contains one item asking participants to recall how much time they spent sitting on a weekday.

The IPAQ asks respondents to report the frequency and duration of each activity at each of the different intensities, performed for at least ten minutes continuously during one session. Both of these criterions are important components of the PA guidelines. Whilst the short form cannot distinguish between activities in different settings, this was not a requirement of the study.

Using a standardised scoring protocol (The IPAQ Group, 2006) it is possible to calculate both a categorical PA score classifying populations into low, moderate and high levels of PA, as well as a continuous PA score. Weekly minutes of walking, moderate and vigorous intensity activities are calculated separately by multiplying the number of days per week by the duration of activity on an average day. The number of weekly minutes in each category are then weighted by a metabolic equivalent (MET; multiples of resting energy expenditure) resulting in a weekly total PA estimate expressed in MET minutes per week and computed by multiplying METs by minutes per week (Craig et al., 2003). A full description of METs is given in Chapter 1, Section 1.2.1.

Using the scoring schedule it is possible to categorise a population into the three levels of PA;

- *Low*: meets neither "moderate" nor "high" criteria

- *Moderate*: Meets any of the following three criteria:
  (a) 3 days of vigorous activity of at least 20 minutes/day;
  (b) 5 days of moderate intensity activity or walking of > 30 minutes/day for >10 minutes at a time; or
  (c) 5 days of any combination of walking, moderate intensity or vigorous intensity activities achieving at least 600 MET-minutes per week

- *High*: Meets either of two criteria:
  (a) vigorous intensity activity on > 3 days/week and accumulating at least 1500 MET minutes/week; or
  (b) > 5 days of any combination of walking, moderate intensity, or vigorous intensity activities achieving at least 3000 MET minutes /week

The moderate category nominally indicates meeting the PA guidelines of 30 minutes moderate intensity exercise on five days a week or 20 minutes of vigorous activity three days a week or a combination (Haskell et al., 2007).Those with a low PA classification would fail to meet the public health guidelines.

2.8.3 Measurement Properties of the IPAQ Short Form

The validity of an instrument refers to the degree to which it measures the construct(s) it purports to measure and contains three measurement properties: content validity, construct validity and criterion validity.

Content validity refers to the extent to which the concepts of interest are comprehensively represented by the items in the questionnaire (Terwee et al 2007) or is the degree to which the content of an instrument is an adequate reflection of the construct to be measured. Van Poppell (2010) suggests that the content of a questionnaire measuring PA should include a measure of duration, frequency, and, if the intention is to measure total PA, then the questionnaire should cover activities in all domains (i.e. work, home, transport, recreation and sport). After defining the purpose of the study in terms of PA measurement, the content validity of the IPAQ-SF was deemed to be appropriate to the study aims.

Construct validity refers to the extent to which scores on a particular instrument relate to other measures, in a manner that is consistent with theoretically derived hypotheses concerning the concepts that are being measured (Streiner and Norman, 2008). Criterion validity refers to the extent to which scores on a particular instrument relate to a gold standard and would include comparison with objective measures of PA such as an accelerometer, pedometer or doubly labelled water (van Poppel et al., 2010). Accelerometers are small devices which measure the amount of acceleration in the trunk and limbs generating a measure of free living PA. They can objectively capture body movement and provide information on the total amount, intensity, duration and frequency of physical activities performed (Plasqui et al., 2013). Pedometers provide a daily total of steps taken, and sometimes a calculated distance and energy-expenditure value (Tudor-Locke et al., 2011). Doubly labelled water measures the energy expended or metabolic rate as a result of PA (Schoeller and Van Santen, 1982). This method is performed by the administration of doubly labelled water, followed by the measurement of the elimination rates of deuterium and oxygen or deuterium oxide-18 over time, through sampling of body concentrations (saliva, urine or blood).

Validity studies generally use Spearman p to examine the relationship between the scale and the objective measure. To determine the effect size, guidelines generally recommend that p values of 0.2, 0.5 and 0.8 are described as small, moderate and large respectively (Ferguson, 2009). Terwee and colleagues (2007) guidelines suggest that effect sizes above 0.5 are considered acceptable for correlations against objectively measured PA.

The first comprehensive validation of the IPAQ was conducted on a diverse sample of adults aged 18 to 65 across 12 countries and assessed total reported PA against the uniaxial CSA model – 7164 accelerometer based on Spearman's correlation coefficients (Craig et al., 2003). Overall, fair to moderate agreement between the two methods (n=781, pooled p=0.30, 95% CI 0.23 -0.36) were reported however the range of Spearman correlations were wide, ranging from p=0.02 (Sweden) to 0 .47 (Finland).

There was however much higher associations between the data produced by categorical estimates of sufficient PA (i.e. meeting the recommended PA guidelines) with about 80% of the estimates showing agreement coefficients of at least 70% and around four fifths of all individuals being similarly classified by both the IPAQ and accelerometer data. Moderate correlations were also reported by the authors between the IPAQ sitting data and the objective measure of sedentary behaviour provided by the accelerometer (Craig et al., 2003).

A recent systematic review which included 16 validation studies of the IPAQ-SF (Lee et al., 2011) reported median correlations of 0.28 (range of p=0.09 to 0.39) for the total PA score of the IPAQ against accelerometer data. Similar correlations were reported against pedometer data (range of p=0.25 to 0.33, median 0.28) and actometer data (p=0.33). More positive results were reported comparing the different intensities of exercise of the IPAQ with accelerometer or pedometer data with moderate to large correlations reported in several studies for walking and moderate intensity exercise (Deng et al., 2008, Kolbe-Alexander et al., 2006, De Cocker et al., 2009). Moderately positive correlations have also been reported for vigorous intensity exercise when compared against fitness measures (VO2 max and maximum treadmill time) and accelerometer data (Lee et al., 2011).

Only one study has used doubly labelled water as the criterion measure (Ishikawa-Takata et al., 2007) and investigated the validity of the IPAQ by categorising participants into insufficiently active, sufficiently active and highly active based on their IPAQ scores. The authors concluded that the highly active participants could be correctly identified and distinguished from inactive participants, but other discrimination was poor,with the PA levels in the two lower categories not demonstrating significant differences.

The majority of the validation studies on the IPAQ have been carried out using general population samples however a small number have focused on specific clinical populations. This is an important consideration as many people with chronic diseases may be limited in their ability to perform higher intensity exercise which in turn may affect the measurement properties of the IPAQ. The studies examining validity in clinical populations have reported correlation coefficients ranging from fair (0.33 chronic fatigue syndrome, 0.37 schizophrenia, 0.38 fibromyalgia) to moderate (0.5 obesity) to high (0.76 HIV) (Scheeres et al., 2009, Faulkner et al., 2006, Ramirez-Marrero et al., 2008, Tehard et al., 2005, Kaleth et al., 2010).

Reliability refers to the degree to which the measure is free from measurement error and is the extent to which the scores for participants, who have not changed, are the same for repeated measurement under several conditions (Riffenburgh, 2012). The time interval between the test and retest must be short enough to ensure that participants have not changed their PA levels but long enough to prevent recall. Reliability is often poorly assessed in PA questionnaires with large time intervals between test and retest and inadequate statistical analysis. Most studies calculate Pearson's or Spearman correlation coefficients as this was the accepted method of statistical analysis in the past. However, more recently there is a consensus that calculating intraclass correlation coefficients (ICCs) or Kappa's is the preferred method of testing reliability (van Poppel et al., 2010).

The reliability of the IPAQ is generally widely accepted with test-retest reliability Spearman correlations clustered around 0.8 (Craig et al., 2003). The IPAQ was one of only five questionnaires to score strongly with level one evidence to support its reliability in a recent systematic review of PA questionnaires (van Poppel et al., 2010). Studies have been consistent in their findings, with scores ranging from 0.66 to 0.88 (Craig et al., 2003, Deng et al., 2008, Dinger et al., 2006). The reliability of the IPAQ in studies using clinical populations are also acceptable ranging from 0.54 (HIV) to 0.68 (schizophrenia). The IPAQ sitting question also

scored well on test-retest repeatability (Spearman rho >0.7) in a study using national samples of four countries (Rosenberg et al., 2008).

Overall the measurement properties of the IPAQ are at least as good as those of other established self report PA measures. A review examining the reliability and criterion validity of seven commonly used PA questionnaires reported reliability correlations ranging from 0.34 with a median of about 0.8 and criterion validity correlations ranging from 0.14 to 0.53 with a median of about 0.3 (Sallis and Saelens, 2000). This compares with typical IPAQ correlations of about 0.8 for reliability and 0.3 for validity (Craig et al., 2003).

The final measurement property one should consider when choosing a PA questionnaire is its responsiveness which reflects its ability to measure change over time. This is not a recommended use of the IPAQ (Craig et al., 2003) and was not a requirement of this research which was concerned with population surveillance rather than evaluation of an intervention.

There are many factors that can influence the variability seen in the reported studies of the IPAQ's validity. These include the different objective measures used for validation, the units of measure used in the analysis (for example energy expenditure, MET score, PA mins/wk) and the different interpretations and use of the IPAQ data.

Whilst the limitations of the IPAQ are acknowledged it is still a recommended and widely used method of assessing PA in larger groups. It remains the most widely used tool in surveillance studies and in national health surveys allowing comparability across countries and different populations (Guthold et al., 2008, Bauman et al., 2009).

Chapter 3 Methodology Study III

3.1 Introduction

This chapter will describe the methodology employed in the final study of this research.

The overall aim of Study III was to agree, through a Delphi consensus process, a PA pathway suitable for use by PTs in Irish primary care services. A schematic summary of the overall aim of this thesis, together with the aims and objectives of each of the studies is included in Chapter 1 page 78.

The following chapter will present the Delphi approach and aspects of this methodology, together with its advantages and disadvantages will be discussed in detail. This approach was chosen as the aim of the final study was to develop consensus on a PA pathway suitable for use in Irish primary care services. A copy of the pathway is included in Appendix X. The sampling procedures used for the final study will also be discussed.

Ethical approval for study III was granted by The Research Ethics Group of the Faculty of Health Sciences, Trinity College Dublin (Appendix I).

3.2 Delphi Methodology

The Delphi methodology is a widely accepted method of pooling data from respondents in their domain of expertise allowing through multiple contacts a consensus to be reached (Powell, 2003). It was originally created in the 1950s by the US Research and Development Corporation's (RAND) programme of research to investigate the likely impact of nuclear war. Since then it has seen increasing application in areas such as programme planning, needs assessment, policy determination and resource utilisation (Hsu and Sandford, 2007).

In a Delphi study, participants are asked to indicate their agreement with a series of questionnaires which are distributed over a number of rounds. In each round, participants respond to the questionnaire and return it to the researcher who then collates and edits the next questionnaire based on collective feedback from the group. This is then returned to participants allowing them to reconsider their initial judgements, based on the feedback received from all participants. Participants provide further comment and alterations as necessary and the process is repeated until consensus is reached. As such, it is a technique that is useful for situations where individual judgements must be gathered and collated, in order to address a lack of agreement or an incomplete body of knowledge (Powell, 2003).

Important considerations of the Delphi technique, are its ability to provide anonymity to participants, a controlled feedback process and the suitability of a number of statistical analysis techniques to interpret the data (Hsu and Sandford, 2007). It has important advantages over other methods of pooling data where dominant or influential individuals and group pressure may unduly influence people to conform (Jairath and Weinstein, 1994). The ability of the Delphi to motivate and involve panel members means that they can be actively

involved in the development or refinement of an instrument leading to perceptions of ownership and the acceptance of findings (McKenna, 1994).

The Delphi is gaining increasing use within medical research (Lodewijckx et al., 2013, Stinson et al., 2012, Green et al., 1999) and many different forms are now in existence including the "modified Delphi"(McKenna, 1994) and the "policy Delphi" (Crisp et al., 1997). Some authors have expressed concern over this flexibility of approach and propose that the lack of strict guidelines on its application may lead to questions concerning the methodological vigour of the technique (Green et al., 1999).

In order to maintain the integrity of the approach there are a number of key aspects to the Delphi process, each of which must be addressed and adhered to. The methodological approach adopted in this study will be outlined in the following sections with reference to the following key stages of the Delphi: question and statement generation, reduction and categorisation of data, iteration, selection and sampling of the expert panel and analysis.

3.2.1 Question and Statement Generation

The generation of questions is an important part of the Delphi, particularly in the first round of the process. Often, round one consists of unstructured open ended questions where the opinions of participants are sought. The data is then analysed using a qualitative framework, themes are identified and used to formulate statements for the second round questionnaire.

A disadvantage of this process is the extremely large volumes of data that can be generated from this open ended approach, especially if the researcher adopts an inclusive approach and does not collapse categories during analysis (Hasson et al., 2000). This can create second round questionnaires that are extremely long, limiting participation and response rates.

Some researchers have revised this open ended approach and use round one to provide participants with pre-existing information for ranking or response (Keeney et al., 2001, Lodewijckx et al., 2013, Marques et al., 2011). As quoted by Hsu et al (2007), *'It should be noted that it is both an acceptable and a common modification of the Delphi process format to use a structured questionnaire in round one that is based upon an extensive review of the literature'* (p.2). It must however be recognised that this approach could limit the possible outcome and possibly bias results. As this research was concerned with establishing consensus on a pre-existing pathway (Appendix X) which has been developed in line with the best available evidence (Department of Health UK, 2010), a semi structured approach was chosen for round one.

Conducting a Delphi study is acknowledged as a time consuming process (Hsu and Sandford, 2007), particularly when it is necessary to complete the analysis, as well as create and distribute the follow up questionnaires within a short timeframe, in this case two weeks. The process is highly dependent on participants providing timely responses, so ensuring that the project is appropriately planned and managed is one of the most challenging aspects. The semi structured approach chosen for round one helped facilitate the efficiency of this process and minimised the response burden on respondents.

Round one therefore, consisted of a mixture of closed statements, with which participants indicated their agreement or disagreement on a seven point Likert scale, as well as open ended questions designed to capture additional opinion. Careful consideration was given to the generation of statements, so as not to bias or limit the participant to this view and open ended questions ensured that participants were given the opportunity to comment on statements that may not have matched their own views.

Round one also collected information on the demographic profile of participants. Specific questions asking participants to identify resources and training requirements to support delivery of the programme were also included. This active involvement of persons in the identification of their own development needs is crucial for the success of any development programme (McKenna, 1994). The round one questionnaire is included in Appendix VI.

3.2.2 Reduction and Categorisation of Data

Rounds two and three took the form of structured questionnaires incorporating feedback from the preceding round. After round one, participants received a second round questionnaire showing the overall anonymised rankings of the group complete with feedback, together with a copy of their initial responses. Statements which received consensus in the preceding round were removed from subsequent rounds. Consensus was based on agreement from 70 to 75% of participants. The specific criteria used to establish consensus are discussed fully in Section 3.2.5. Statements not achieving consensus were included again, along with graphical representation of the distribution of responses from the group (See Appendix VI for second and third round questionnaires). Participants were asked to reconsider their responses following collective opinion and the revised statements from round one. Open ended questions from round one were thematically analysed, collapsed into categories and included as new statements for agreement/disagreement in rounds two and three. This process was repeated between rounds two and three.

3.2.3 Iteration

Another important consideration of the Delphi is the number of iterations that are required to reach consensus. The literature traditionally reported the original Delphi as having four rounds (Young, 1978); however, more recently this has been shortened to three or even two rounds (Green et al., 1999). Three iterations is often reported as being sufficient to reach consensus (Custer et al., 1999) as it becomes increasingly difficult to maintain a high response rate within a Delphi that has many rounds (Keeney et al., 2001). Poor response rates are often a characterisation of the final round of a Delphi, however face to face interviews or contact with the researcher may increase response rates (McKenna, 1994). At the study outset it was estimated that three rounds of the questionnaire would be required to establish consensus.

3.2.4 **Selection and Sampling of the Expert Panel**

The formation of the group of experts is one of the critical components of the Delphi process as the expert status of participants together with the make-up of the group may impact on the validity of the results (Keeney et al., 2001). Goodman (1987) states that if the panellists participating in the study can be shown to be representative of the group or area of knowledge under study then content validity can be assumed. The Delphi method, therefore, does not use random sampling but uses non probability sampling techniques, namely purposive or criterion sampling. Participants are selected for a purpose; to apply their knowledge to a certain problem on the basis of criteria (Hasson et al., 2000). The process involves the selection of "experts", defined as a group of "informed individuals" (McKenna, 1994) or "specialists" in their field (Goodman, 1987). PTs study PA as a core area of their undergraduate education; they also regularly prescribe PA as a key component of their professional role and would therefore be considered specialists in this field (Dean, 2009).

Study III used a purposive sampling approach which is based on the presumption that the researcher has information about the skills and knowledge of the population being studied and can therefore selectively target participants. In purposive sampling the sample units are deliberately chosen to represent specific characteristics suspected to be relevant to the research question (Stommel and Wills, 2004).

When considering the composition of the expert group for this study, nominations from a number of different professional groups within the physiotherapy profession were sought to ensure adequate representation and to allow for diversity of opinion. Initially the researcher identified key characteristics suspected to be relevant to the research question. These were identified as the geographical area of work (urban/rural), professional grade, client group treated and the different financial structures between private and public heath provision.

It is important that both the heterogeneity and the size of the sample is adequate to ensure the entire spectrum of opinion is determined (Delbecq et al., 1975). Heterogeneity and sample size depend upon the purpose of the project, the selected design and the time frame for data collection of each phase (Keeney et al., 2001). A heterogeneous sample will produce a higher proportion of good quality, highly acceptable opinions than homogenous groups (Delbecq et al., 1975) and thus experts should be drawn from varied backgrounds to ensure a wide base of knowledge. Delbecq and colleagues (1975) state that three groups of people are well qualified to be participants in a Delphi study; the top management decision makers who will utilise the study outcomes; the professional staff members; and the respondents to the Delphi questionnaire whose judgements are being sought.

The composition of the group was therefore set to include representation from the following professional groups;

- Physiotherapists working in an urban primary care location
- Physiotherapists working in a rural primary care location
- Physiotherapists working in private practice
- Physiotherapy managers
- Clinical Specialist Physiotherapists

All PTs were required to be at least of a senior grade which was defined as having a minimum of three years post qualification work experience. Including PTs employed by both the HSE and private practice allows results to be generalised to the whole population of primary care based PTs.

The optimal number of participants in a Delphi study is not established in the literature. There is a lack of agreement around the expert sample size and no criteria against which a sample size choice could be judged (Akins et al., 2005). Delbecq (1975) suggests that ten to fifteen participants could be sufficient if the background of participants is homogenous but when various reference groups are being used, the numbers may need to be higher. If the sample size is too small participants may not be considered as having provided a representative pooling of judgements regarding the subject (Hsu and Sandford, 2007). Sample sizes must not however be so large so as to prohibit the data reduction and categorisation process within the allotted timeframe. Sample sizes for the Delphi have tended to be between 15 to 20 participants but generally remain under 50 (Witkin, 1995). Hasson argued that in order to maintain the rigor of the Delphi technique, a response rate of 70% must be maintained (Hasson et al., 2000).

As there is no central register of PTs in Ireland sample size was determined following personal communication with the Irish Society of Chartered Physiotherapists, the national professional body representing physiotherapy in Ireland. National membership of the society is estimated to be about 2470 members of whom 1291 are located in its Eastern branch. Of the eastern branch members, approximately 500 are employed either as primary care clinicians within the HSE or private practice.

As there are no strict criteria against which sample size could be calculated, a decision was taken, based on the heterogeneity of the group and allowing for attrition, to set the sample size at 40. This was thought to be a large enough sample to ensure representation from each of the professional groups and ensure diversity of the sample, whilst not being so large as to prohibit timely analysis between rounds. A response rate of at least 70% was predicted, based on the 89% response rate achieved from PTs in Study I. Allowing for attrition this ensured a final sample size of at least 28.

The researcher identified a number of physiotherapy departments within the Dublin mid Leinster area that fitted the inclusion criteria. At least one of each of these departments were located in an urban, a rural and mixed urban/rural location and one department was a private practice. The different professional grades of seniors, managers and clinical specialists were recruited from within these departments and thus were representative of the normal staffing ratios (i.e. large numbers of senior staff with smaller representation from managers and clinical specialists). Whilst every effort was made to ensure a representative and well informed group, it must be acknowledged that choosing individuals who have knowledge on a subject does not necessarily mean that they are experts. Therefore the claim that the Delphi represents "expert" valid opinions must not be overstated as it is difficult to scientifically validate (Keeney et al., 2001, McKenna, 1994). It is plausible that people who are more interested in the topic under investigation are more likely to engage with the process, biasing

the impartiality of participants; however this bias may be levelled at most studies involving opinion.

3.2.5 **Analysis**

Data analysis within the Delphi can be both quantitative and qualitative. Mean, median and mode are used to measure central tendency and levels of dispersion using the standard deviation and interquartile ranges (IQR) are used to present information on collective judgements of respondents (Hasson et al., 2000). Generally the use of median and mode are favoured especially the use of the median when based on Likert scales (Hsu and Sandford, 2007).

Content analysis techniques are used for qualitative data generated in round one, where the data is analysed for similarity, generating major themes or pooling of similar items together. The process of categorisation of first round responses needs important consideration. The literature suggests that a disadvantage of the Delphi is that it encourages researcher bias, as judgements are made about the equivalence/non-equivalence of responses and which high-consensus statements can be omitted from intermediate rounds (Green et al., 1999). In order to ensure fair representation of the data, the process of generating themes and groupings in round one was carried with the assistance of a second researcher; a member of the TCD physiotherapy teaching and research staff with experience in qualitative analysis. After initially examining the data both researchers firstly discussed and agreed on a number of themes based on participants responses. Following this, each researcher examined the data independently and labelled each response with an appropriate theme(s). To determine consistency among raters, interrater reliability analysis using the Kappa statistic was performed. The Kappa statistic for each open ended question ranged from 0.891 ($p < 0.001$) to 0.966 ($p<0.001$) indicating the highest level of agreement (Peat, 2001).

As far as possible, all of the items generated by round one were included as listings in round two. The wording was kept as similar as possible to the original with only minor editing imposed for clarity.

Appling quantitative measures such as pre defined level of agreement is another method of attempting to reduce researcher bias; this needs to be done in a principled way that minimises distorting panellist's views (Hasson et al., 2000). There is however, little finality in the research with regards to this. Often, consensus is defined or achieved if a certain percentage of votes fall within a prescribed range but the level set is not consistent. One criterion recommends that consensus is based on 80% of the votes falling within two categories on a seven point scale (Ulschak, 1983). Another suggests that at least 70% of Delphi participants need to rate three or higher on a four point Likert scale and the median has to be 3.25 or higher (Hsu and Sandford, 2007). Other researchers have suggested consensus at scores ranging from 51% to 80% (McKenna, 1994, Green et al., 1999).

For the purpose of this study a seven point Likert scale was chosen, as these have been found to be more reliable than five point scales (Finstad, 2010). A score of one on the Likert scale corresponded to a low level of agreement (do not agree) and seven corresponded to a high

level of agreement (highly agree). The midpoint of the scale was given the descriptor "somewhat agree". In order to minimise researcher bias, consensus was predefined as 70% to 75% of participants scoring either a six or a seven on the Likert scale, where the median was either six or seven and the IQR was less than or equal to one. Participants were informed of this at the introductory education session so the criterions for establishing consensus were clear to all at the outset.

3.3 Advantages and Disadvantages of the Delphi

One of the inherent problems of the Delphi is the risk of low response rates due to the multiple contacts and feedback required. One of the ways to minimise this is through face to face contact with the researcher and ensuring personalisation of all correspondences (Dillman, 2007, McKenna, 1994). The researcher's details were included in all documentation and participants were encouraged to contact the researcher if they had any questions or issues requiring clarification. It was agreed with participants that they would receive one email reminder at the latter stages of the two week time-frame. Pilot testing was used to identify any wording difficulties or ambiguity of the questionnaire and to improve the feasibility of data management and administration for the main study. This meant the researcher was confident of being able to input and analyse data and produce follow up questionnaires within the allotted timeframe. All of these served to ensure the process of the study was as smooth as possible relieving the burden on participants and improving response rates.

The Delphi process has been criticised by some for forcing consensus and not allowing participants to discuss or verbally debate the issue or elaborate on their views (Hasson et al., 2000, Goodman, 1987). Efforts were made to counteract this by emphasising to participants that it was not necessary to change their opinion in follow-up questionnaires in response to collective opinion. This was also specifically addressed on each follow-up questionnaire where a statement advising participants that they could choose not to change their response was included (Appendix VI). Wording on the questionnaire was carefully considered to avoid the possibility of researcher bias; statements advising participants to reconsider their response or keep their response unchanged were given equal weighting.

The Delphi has also received criticism for having limited evidence of reliability (Hasson et al., 2000, Boulkedid et al., 2011), for example if the same information were given to two or more panels there is no guarantee the same results would be obtained. However, others argue that the technique is accurate (Ono and Wedemeyer, 1994). Content validity may also be questioned if participants in the panel are not representative of the group and area of knowledge been tested, however, this was carefully addressed through the sampling frame and the use of purposive sampling. Efforts were made to ensure all relevant physiotherapy subgroups were included and only clinicians employed in a senior post were recruited. Face validity may be biased if the researcher has influence over the development of themes or the inclusion/exclusion of data during the questionnaire rounds (Hasson et al., 2000). These criticisms may be levelled at most qualitative data and attempts to address them included the use of a second independent researcher to code and theme the qualitative data and agree statements for inclusion in rounds two and three. Best practice guidelines suggested by

Boulkedid and colleagues regarding the planning and reporting of Delphi studies have been adhered to in the execution of this research (Boulkedid et al., 2011). These include the use of a heterogeneous group of experts, defining consensus before the study outset, reporting characteristics of the expert panel fully, reporting response rates of each round, as well as the duration of the Delphi procedure.

Chapter 4 Study 1: Promotion of Physical Activity in Primary Care

4.1 Introduction

This chapter describes the methodology, results and discussion of the first study undertaken as part of this thesis.

PA has comprehensive health benefits and the importance of promoting PA in primary care is widely acknowledged (Haskell et al., 2007, Graham et al., 2007, World Health Organisation, 2009b). Chapter 1 discussed the evidence for the effectiveness of PA promotion in primary care and provided a detailed literature review on the knowledge and practice of primary care professionals in this task (Section 1.9.1). Whilst PA promotion was accepted as an important component of a primary care clinician's role, very few studies investigated how knowledgeable clinicians were about the PA public health recommendations and there was a lack of detail about what PA screening and counselling actually entails in clinical practice.

The overall aim of Study I was to describe the current practice of Irish GPs and Physiotherapists (PTs) in the screening and promotion of PA in primary care.

The specific objectives of Study 1 were;

1. To determine GPs' and PTs' knowledge of the PA guidelines;
2. To establish the likelihood of screening and counselling of patients with and without cardiovascular risk factors;
3. To describe the PA interventions most frequently used by participants and;
4. To identify potential barriers limiting practice.

This study has been published in the Journal of Public Health (Appendix XI).

BARRETT, E. M., DARKER, C. D. & HUSSEY, J. 2012. Promotion of physical activity in primary care: knowledge and practice of general practitioners and physiotherapists. Journal of Public Health, 21, 63-69.

4.2 Methodology

4.2.1 Participants

The study population included all GPs (n=543) registered with the state run General Medical Services programme and all primary care PTs (n=101) employed by the National Health Service Executive in the region of Dublin Mid Leinster. Up to date mailing lists were generated by contacting each of the relevant primary care and physiotherapy managers in the region. A full description of the sampling method and the procedures followed to minimise the risk of sampling and coverage error is given in Chapter 2, Section 2.3.1.

4.2.2 **Study Design**

This was a descriptive study utilising a cross sectional study design. The data were collected using a self report postal questionnaire that was developed specifically for the study and piloted extensively prior to use (Chapter 2, Section 2.4).

Data collection occurred over a two month period in summer 2010 and consisted of a maximum of four phased contacts. Participants initially received a pre notice letter informing them of the study, the study aims and requesting their participation. In the second contact, participants received a copy of the questionnaire and a stamped addressed envelope for its return. Non-respondents were followed up by post on a further two occasions, at two week intervals. Further details on the choice of survey mode and the four phased contact procedure are provided in Chapter 2, Sections 2.6 and 2.7.

Several methods were used to maximise response rates including; personally addressed letters to participants, multiple contacts for non-respondents, prepaid envelopes for questionnaire return, and careful design of the study tool through pilot testing and focus group follow up.

4.2.3 **Questionnaire**

The questionnaire was divided into four distinct sections. The first section examined knowledge of the PA guidelines. Participants were required to accurately report the correct frequency, duration and intensity of PA required to meet the ACSM guidelines (Haskell et al., 2007). They were also questioned about their sources of information in relation to PA.

Section two questioned participants about their normal practice in screening PA levels of patients. Participants chose, from a choice of five statements, the one that most accurately captured their screening practice. These statements ranged from "not screening PA in any patient" to "screening PA in all of their patients". Participants had the opportunity to record other options should their practice fall outside the range of choices provided. Specific questions requested details on the use of formal screening methods such as the use of a questionnaire or pedometer.

In section three, participants were asked about their normal practice in the promotion of PA to their patients. Similar to the screening questions in section two, participants chose from a choice of five statements the one that most accurately captured their promotional practice. Participants were asked to provide details on the types of promotional activities they used and asked how likely or unlikely they were to promote PA to healthy people and those with CVRFs.

The final section of the questionnaire recorded professional and demographic information and details about postgraduate training in PA or exercise promotion. There were minor wording differences between the physiotherapy and GP questionnaires to reflect the different educational resources and promotional practices of these professions.

Copies of the GP and PT questionnaires are included in Appendix IV.

4.2.4 Data Management and Analyses

Data from the questionnaires were assigned a numerical code, inputted and analysed using SPSS version 18.0 (SPSS, Inc., Evanston, IL). The data were cleaned twice to identify any data entry errors or omissions. A third and final screen was carried out on 10% of the total data by a person unconnected to the study. This revealed no further errors.

The data were then analysed using descriptive statistics. Categorical variables were reported as frequencies and percentage prevalence (to one decimal point) within each of the professional groups and presented graphically using bar charts. The Chi-square test for independence was used to test for significant associations between categorical variables. Yates Correction for Continuity was used to correct for overestimation of the Chi-square value when using two by two tables.

The continuous variable "number of years in primary care" was assessed for normality using the Kolmogorov-Smirnov (K-S) test and the non parametric Mann-Whitney U test used to test for differences between the two professional groups. The level of significance for all tests was set at p=0.05. Missing data is accounted for in the tables.

Data produced from the open ended questions was entered verbatim onto an excel spreadsheet where it was arranged into common themes and coded. As the volume of data produced from these questions was extremely small, it was not subject to further analysis.

4.3 Results

4.3.1 Response Rate

Overall, 65% (342/523) of GPs and 88% (89/101) of PTs completed the questionnaire. A summary of the response rates to each of the three waves of questionnaires is provided separately for GPs and PTs in Figure 14 and 15 respectively.

Three percent (n=15) of GPs opted out of the study, two percent (n=10) of the questionnaires were returned uncompleted and 30% (n=156) of GPs failed to respond. Questionnaires were returned unanswered due to recipients being on extended leave, retired, not working in primary care or due to incorrect addressing.

Only one PT opted out of the study and two questionnaires were returned unanswered as the recipients were on extended leave and not working in primary care. Eight percent (n=8) of PTs failed to respond to the study.

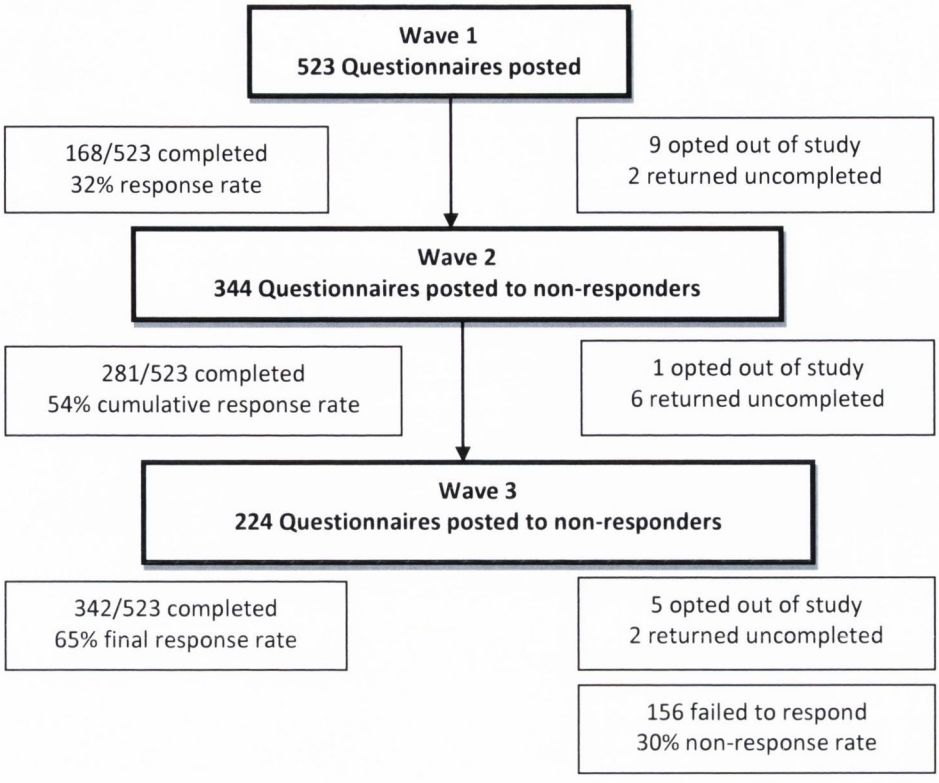

Figure 14 General Practitioners Response Rate to Study Questionnaire

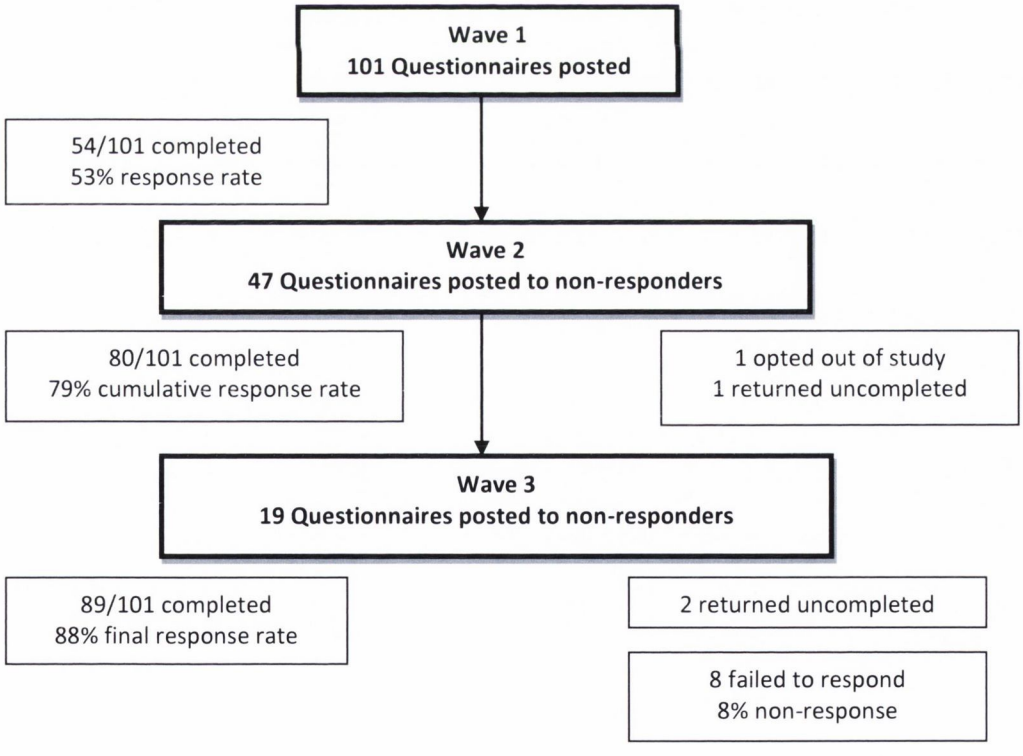

Figure 15 Physiotherapists Response Rate to Study Questionnaire

4.3.2 Demographic and Professional Details

Details of gender, years working in primary care and the numbers of participants with postgraduate training in exercise prescription are given in Table 10. Both the gender distribution and the number of years working in primary care were significantly different between the professional groups. Over 60% (n=229) of the GP group were male whilst less than 20% (n=15) of the PT sample were male. However it is important to note that on comparison with national data (O' Dowd et al., 2006), there were no differences in gender distribution between the study population and that of the general population of the professions surveyed, suggesting that the demographic profile of the respondents in Study 1 were reflective of the two professions at national level (Physiotherapy data accessed by personal communication with the Irish Society of Chartered Physiotherapists).

Whilst the prevalence of postgraduate education in exercise prescription was similar across groups it is important to highlight a distinction between the professions. For PTs, only postgraduate education leading to a formal qualification such as a diploma or MSc was requested, whereas GPs were asked to include all post graduate education on exercise prescription including short courses and conferences. This distinction was made to reflect the different education and professional roles of the two groups. As the majority of post graduate short courses in physiotherapy would very likely contain some components related to exercise prescription, it was thought more appropriate to establish the prevalence of more formalised education in exercise prescription in this group. As post graduate GP training is likely to be of a more medical nature, attendances at short courses in exercise prescription were included for this profession.

Table 10 Study I Professional Details of Participants

	GPs	(n =342)	PTs	(n=89)	p value
Gender % (n)	M	67 (229)	M	16.9 (15)	p<0.001
	F	33 (113)	F	83.1 (74)	χ^2=72.18
PG training in exercise	Yes*	14.5 (49)	Yes	18 (16)	ns
prescription % (n)	No	85.5 (290)	No	82 (73)	χ^2=0.679
Median yrs in primary care (IQR)	23 (15)		3 (4)		p<0.001†

* Data missing for 3 participants † Mann-Whitney test PG postgraduate

4.3.3 Knowledge of the Physical Activity Guidelines

Participants were asked to record the current minimal PA guidelines for healthy adults in terms of the correct frequency, duration and intensity. As highlighted by Figure 16, significantly fewer GPs than PTs (28.4%; n=97 vs. 50.6%; n=45, χ^2=16.56, df=1, p<0.005) accurately reported the guidelines with 44.7% (n=153) of GPs and 34.8% (n=31) of PTs reporting PA levels that were below the recommended minimum.

When examining the individual parameters of frequency, duration and intensity, the largest discrepancies were seen in reporting of frequency and duration of PA. As highlighted in Table 11, 58.1% (n=197) of GPs and 37.1% (n=33) of PTs provided incorrect responses when

reporting the frequency of exercise required to meet the guidelines. This was in contrast to the very high numbers that accurately reported the correct intensity.

Participants used a variety of resources to source information on PA including; international guidelines (GP 20.2%; n=69, PT 37.1%; n=33), National Department of Health guidelines (GP 12.6%; n=43, PT 34.8%; n=31), short course attendances (PT 65.2%; n=58) and their professional body's website (GP 29.3%; n=100).

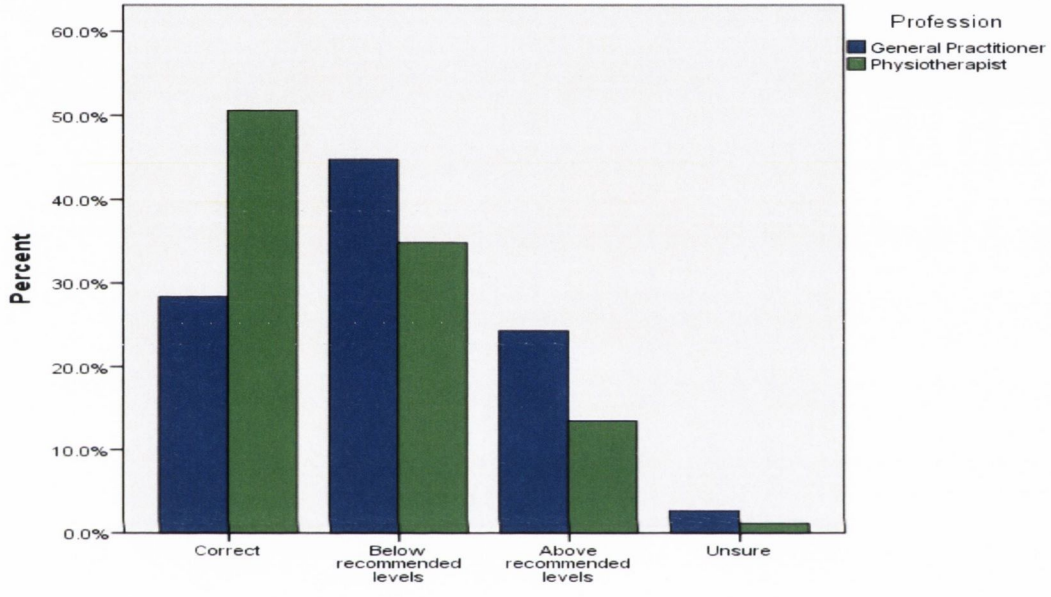

Figure 16 Knowledge of General Practitioners and Physiotherapists of the Physical Activity Guidelines

Table 11 Percentage of General Practitioners and Physiotherapists Correctly Reporting Physical Activity Guidelines

	Profession	Correct % (n)	Incorrect % (n)	p value
Frequency	GP*[1]	41.9 (142)	58.1 (197)	p<0.001
	PT	62.9 (56)	37.1 (33)	χ^2=12.54
Duration	GP*[2]	60.1 (203)	39.9 (135)	p=0.001
	PT	78.7 (70)	21.3 (19)	χ^2=10.56
Intensity	GP*[1]	92.3 (313)	7.7 (26)	ns
	PT	93.3 (83)	6.7 (6)	

*1 Data missing for 3 participants *2 Data missing for 4 participants GP General Practitioner PT Physiotherapist

4.3.4 Physical Activity Screening Practices

Ninety five percent of both groups (GP n=325, PT n=85) felt that PA screening and promotion was part of their professional role. To determine screening and counselling practices

participants were asked to read a series of statements (outlined in Figure 17) and indicate which one most closely related to their routine practice. The largest proportion of GPs (40.8%; n=139) reported opportunistic or ad hoc screening practices with a further 37% (n=126) screening PA levels if relevant to a patient's presenting complaint. Eight percent (n=28) of GPs reported routine screening of PA in all of their patients. Conversely, the largest proportion of PTs (33.7%; n=30) reported screening PA in all of their patients. Twenty eight percent (n=25) of PTs screened PA levels if it related to a patient's complaint and 23.6% (n=21) reported opportunistic screening.

Formal screening tools such as the use of a PA questionnaire (GP 2.9%; n=10, PT 4.5%; n=4) or pedometer (GP 2.3%; n=8, PT 1.1%; n=1) were rarely used by participants.

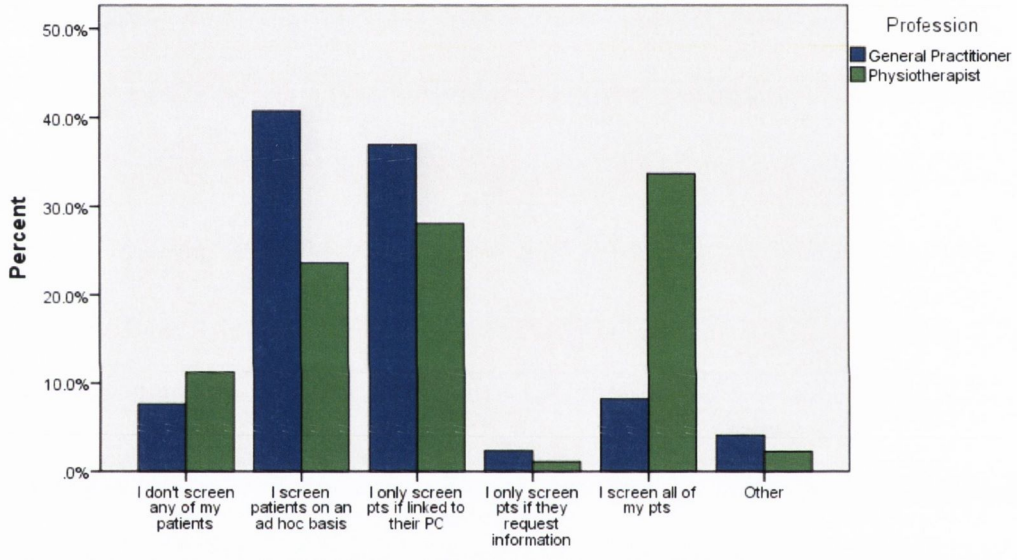

Figure 17 Physical Activity Screening Practices of General Practitioners and Physiotherapists

4.3.5 Physical Activity Counselling Practices

The counselling practices of GPs and PTs are presented in Figure 18. The overall pattern of counselling practice was similar to that of screening, with the largest proportion of GPs counselling in an ad hoc manner (47.9%; n=163) and the largest proportion of PTs counselling all of their patients (38.2%; n=34).

Participants were asked to indicate how likely or unlikely they were to counsel healthy patients and those with known CV risk factors and the results are presented in Table 12. Overweight patients were most likely to be counselled by both professions but significantly more GPs than PTs reported counselling patients with hypertension, raised cholesterol and diabetes. The promotion of PA to healthy populations was much lower with 37.7% (n=128) of GPs and 20.2% (n=18) of PTs reporting that they were unlikely to counsel these patients.

Participants reported using a number of different interventions to promote PA, those reported most frequently are presented in Figure 19. Overall education and advice was the intervention most frequently used by both professions (GP 75.7%; n=258, PT 96.6%; n=86, χ^2=18.10, df=1, p<0.001). GPs utilised onward referrals to other services more often than PTs, reporting referrals to the PT (35.2%, n=120), practice nurse (GP 16.4%; n=56, PT 6.7%; n=6, χ^2=4.60, df=1, p=0.03), exercise specialist (GP 14.4%; n=49, PT 7.9%; n=7, ns) and exercise prescription schemes (GP 10.9%; n=37, PT 3.4%: n=3, χ^2= 3.83, df=1, p=0.05).

PTs utilised written materials (PT 73%; n=65, GP 31.4%; n=107, χ^2=49.3, df=1, p<0.001), exercise diaries (PT 57.3%; n=51, GP 13.2%, n=45, χ^2=76.65, df=1, p<0.001) and follow up appointments (PT 52.8%; n=47, GP 28.2, n=96, χ^2= 18.23, df=1, p<0.001) more frequently than GPs. Behavior modification (GP 50.4%; n=172, PT 52.8%; n=47, ns) and gym referrals (GP 44%; n=150, PT 44.9%; n=40, ns) were used similarly by both groups.

Barriers to PA promotion included time constraints (GP 51%; n=175, PT 50.5%; n=45), poor patient compliance with advice (GP 34%; n=115, PT 66%; n=59), lack of educational resources (GP 25%; n=86, PT 31.5%; n=28) and uncertainty regarding local services (GP 24%; n=83, PT 18%; n=16).

The majority of both professional groups (GP 71.4%; n=247, PT 92.2%; n=82, χ^2=19.15, df=5, p=0.002) indicated that they felt confident providing PA advice to their patients. Further analysis found that there was no association between respondents who correctly described PA recommendations and reported confidence to promote PA (χ^2=5.386, df=2, p=0.068).

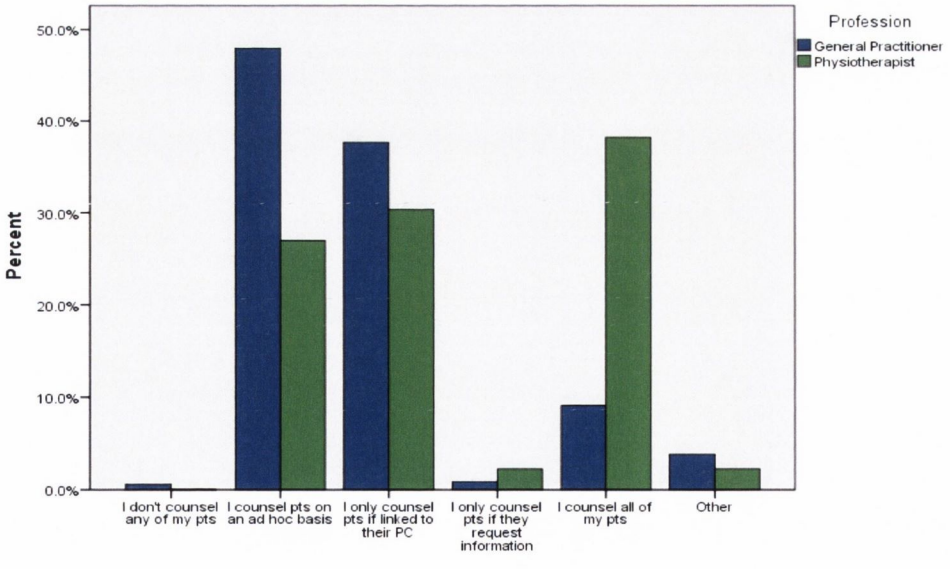

Figure 18 Physical Activity Counselling Practices of General Practitioners and Physiotherapists

Table 12 Likelihood of General Practitioners and Physiotherapists to Counsel Healthy and Cardiovascular Risk Patients

		Very Likely	Likely	Unlikely/ V Unlikely#	p Value
Hypertension	GP %(N)*[1]	63.2 (216)	33.3 (114)	3.5 (11)	p<0.001
	PT %(N)*[1]	22.5 (20)	65.2 (58)	12.4 (10)	χ^2=49.65
Hypercholest-erolemia	GP %(N)*[1]	70.5 (241)	27.8 (95)	1.8 (5)	p<0.001
	PT %(N)	38.2 (34)	56.2 (50)	5.6 (5)	χ^2=32.58
Diabetes	GP %(N) *[3]	74.3 (254)	22.8 (78)	2.9 (7)	p<0.001
	PT %(N)	49.4 (44)	47.2 (42)	3.4 (3)	χ^2=21.42
Overweight	GP %(N) *[2]	85.7 (293)	12 (41)	2.3 (6)	ns
	PT %(N)	76.4 (68)	21.3 (19)	2.2 (2)	χ^2=5.17
Healthy	GP %(N)*[1]	21.3 (73)	40.9 (140)	37.7 (128)	p<0.01
	PT %(N)	24.7 (22)	55.1 (49)	20.2 (18)	χ^2=9.91

***1** data missing for 1 participant ***2** data missing for 2 participants ***3** data missing for 3 participants

collapsed responses "unlikely" and "very unlikely" into one category for analyses

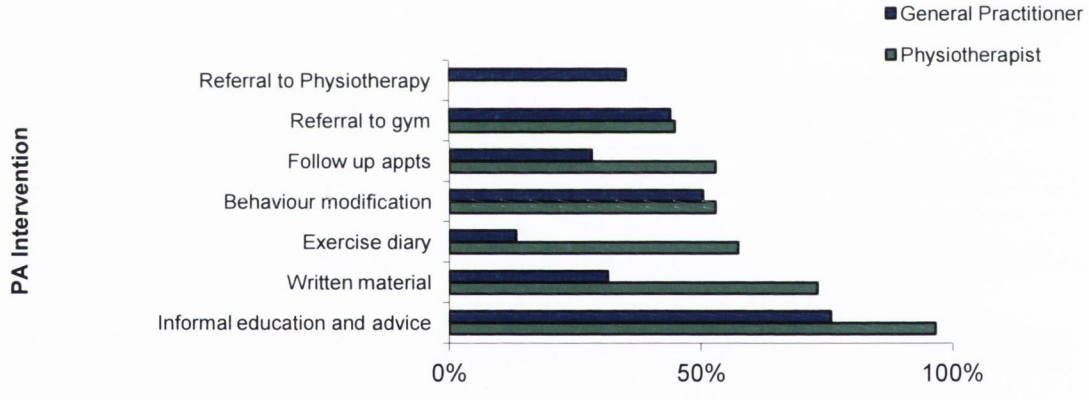

Figure 19 Use of Physical Activity Interventions by General Practitioners and Physiotherapists

4.4 Discussion

4.4.1 Response Rate

Response rates to GP surveys are traditionally very low raising concern about the validity of the findings (VanGeest et al., 2007). The GP response rate of 65% achieved in this study was therefore satisfactory and compares favourably to similar studies, which reported rates ranging from 40% to 64% (Buffart et al., 2009). The response rate of 88% from the PTs was excellent and much higher than a study of Australian PTs (54%) suggesting that the sample is representative of PTs working in statutory primary care services (Shirley et al., 2010). The generally high response rates achieved in this study may reflect the importance accorded to PA

by the study population and its relevance to general practice. However non-response bias, particularly amongst the GP population cannot be ruled out. In the absence of a central register of PTs, only PTs employed in the HSE were surveyed, meaning that the results cannot be generalised to PTs employed in private practice. It is estimated that approximately 50% of Irish PTs are employed in the HSE[5].

4.4.2 **Knowledge of the Guidelines**

PA needs to be of sufficient duration, frequency and intensity in order to incur health benefits (Haskell et al., 2007) so it is important that patients receive the correct information from health professionals. Less than a third of GPs and half of PTs reported the correct PA guidelines. Where guidelines described were incorrect, respondents were more likely to report levels below the recommended minimum. Reporting the correct frequency of PA was the component with which participants were most unsure, accounting for the largest number of incorrect answers both in this study and in previous work (Daley et al., 2008).

Despite this disparity in knowledge, the majority of participants reported feeling confident providing patients with advice. Although far from optimal, knowledge of guidelines by Irish health professionals is better than that reported in two previous studies, in which 13% of Scottish GPs (Douglas et al., 2006a) and a third of Australian PTs (Shirley et al., 2010) stated the correct PA guidelines. There is of course the possibility that interested participants may have accessed the guidelines after receipt of the questionnaire and the true level of knowledge was actually lower than that reported.

PA has recently been receiving more widespread promotion with the release of population targeted guidelines, evidence based statements and the inclusion of PA recommendations in many health policy documents at national and international level. It is likely that PA guidelines need to be more specifically tailored to their target audience and their distribution and promotion co-ordinated more formally to improve knowledge and acceptance. Increasing the numbers of professionals who undertake postgraduate training in this area may also be required as less than a fifth of participants reported postgraduate training in exercise prescription.

Ensuring PA promotion is an integral part of the undergraduate curriculum of both physiotherapy and medical student education is also essential. A recent study which reviewed the PA content of physiotherapy undergraduate programmes in Ireland, suggested that further emphasis needed to be placed on PA for public health and PA for lifestyle related diseases (O'Donoghue et al., 2011). A study which reviewed the PA content from all medical school programmes across the UK, reported *'widespread omission of basic teaching elements, such as the Chief Medical Officer recommendations and guidance on physical activity'* (Weiler et al., 2012a) (p.1025).

[5]Personal correspondence with the Irish Society of Chartered Physiotherapists, based on 2014 membership figures

4.4.3 Physical Activity Screening Practices

There was a high level of awareness of PA amongst professionals with almost all participants considering PA promotion as part of their professional role. The screening practices of participants were quite varied. In addition to those who do not screen any patients, large numbers reported ad hoc practices suggesting that a number of inactive or insufficiently active patients are not being correctly identified. Another frequent practice was screening patients PA levels when it was relevant to their presenting complaint. While this may be understandable in busy practice, physical inactivity is in itself, an independent risk factor for cardiovascular disease and several other non-communicable diseases and thus should be screened for as such. An Australian study reported similar findings with little change in the percentage of patients screened over a ten year period (Buffart et al., 2009).

The use of any formalised methods of screening such as questionnaires was negligible among participants. Given the potential public health benefits of increasing PA levels, all primary care assessments should at least include a simple screening process to identify patients not meeting recommendations. This could be administered quickly in the form of a one question screening tool (Rose et al., 2008), a self report questionnaire (Bull and Maslin, 2006, Heron et al., 2014, Department of Health, 2006), or by specific questioning of the patient, none of which add much to the time burden of professionals.

4.4.4 Physical Activity Counselling Practices

In view of the evidence supporting the use of PA in the prevention and treatment of cardiovascular disease (Thompson et al., 2003, Blair and Jackson, 2001, Fagard, 2001, Graham et al., 2007, Perk et al., 2012), it is reassuring to see that high numbers of health professionals are likely/very likely to counsel patients with known CVRFs. However, despite the overall high counselling rates, GPs were more likely than PTs to counsel patients with hypertension, raised cholesterol and diabetes suggesting that as a profession they have better awareness of these risk factors. Whilst the medical training of doctors has a strong focus on cardiovascular health, PTs may be less alert to these risk factors or consider them less of a priority when treating patients for an unrelated condition such as an orthopaedic or musculoskeletal disorder. However the prolonged nature of many PT appointments and specialist skills in exercise prescription offers a further opportunity to promote PA in this high-risk population. Similar to previous reports (Kreuter et al., 1997, Douglas et al., 2006a, Attalin et al., 2012, Ampt et al., 2009), the current study found that overweight patients are most likely to receive PA counselling. This may be as a result of the increased focus on obesity both in the medical literature and general media or may reflect the external visual cue a health professional receives when assessing an overweight patient reminding them to promote PA.

Despite the call for PA promotion to be included in all primary care consultations (World Health Organisation, 2009b) participants were less likely to counsel healthy patients. The infrequent use of PA promotion as a primary preventative strategy is an important finding, which warrants further investigation. Half of all participants in this study identified time constraints as a barrier to practice and thus may choose to limit counselling to more high-risk populations. Time constraints are one of the most consistent barriers to PA promotion

reported in the literature (Chapter 1, Section 1.9.4). Other factors such as a lack of financial remuneration, personal interest in PA, personal PA behaviour and perceived effectiveness in influencing change have all been suggested to influence health professional's practice (Patra et al., 2013, Lobelo et al., 2009, Ampt et al., 2009). Despite reporting high confidence in providing PA counselling, participants in this study were less confident that such advice would result in a positive change in a patient's behaviour, with a third of GPs and 66% of PTs reporting poor patient compliance as a barrier to practice. Several studies, have in the past cited patient non compliance and poor patient motivation as barriers to practice (Chapter 1, Section 1.9.4).

To effect large scale improvements in public health, promotion of PA by medical professionals must be delivered alongside policy reform, community engagement, media campaigns and widespread targeted education programmes (World Health Organisation, 2009b).

4.4.5 Use of Physical Activity Interventions

Informal advice and education was the intervention most frequently used by health professionals and when supported by written materials has been found to be effective in producing at least short term changes in PA behaviour (National Institute for Health and Clinical Excellence, 2013). A quarter of GPs and just under a third of PTs identified a lack of patient educational material as limiting their practice. Improving the availability and dissemination of printed educational materials particularly amongst GPs may reinforce the advice a patient receives. The 10,000 Steps Rockhampton study, a community based PA counselling intervention showed a 31% increase in the numbers of patients recalling GP advice on PA following practice based instruction to GPs and distribution of promotional materials (Eakin et al., 2004).

About half of the participants reported using behavioural counselling to influence patients' PA. These approaches, tailor advice given to a patient relative to their goals and stage of behaviour change and when delivered over a number of appointments have been shown to produce more promising and long-term results (Lawton et al., 2008, Lin et al., 2010). It was not within the scope of this study to describe the actual content of each intervention but the numbers of participants providing follow up appointments ranged from 28% (GP n=96) to 53 % (PT n=47) suggesting that at least in some cases, the frequency of the follow up may not have been high enough to support change. Uncertainty regarding local PA services was reported by at least a quarter of GPs and may have impacted on their decision to refer patients for further intervention or follow up appointments with another professional or PA provider.

It is likely that the different professions working in primary care have different roles to play in PA promotion. Undoubtedly, GPs are the cornerstone of public health and must play a vital role in terms of screening and assessment of activity levels. They are also best placed to offer brief advice, such as the promotion of PA guidelines to the large sections of the population they come into contact with. However, patients requiring more supportive measures may benefit from onward referral to more specialised services. There is still no consensus as to what is the best form of supervised PA intervention and the role that the PT may play in the provision of such programmes has to date received very little formal evaluation.

4.4.6 Limitations of the study

This study contacted PTs who were employed only in the statutory health services and the limitations arising from this were addressed in Section 4.4.1, together with a discussion of the limitations arising from the response rate. As with any questionnaire there was limited scope to gather detailed descriptive data and it was therefore beyond the scope of this study to fully describe the PA promotional interventions provided by participants. This is an area that would benefit from further qualitative study in the form of a focus group or interview.

4.5 Conclusion

GPs and PTs consider PA promotion an important component of their primary care role. However, PA screening practices are inconsistent, with minimal use of any formalised means of assessment such as questionnaires. Patients with CVRFs are very likely to receive PA counselling, particularly from GPs, but PA promotion as primary preventative strategy, to healthy populations was less well established. There are ongoing challenges to ensure that evidence based guidelines and interventions supporting long-term behaviour change are incorporated into routine practice.

Chapter 5 Study II: The Physical Activity Profile of a Primary Care Population

5.1 Introduction

Study 1 described the PA screening and promotional practices of GPs and PTs within the primary care sector of Irish health services. As discussed in Chapter one (Section 1.10), the health system in Ireland is currently undergoing significant reform with increasing emphasis on the expansion of primary care services (Department of Health, 2013b). This offers a unique opportunity to develop PA programmes that are in line with governmental policy and integrated into health reform. One of the key pillars of this reform is to increase the focus on health and wellbeing, through preventative approaches, earlier identification of illness and better integration of chronic disease management (Department of Health and Children, 2009a). Supporting people to become physically active must be a key component of any programme that aims to protect or improve health and prevent disease (Kohl et al., 2012).

The last available study which provided a more comprehensive analysis of the PA levels of the general Irish population was obtained in 2007, as part of the Surveys of Lifestyle, Attitudes and Nutrition in Ireland (SLÁN) (Morgan et al., 2008). Whilst national level data is an important indicator for public health, it is less clear whether national population estimates are truly representative of people attending primary care services. National level data will, by its nature, be representative of the whole population and will therefore include the fit and healthy, and those involved with sport and exercise at all levels of participation. People attending primary care present with a diverse and wide ranging set of risk factors and medical conditions and therefore may demonstrate different patterns and trends in PA and sedentary behaviour than seen in the general population. Reliance solely on general population data has the potential to mask or overestimate the PA levels of people who may have less favourable health profiles or who are considered more at risk than the general population.

As evidenced by the literature review in Chapter 1 (Section 1.12.4) there have been no studies that have provided a detailed analysis of sitting in the Irish population and sedentary behaviour was not included as part of the national SLÁN survey (Morgan et al., 2008). Given the accumulating evidence supporting the relationship of sedentary behaviour with multiple adverse health outcomes (See Chapter 1 Section 1.4.2) it is important to establish the patterns of sedentary behaviour in the Irish population, as well as gaining insight into its associated correlates. This is particularly relevant given the recent recommendations by several international health authorities, including those in Ireland (Department of Health and Children, 2009b), to limit the amount of time being sedentary (Chapter 1, Section 1.6.3). Sedentary behaviour is an area of emerging importance in terms of public health surveillance and establishing current data in the Irish population will allow for meaningful comparisons with European and international estimates.

The first step in developing effective primary care led public health interventions, is to base them on the stated needs of the target population. It is important initially to establish the prevalence of insufficient PA and sedentary behaviour among primary care patients and then, to gain insight into the characteristics that may explain why some people are regularly active

and others are not. A common approach to the study of PA is to integrate ideas from several different theories into an ecological model which considers the interrelationship between individuals and their social and physical environments (Bauman et al., 2012). The ecological approach uses a comprehensive framework to explain PA, proposing that determinants at all levels – individual, social, environmental and policy are all contributors (Bauman et al., 2012). The literature review of prevalence studies in Chapter I (Section 1.12) provided evidence for some of the key factors that have been shown to influence PA in adults including gender, age and economic factors. In addition, environmental factors have been receiving increasing focus within the last decade (van Stralen et al., 2009, Duncan et al., 2005) but have yet to be investigated in the Irish population. Whilst the factors influencing sedentary behaviour are much less studied there is some evidence to support age, education, health status and low activity levels as being important (Bennie et al., 2013).

Understanding what causes people to be physically inactive and sedentary is paramount to the planning and delivery of successful public health interventions. In order to promote PA in line with national targets, a greater depth of understanding regarding the individual, environmental and social influences on PA and sedentary behaviour is essential.

The aim of Study II was to describe the prevalence and patterns of PA and sedentary behaviour specifically in a primary care population.

The specific objectives of Study II were;

1. To determine the percentage of patients attending primary care who failed to meet the minimal PA recommendations;

2. To describe the PA patterns of primary care patients according to socio-demographic and cardiovascular variables;

3. To determine whether there was an association between primary care location and PA patterns;

4. To establish the prevalence of daily sitting time amongst primary care patients;

5. To describe the patterns of sitting behaviour amongst primary care patients according to socio-demographic and cardiovascular variables and;

6. To establish whether there was an association between daily sitting time and PA.

5.2 Methodology

5.2.1 Sampling

The population of interest were patients attending primary care services in the HSE region of Dublin Mid Leinster in the Republic of Ireland. Computer generated, stratified random sampling was used to identify three primary care centres in the region, from which the sample

was drawn. Stratification was based on the urban/rural location of the centre and the SAHRU National Deprivation Index (Kelly and Teljeur, 2007). The stratification and sampling procedures used in this study are described in full in Chapter 2, Section 2.3.2.

A pilot study was initially conducted in one of the three primary care centres to calculate sample size and test the feasibility of the questionnaires and survey process (Chapter 2, Section 2.3.2). Using a physical inactivity prevalence rate of 35% (n=159) obtained from the pilot, a sample size of 750 was calculated, based on 95% confidence intervals and a 3% margin of error. An additional 10% was added to this estimate to allow for subgroup analysis (n=825). The sample was drawn equally from the three primary care centres; one an urban deprived location (UD), the second an urban non deprived location (UND) and the third a rural primary care location with mixed deprivation scores (R).

5.2.2 **Study Tool and Procedure**

This was a cross sectional study which utilised the short version of the self administered IPAQ to collect data on the level of activity undertaken by participants in the previous seven days (Appendix V). Full details of the measurement properties and the relative advantages and disadvantages of the questionnaire are presented in Chapter 2, Sections 2.8.1 and 2.8.3. An additional short questionnaire (Appendix V) designed by the researcher (EB) collated information on self-reported CVRFs, history of cardiovascular disease (CHD or stroke) and socio-demographic data. Questions on the presence of major CVRFs (smoking, hypertension, raised cholesterol, overweight and diabetes) were adapted from the National Survey of Lifestyle, Attitudes and Nutrition (Morgan et al., 2008).

Two additional PA questions were also included in the researcher designed questionnaire. The first asked participants whether they felt they had a disability or injury limiting their ability to be physically active. The second question asked respondents about their regular PA behaviour in the last six months. "Physically active" was defined as vigorous exercises or sport three times a week for a minimum of 20 minutes or more general activities like walking, cycling or dancing five times per week for at least 30 minutes a day (Haskell et al., 2007). Respondents choose from a series of five statements based on the stages of change behaviour model (See Appendix V Question 8).

Consenting adults between the ages of 18 to 69 were consecutively recruited by the researcher (EB) as they presented for their primary care appointment. People who were unable to complete the questionnaires in English or who were attending a structured exercise programme provided by the HSE (for example cardiac rehabilitation) were excluded. The researcher remained with participants while the questionnaires were being completed to address any queries. Data were collected from November 2011 to January 2012 and took approximately five days in each of the three centres.

5.2.3 Data Management and Analyses

Data from the IPAQ was scored using the standardised scoring protocol (The IPAQ Group, 2006) described in Chapter 2 Section 2.8.2 and inputted to SPSS version 19.0 (SPSS, Inc., Evanston, IL). Data from the additional questionnaire were assigned numerical codes and inputted to the database. The data set was cleaned twice to identify any errors or omissions. A final screen was carried out on 10% of the total data revealing no further errors.

A number of new variables were created from the data to fully address the study objectives and allow for more accurate presentation of data. Details of these are presented in Table 13. BMI was calculated using the formula (weight (kg)/height $(m)^2$) (WHO 2000) and used to classify participants into the following categories; underweight BMI < 18.5 $kg.m^{-2}$, normal weight BMI 18.5 – 24.9 $kg.m^{-2}$, overweight BMI 25- 29.9 $kg.m^{-2}$, obese BMI >30 $kg.m^{-2}$.

The data were then analysed using descriptive and inferential statistics. PA was described in terms of the two measures produced by the IPAQ data; a categorical measure of PA (low/moderate/high) and a continuous measure described as MET minutes/week (Chapter 2 Section 2.8.2). As there are no well accepted thresholds to categorise time spent sitting, the data was described in terms of five, two hourly sitting categories as highlighted in Table 13. Categorical variables were reported as frequencies and percentage prevalence (to one decimal point) and presented graphically as bar charts. The Chi-square test for independence was used to test for significant associations between categorical variables. Yates Correction for Continuity was used to correct for overestimation of the chi-square value when using two by two tables.

Continuous data were assessed for normality by inspection of histograms and normal probability plots, and statistically through the use of the skewness and kurtosis values and the Kolmorgorov-Smirnof test. As PA and sitting data from the IPAQ were not normally distributed, they were described in terms of median and interquatile ranges (IQR) and non parametric testing was used. The Mann Whitney U and Kruskal-Wallis tests examined for between group differences in continuous variables. Post hoc testing was carried out in analysis involving more than two groups using a Bonferroni adjusted alpha level to control for Type 1 error (Bland and Altman, 1995).

Binary logistic regression analysis examined for associations between socio-demographic and cardiovascular variables and classification in the low PA category. After checking for multicollinarity of variables, all independent variables were entered into the regression in the first instance. Non significant variables were then removed and the regression repeated using significant variables. Generalised linear regression, scale response, gamma with log link, was used to examine for associations between sitting time and socio-demographic and cardiovascular variables. All independent variables were entered into the regression in the first instance, non significant variables were then removed and the regression repeated using significant variables.

Spearman's rho was used to determine if there was a relationship between time spent being physically active and sitting. Odd Ratios (ORs) and Relative Risk (RR) were used to compare the

probability of CVRF(s) in participants meeting and failing to meet PA recommendations. ORs and RR of greater than one implies the event is more likely in the low active group.

The level of significance for all statistical tests, other than post hoc testing was set at p=0.05. Missing data is accounted for in the tables.

Table 13 Summary of Data Management of Study II

Questionnaire data	New variables created
Q7 Hours spent sitting	Recoded into 5 categories 0-2hrs/2-4hrs/4-6hrs/6-8hrs/>8hrs
Q10 Age in years	Recoded into 4 age categories 18-29/30-44/45-64/65-69
Q 11 & Q12 Qs pertaining to cardiovascular disease	Recoded into 2 categories history of CV disease/no history of CV disease
Q 13 to 20 Qs pertaining to CVRFs	A. Recoded into 2 categories at least 1 CVRF/at least 2 CVRF B. Recoded into 3 categories 0 CVRF/1 CVRF/2CVRF
Q18 to Q20 Q18 Self report weight descriptor Q19 Weight Q20 Height	Weight(Q19) and Height(Q20) used to calculate BMI category, <18.5 $kg.m^{-2}$, 18.5 –24.9 $kg.m^{-2}$, 25-29.9 $kg.m^{-2}$, >30 $kg.m^{-2}$ Where data for Q19 or Q20 were missing, data from Q18 was used to categorise participants BMI
Q22 Highest educational level	Collapsed 8 categories to 4 Primary only/secondary/third level or higher/did not wish to answer

CV=cardiovascular

5.3 Results

Overall 915 people were invited to complete the questionnaires. Fifteen (1.6%) people declined to participate and four were unable to complete the questionnaire due to language barriers. The IPAQ data was incomplete on 11 (1.2%) questionnaires, so these were removed from analysis as per protocol (The IPAQ Group, 2006). In total, data from 885 (96.7% response rate) participants are presented here.

5.3.1 Socio-demographic Details

Table 14 outlines the demographic details of participants from each of the three primary care centres. Overall 76.8% (n=680) of participants were attending a GP, 10.2% (n=90) were attending a nurse, 6.4% (n=57) a therapist and 6.6% (n=58) another practitioner at the time of assessment. A medical card entitles people of low income or with certain chronic diseases to free healthcare including general practitioner visits and primary care services.

Table 14 Study II Socio-demographic Details of Participants by Primary Care Location

	Total n=885	Urban deprived n=295	Urban non deprived n=292	Rural mixed deprivation n=298	p value
Gender % (n)					
M	36.2 (320)	40.3 (119)	31.8 (93)	36.2 (108)	ns
F	63.8 (565)	59.7 (176)	68.2 (199)	63.8 (190)	
Age Median (IQR)[*1]	39 (31-53)	41(31-55)	38 (31-51)	39 (31-52)	ns
Age Category[*1]					
18-29	20.0 (179)	21.5 (63)	20.2 (58)	19.5 (58)	p=0.03
30-44	42.6 (377)	35.8 (105)	47.7 (137)	45.3 (135)	χ^2=13.99
45-64	27.2 (241)	32.8 (96)	21.6 (62)	27.9 (83)	
65-69	9.2 (81)	9.9 (29)	10.5 (30)	7.4 (22)	
Education level % (n)[*2]					
Primary	15.8 (140)	28.8 (85)	4.1 (12)	14.4 (43)	P<0.001
Secondary	35.6 (315)	40.3 (119)	20.2 (59)	46 (137)	χ^2=167.03
Third level	47.7 (422)	28.8 (85)	75.3 (220)	39.3 (117)	
Medical card holder % (n)[*3]	51.3 (454)	76.9 (226)	23.6 (69)	53.4 (159)	p<0.001 χ^2=166.94

*[1] data missing for 7 participants *[2] data missing for 8 participants *[3] data missing for 1 participant

5.3.2 Cardiovascular Risk Factors

Five percent (5.2%, n=46) of participants reported having established cardiovascular disease such as a stroke or previous myocardial infarction. Table 15 details the self reported CVRFs of participants. The prevalence of at least one, or, at least two CVRFs is presented by age and gender.

Table 15 Study II Self Reported Cardiovascular Risk Factors by Gender and Age

	Total %(n) n=885	**Male** %(n) n=320	**Female** %(n) n=565	**p value**
At least one CVRF	74 (650)	85.9 (275)	67.4 (381)	p<0.001 χ^2=36.47
18-29	17.5 (114)	11.4 (31)	21.9 (83)	ns
30-44	38.6 (251)	39.5 (107)	38 (144)	p<0.001 χ^2=26.88
45-64	32.3 (210)	36.5 (99)	29.3(111)	p=0.026 χ^2=4.981
65-69	11.5 (75)	12.5 (34)	10.8 (41)	ns
At least two CVRF	35.8 (317)	45.9 (147)	30.1 (170)	p<0.001 χ^2=22.32
18-29	9.8 (31)	5.4 (8)	13.5 (23)	ns
30-44	31.5 (100)	30.6 (45)	32.4 (55)	p=0.005 χ^2=7.79
45-64	42.3 (134)	46.3 (68)	38.8 (66)	p=0.026 χ^2=4.93
65-69	16.4 (52)	17.7 (26)	15.3 (26)	ns
Overweight or obese[*1]	51.2 (453)	62.5 (200)	44.8 (253)	p<0.001 χ^2=29.47
Smoking[*2]	33.3 (295)	36.8 (117)	31.6 (178)	ns
Hypertension[*3]	16.5 (146)	22.3 (71)	13.3 (75)	p<0.001 χ^2=11.93
Raised cholesterol[*3]	15 (133)	19.4 (62)	12.6 (71)	p=0.004 χ^2=7.53
Diabetes[*2]	3.4 (30)	6.3 (20)	1.8 (10)	p=0.001 χ^2=12.55

[*1] data missing for 10 participants [*2]data missing for 4 participants [*3] data missing for 1 participant

5.3.3 Physical Activity

In this section PA data from the IPAQ is presented according to the following:

A. Socio-demographic variables; gender, age, educational attainment and medical card status;
B. Primary care location; urban deprived, urban non deprived, rural mixed deprivation and
C. The prevalence of one and two cardiovascular risk factors.

Physical Activity Category

Table 16 presents the PA category of participants according to socio-demographic variables and primary care location. Participants classified within the low PA category were insufficiently active to meet the recommended minimal levels of PA outlined in the public health guidelines. Significantly more participants classified as low active were female (χ^2=10.76, df=2, p= 0.005), of older age (χ^2=12.39, df=6, p=0.054) and educated to a primary level only (χ^2=18.14, df=6,

p=0.006). In contrast, more of highly active sample were male, of younger age and had higher educational attainment

The differences in PA category are also presented graphically in Figures 20 to 23. Figure 20 highlights the similar percentages of males and females classified as moderately active and the differences in gender distribution at both the low and high ends of the scale. Figure 21 highlights the greater prevalence of high activity amongst younger participants and the almost stepwise decline in higher activity levels as age increases. In Figure 22 the largest proportion of participants (60%; n=84) classified as low active were educated to primary level only.

There were significant differences between the activity categories of participants attending the three primary care areas (χ^2=42.56, df=4, p<0.001) and these are presented in Table 16 and graphically in Figure 23.

Table 16 Physical Activity Category according to Socio-demographic Variables and Primary Care Location

	% (n)	Low % (n)	Moderate % (n)	High % (n)	p value
Total	n= 885	47.2 (418)	42.6 (377)	10.2 (90)	
Gender					
Male	36.2 (320)	41.9 (134)	44.1 (141)	14.1 (45)	p= 0.005
Female	63.8 (565)	50.3 (284)	41.8 (236)	8 (45)	χ^2 =10.76
Age *1					
18-29	20.2 (179)	42.5 (76)	41.9 (75)	15.6 (28)	p=0.054
30-44	42.6 (377)	45.6 (172)	44 (166)	10.3 (39)	χ^2=12.39
45-64	27.2 (241)	50.6 (122)	41.5 (100)	7.9 (19)	
65-69	9.2 (81)	53.1 (43)	43.2 (35)	3.7 (3)	
Education *2					
Primary	15.8 (140)	60 (84)	36.4 (51)	3.6 (5)	p= 0.006
Secondary	35.6 (315)	47.6 (150)	42.5 (134)	9.8 (31)	χ^2= 18.14
Third level	47.7 (422)	42.9 (181)	44.8 (189)	12.3 (52)	
Medical Card Holder *3					
Yes	51.3 (454)	46.9 (213)	43.8 (199)	9.3 (42)	ns
No	48.6 (430)	47.4 (204)	41.4 (178)	11.2 (48)	
Primary Care Area					
Urban deprived	33.3 (295)	37.6 (111)	45.4 (134)	16.9 (50)	p<0.001
Urban non deprived	33 (292)	44.5 (130)	47.3 (138)	8.2 (24)	χ^2=42.56
Rural	33.7 (298)	59.4 (177)	35.2 (105)	5.4 (16)	

*1 data missing for 7 participants *2 data missing for 8 participants *3 data missing for 1 participant

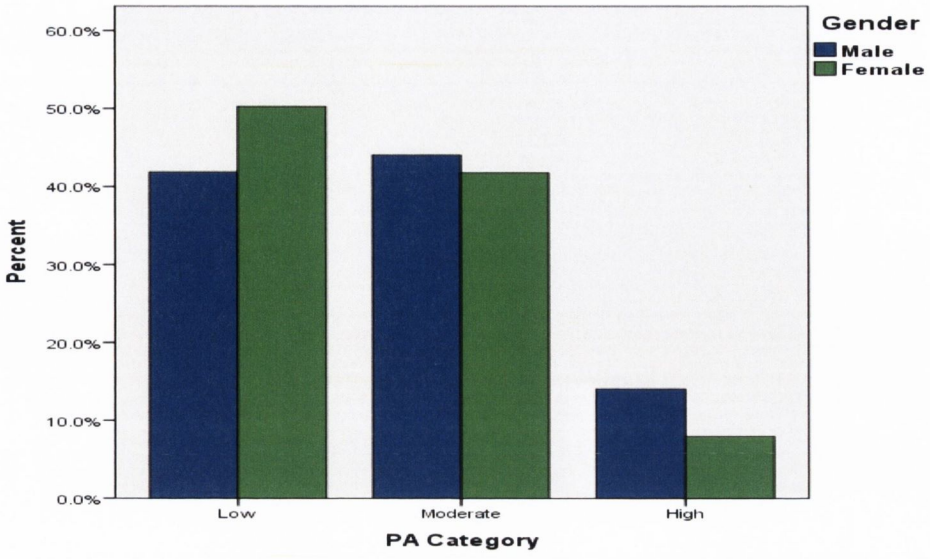

Figure 20 Physical Activity Category according to Gender

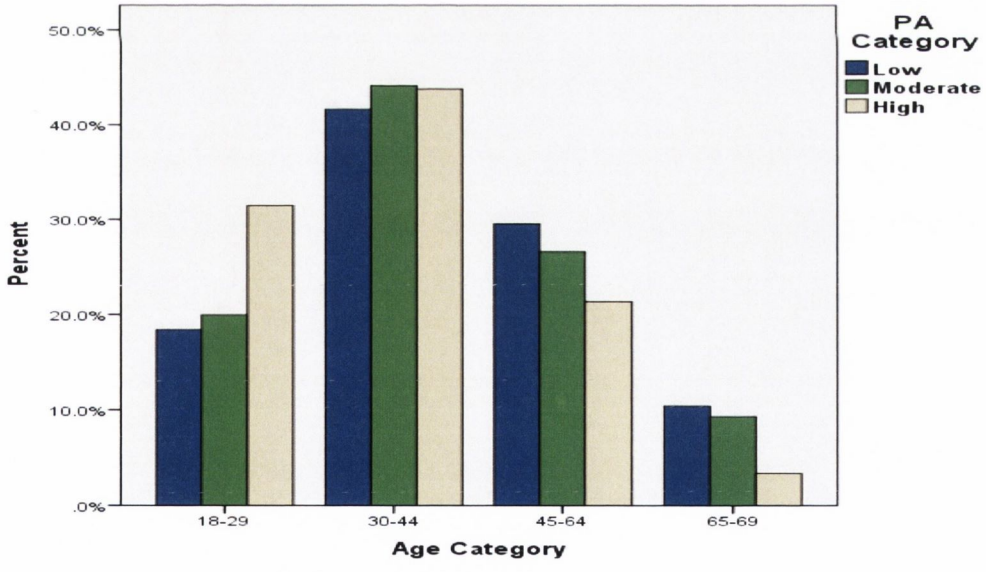

Figure 21 Physical Activity Category according to Age

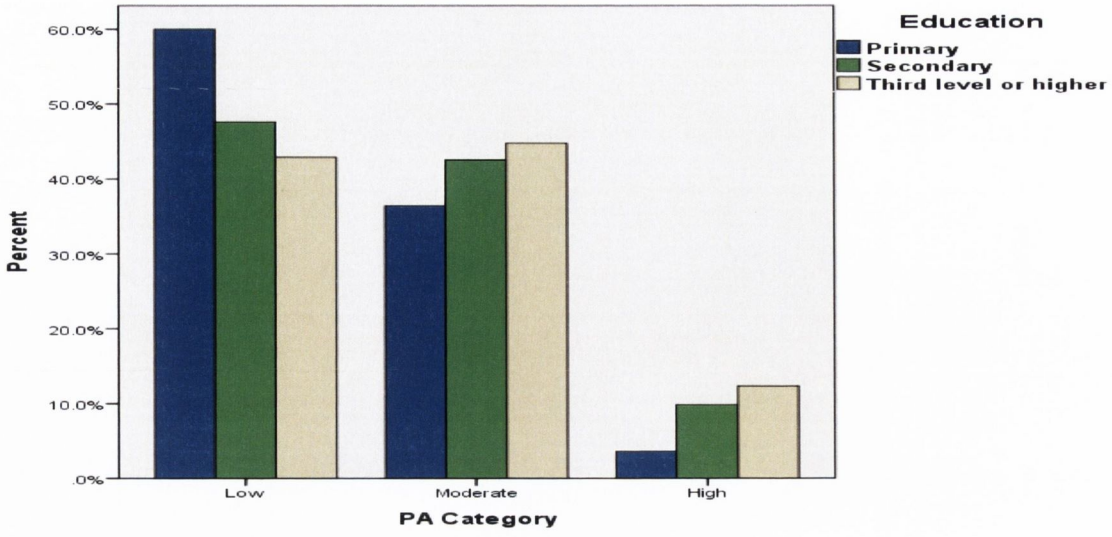

Figure 22 Physical Activity Category according to Education

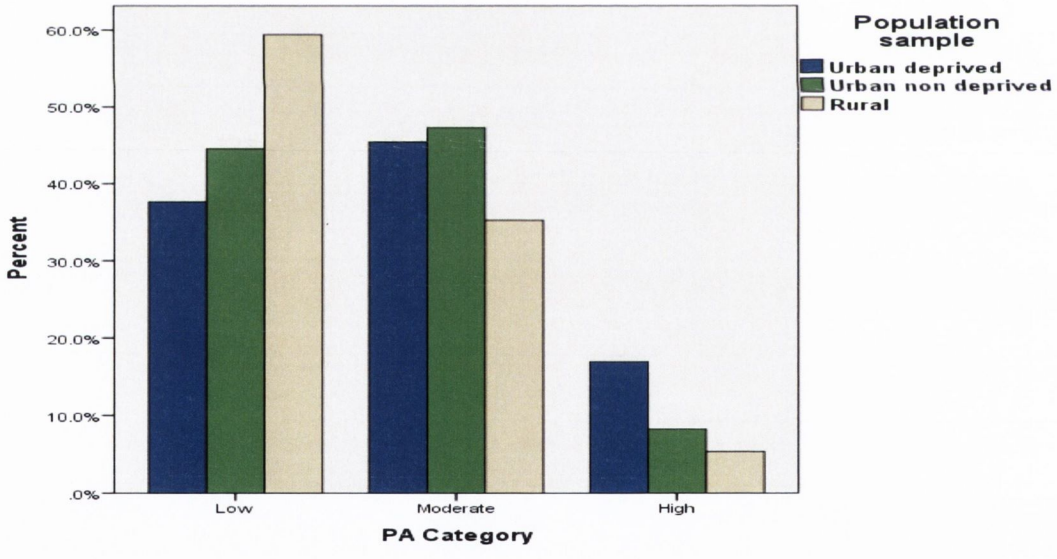

Figure 23 Physical Activity Category according to Primary Care Location

Total Weekly Physical Activity

Table 17 presents the total weekly PA scores of participants, as well as data in relation to walking which will be discussed in the following section. Data are presented as median MET minutes/week (IQR) and detailed according to demographic variables and primary care location.

The total weekly PA score for all participants was 693 MET minutes/week (IQR 320-1440). Male participants carried out significantly more total weekly PA than females as highlighted in the box plot in Figure 24 ($p<0.001$).

There was a statistically significant difference in the total weekly PA scores between participants in the four different age categories ($p=0.02$). Using a Bonferroni adjusted alpha level of $p=0.01$, post hoc analysis revealed a statistically significant difference between the youngest age category and the 45-64 age group ($p=0.01$). Figure 25 highlights the total weekly activity scores for males and females according to age category.

The education status of participants showed a statistically significant relationship with total weekly PA scores ($p=0.002$). Post hoc analysis with an adjusted alpha level of $p=0.025$, demonstrated that participants with a primary education only, carried out significantly less PA than either of the other two education groups (secondary $p=0.006$, third level $p<0.001$).

There were statistically significant differences between the total weekly activity scores of the three primary care areas as highlighted by the boxplots in Figure 26. The rural group reported the lowest level of PA in a week and this was significantly lower than both the urban deprived group ($p<0.001$) and the urban non deprived group ($p<0.001$).

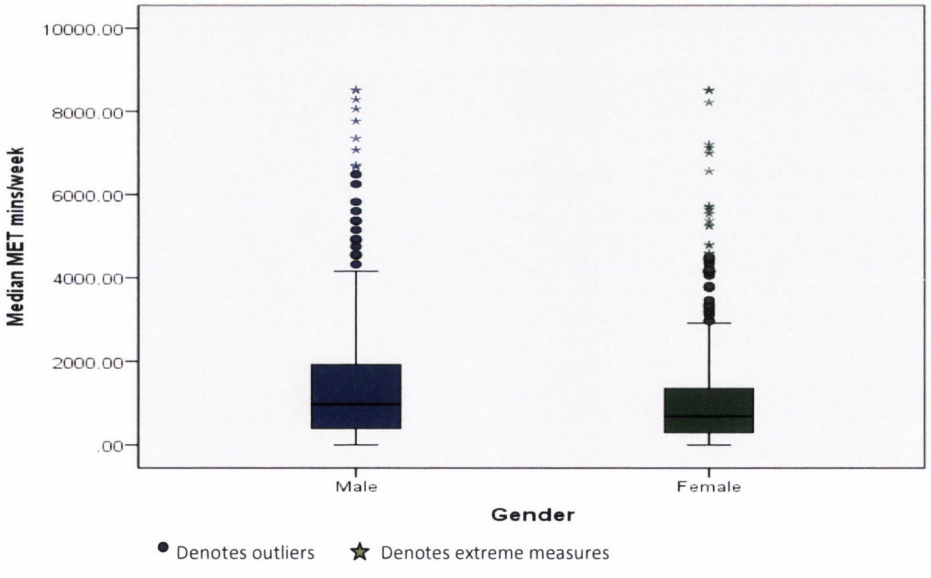

Figure 24 Total Weekly Physical Activity of Males and Females

Table 17 Physical Activity Scores Presented as Median MET minutes/week according to Sociodemographic Variables and Primary Care Location

	% (n)	Total weekly PA Median (IQR)	p value	Weekly walking Median (IQR)	p value
Total	n=885	693 (319-1140)		462 (198-891)	
Gender					
M	36.2 (320)	975 (396-1920)	p<0.001	396 (132-870)	ns
F	63.8 (565)	686 (297-1356)		462 (198-891)	
Age category *1					
18-29	20.0 (179)	843 (366-1805)	p=0.02	495 (198-990)	ns
30-44	42.6 (377)	792 (396-1465)		396 (132-792)	
45-64	27.2 (241)	594 (264-1386)		462 (198-829)	
65-69	9.2 (81)	579 (247-1386)		371 (198-973)	
Education level *2					
Primary	15.8(140)	480 (198-1386)	p=0.002	330 (33-767)	p=0.008
Secondary	35.6 (315)	716 (319-1390)		396 (132-396)	
Third level	47.7 (422)	808 (396-1525)		495 (198-924)	
Medical card holder *3					
Yes	51.3 (454)	693 (264-1386)	ns	462 (198-924)	ns
No	48.6 (430)	779 (396-1491)		396 (198-792)	
Primary care location					
Urban deprived	33.3 (295)	975 (445-1933)	p<0.001	693(297-1386)	p<0.001
Urban non deprived	33 (292)	743 (428-1419)		462 (224-813)	
Rural	33.7 (298)	535 (132-1197)		229 (0-544)	

*[1] data missing for 7 participants *[2] data missing for 8 participants *[3] data missing for 1 participant

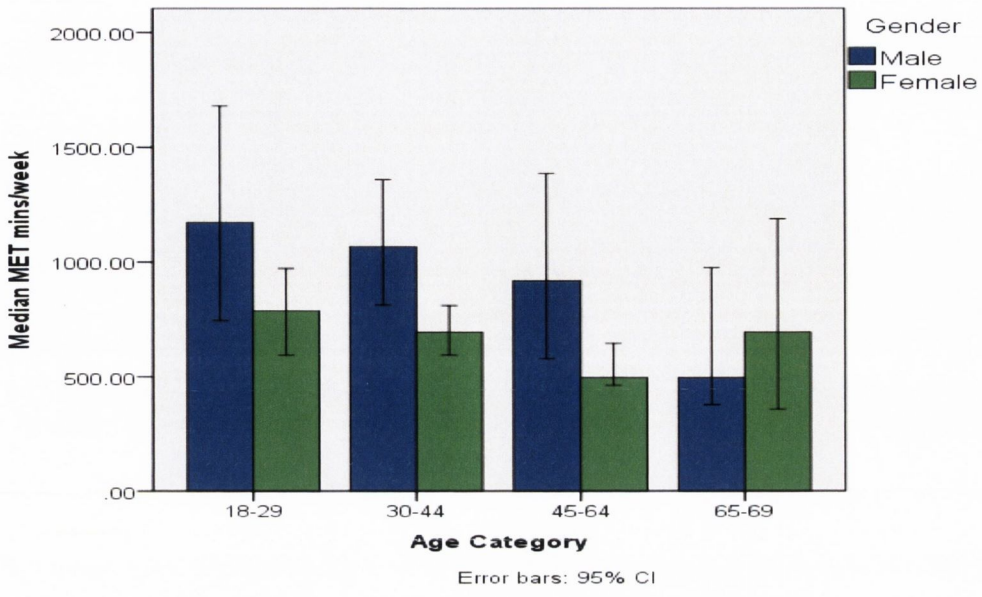

Figure 25 Total Weekly Physical Activity of Males and Females according to Age

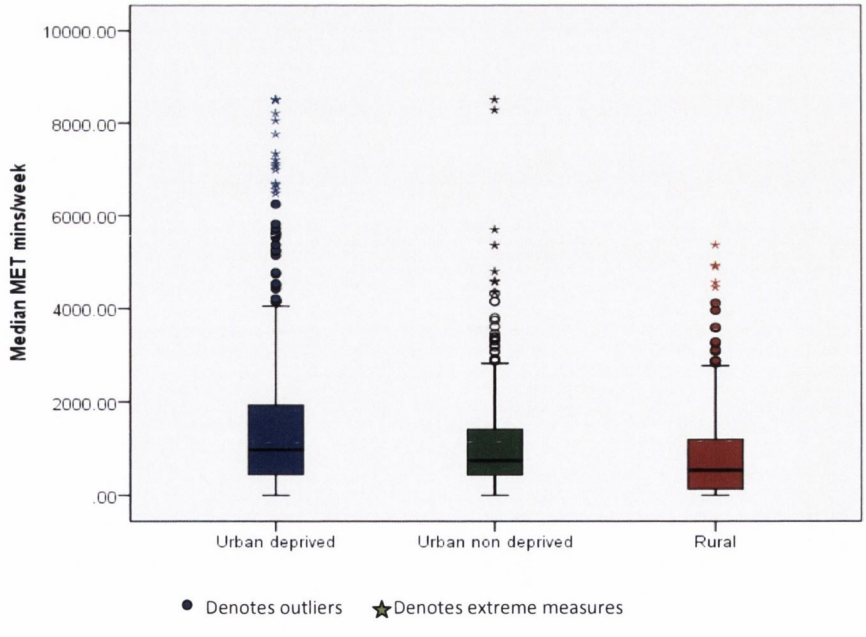

Figure 26 Total Weekly Physical Activity according to Primary Care Location

Intensity of physical activity

The PA data from the IPAQ was examined further in terms of the intensity of exercise (vigorous/moderate), as well as for walking. The weekly walking scores of participants are presented according to demographic variables and primary care location in Table 17.

There were significant differences between male and female participants with males engaging in significantly more vigorous ($p<0.001$) and moderate activity than females ($p=0.003$). Walking was the only activity in which females reported higher levels than males, however this did not reach statistical significance.

Participants across all age categories performed similar amounts of moderate intensity activity and walking. The distribution of vigorous activity differed however, with the two younger age categories carrying out significantly more of these types of activities than older participants ($p=0.01$).

There was a statistically significant relationship between education and PA intensity. For each of the three intensities, those with a primary education only, performed the least amount of activity and those with a third level education performed the highest amount of activity (vigorous $p=0.002$, moderate $p=0.003$, walking $p=0.008$).

Non medical card holders carried out higher levels of both vigorous ($p=0.002$) and moderate ($p=0.028$) intensity exercise than medical card holders but there was no difference seen between the groups for walking.

The amounts of vigorous and moderate intensity activity reported by participants did not differ according to primary care location. There were however significant differences in the amount of walking by participants in the three different primary care locations ($p<0.001$) as highlighted by the box plot in Figure 27. Participants in the urban deprived location reported significantly higher levels of walking than either the urban non deprived ($p<0.001$) or rural samples ($p<0.001$). The urban non deprived sample also carried out significantly more walking than the rural sample ($p<0.001$).

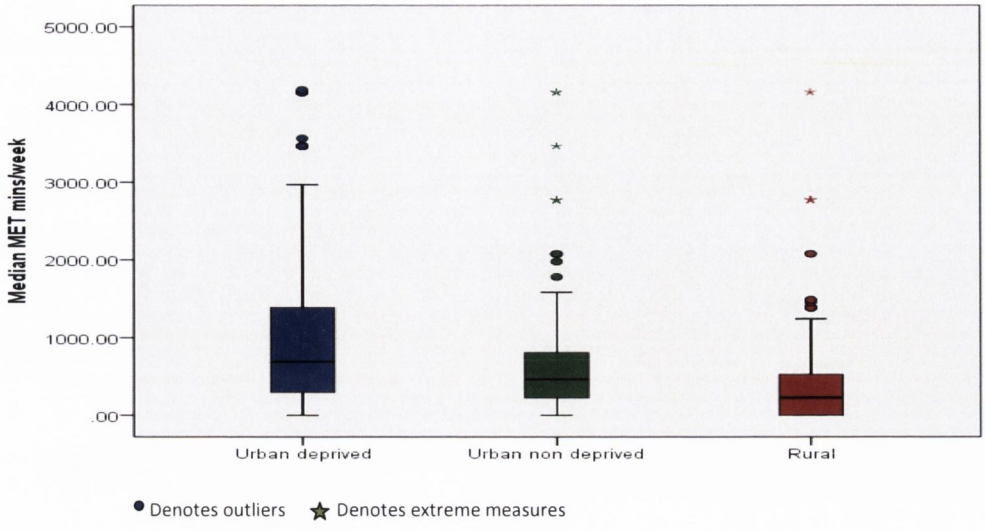

Figure 27 Total Weekly Walking according to Primary Care Location

5.3.4 Prevalence of No Physical Activity

Ten percent (n=89) of the total sample reported taking no PA in a week and this did not differ significantly according to gender, age or medical card status.

Significant differences in the proportion of participants reporting no PA in a week were found between different educational levels (χ^2=7.408, df=2, p=0.025) and between different primary care locations (χ^2=41.51, df=2, p<0.001).

Sixteen percent (15.7%, n=22) of the primary only educational category reported no PA in the last week, compared with 9.8% (n=31) of the secondary group and 7.8% (n=33) of the third level group. The largest prevalence of inactivity was found in the rural primary care area with almost 20% (19.1%, n=57) of this sample reporting no PA in the last week. This compared to 6.4% (n=19) of the urban deprived and 4.5% (n=13) of the urban non deprived samples.

5.3.5 Physical Activity over the Previous Six Months

Question eight asked respondents to state how physically active[6] or inactive they had been over the past 6 months. Fifty percent (n=443) of respondents reported having been physically active with 41% (n=363) having been physically active for more than six months.

Of those participants who did not meet the PA guidelines, 36.3% (n=150) were actively considering becoming physically active within the next month and 25.9% (107) were thinking about becoming physically active in the next six months.

[6] "Physically active" was defined as vigorous exercises or sport three times a week for a minimum of 20 minutes or more general activities like walking, cycling or dancing five times per week for at least 30 minutes a day

5.3.6 Prevalence of an Injury or Disability Limiting Physical Activity

Forty four percent (44.5%, n=394) of all respondents and 50.1% (n=209) of those not meeting the PA guidelines felt they had an injury or disability that limited their ability to be physically active. There was a significant difference between the prevalence of disability/injury between the primary care areas (χ^2=12.10, df=2, p=0.002). The urban non deprived sample reported the least at 36.3% (n=106). Both the rural and urban deprived samples reported similar rates of disability/injury at 49% (n=146) and 48.3% (n=142) respectively.

5.3.7 Physical Activity and Cardiovascular Risk Factors

The cardiovascular details of participants, excluding physical inactivity have previously been presented in Section 5.3.2 and Table 15.

As presented in Table 18, when physical inactivity (low PA IPAQ category) is included as a risk factor, the percentage of participants having at least one CVRF increased from 74.1% (n=656) to 85.3% (n=755). The percentage of participants having at least two CVRFs increased from 35.8% (n=317) to 64.5% (n=571). Physical inactivity (47.2%, n=418) was the second most common CVRF after being overweight (51%, n=453) and it was the only risk factor which was significantly higher in females than in males (χ^2 =10.76, df=2, p=0.005).

Table 18 Prevalence of Cardiovascular Risk Factors Exclusive and Inclusive of Physical Inactivity amongst Male and Female Participants

	Total %(n) n=885	**Males** %(n) n=320	**Females** %(n) n=565	**p value**
At least one CVRF	74.1 (656)	85.9 (275)	67.4 (381)	p<0.001 χ^2=36.47
One CVRF including physical inactivity	85.3 (755)	90 (288)	82.7 (467)	p=0.003 χ^2=8.79
At least two CVRF	35.8 (317)	45.9 (147)	30.1 (170)	p<0.001 χ^2=22.32
Two CVRF including physical inactivity	64.5 (571)	65 (208)	64.2 (363)	ns

CVRF cardiovascular risk factor

Physical Activity Category and Cardiovascular Risk Factors

There was no significant relationship between PA category (low, moderate, high) and the presence of none, one or two CVRFs controlling for age and gender.

Table 19 presents the percentage prevalence of one and two CVRFs together with odds ratios and relative risk in participants meeting and failing to meet the PA guidelines. For both males and females the odds of having one or two CVRFs were higher in the group failing to meet the PA recommendations. The largest odds (1.93) were found in males for the presence of one CVRF, followed by males for the presence of two CVRFs (1.81). Over 90% of males failing to meet the PA guidelines reported at least one CVRF.

Table 19 Odds Ratios and Relative Risk of Cardiovascular Risk Factors in Participants Failing to Meet Physical Activity Guidelines

Meets the PA Guidelines	Yes/No % (n)	1 CVRF prevalence % (n)	Odds ratio (95% CI)	Relative risk (95% CI)	2 CVRF Prevalence % (n)	Odds ratio (95% CI)	Relative risk (95% CI)
Total n=885	**No** 47.2 (418)	76.3 (319)	1.24 (0.92-1.68)	1.06 (0.98-1.14)	39.2(164)*	1.32 (1.01-1.74)	1.20 (1.00-1.43)
	Yes 52.8 (467)	72.2 (337)			32.8(153)*		
Males n=320	**No** 41.9 (134)	90.3 (121)	1.93 (0.97-3.84)	1.09 (1.00-1.19)	54.5 (73)*	1.81 (1.16-2.84)	1.37 (1.08-1.73)
	Yes 58.2 (186)	82.8 (154)			39.8 (74)*		
Females n=565	**No** 50.3 (284)	69.7 (198)	1.23 (0.87-1.75)	1.07 (0.95-1.20)	32 (91)	1.21 (0.84-1.73)	1.14 (0.89-1.47)
	Yes 49.8 (281)	65.1 (183)			28.1 (79)		

* $p < 0.05$ CI Confidence Interval

Total Weekly Physical Activity and Cardiovascular Risk Factors

There was a statistically significant difference in the total weekly PA scores between participants with no, one and two CVRFs ($p=0.006$). Participants with no risk factors performed the highest amount of PA (924 METS minutes/week, IQR 396-1656) followed by those with one CVRF (693 METS minutes/week, IQR 320-1413). Participants with two CVRFs performed the lowest amount of PA (633.5 METS minutes/week, IQR 264-1386). Further post hoc analysis revealed that participants with two CVRFs carried out significantly lower levels of PA than those with no CVRFs (alpha level adjusted to $p < 0.025$, $p=0.001$).

The relationship between total weekly PA and CVRFs was further examined controlling for gender and age. Males with no CVRFs carried out the highest levels of PA (1386 METS minutes/week, IQR 607.5-3065) whilst males with two risk factors carried out the least (742.5 METS minutes/week, IQR 264-1644) as demonstrated in the box plot in Figure 28 ($p=0.008$). There was a similar statistically significant relationship for females as demonstrated in Figure 29 ($p=0.013$). There was no relationship between total weekly PA and CVRFs when controlling for age.

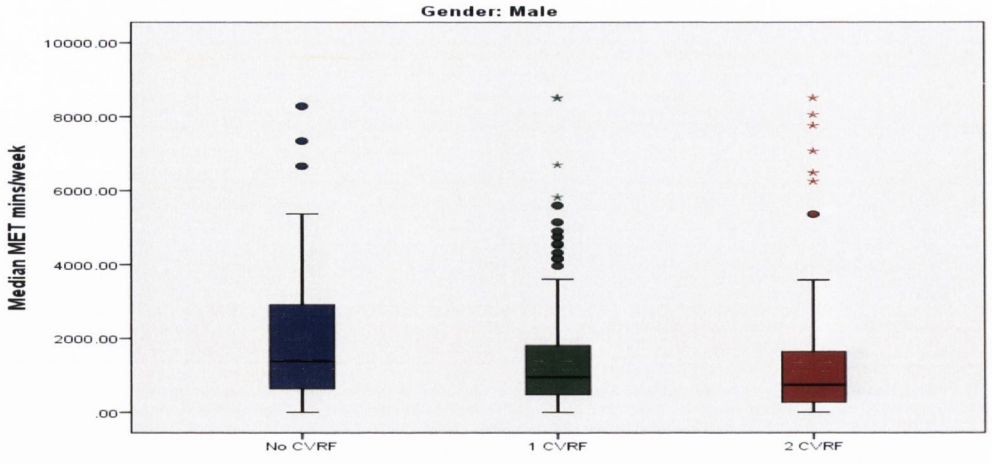

Figure 28 Total Weekly Physical Activity according to Cardiovascular Risk Factor Prevalence in Males

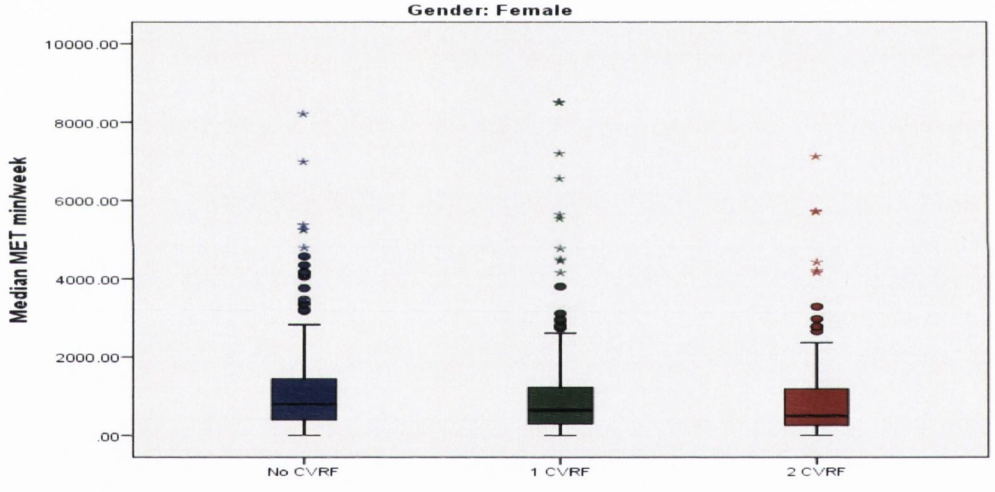

Figure 29 Total Weekly Physical Activity according to Cardiovascular Risk Factor Prevalence in Females

5.3.8 Correlates of Low Physical Activity

Finally, binary logistic regression analysis was used to determine whether there was a correlation between socio-demograhic variables and cardiovascular/disability variables and participants classified as low active. Results are presented in Table 20. Included in the regression analysis were socio-demographic variables; gender, age, education status, medical card holder and primary care location. Included in the cardiovascular/disability variables were; previous cardiovascular history, overweight/obesity, smoker, raised cholesterol, diabetes, hypertension and an injury/disability limiting PA. Upon adjustment for multiple factors by logistic regression, female gender, education status, primary care location and having a

disability/injury limiting PA were predictive of low activity levels. The highest odds were reported for participants attending rural primary care locations.

Table 20 Correlates of Low Physical Activity

Variable	Odds Ratio (OR)	95% Confidence Intervals	p Value
Gender (ref male)			
Female	1.59	1.19 to 2.13	P=0.002
Age	1.01	0.99 to 1.02	ns
Medical card (ref no)			
Yes	0.84	0.60 to 1.17	ns
Education: (ref primary only)			
Secondary	0.50	0.33 to 0.77	p=0.002
Third level	0.39	0.25 to 0.61	P<0.001
Primary Care Location: (ref urban deprived)			
Urban non deprived	1.84	1.27 to 2.68	p=0.001
Rural	2.86	2.01 to 4.05	p<0.001
Previous cardiovascular history (ref no)	1.03	0.53 to 2.01	ns
Overweight or obese (ref BMI<25)			
BMI 25 to 29.9	1.00	0.72 to 1.39	ns
BMI ≥30	1.25	0.84 to 1.87	ns
Smoker (ref no)	1.10	0.81 to 1.51	ns
Raised cholesterol (ref no)	1.17	0.76 to 1.83	ns
Diabetes (ref no)	1.85	0.80 to 4.29	ns
Hypertension (ref no)	1.27	0.83 to 1.97	ns
Disability/injury limiting PA (ref no)	1.45	1.20 to 1.92	p=0.009

SUMMARY ON THE MAIN FINDINGS ON PHYSICAL ACTIVITY

Overall 47% percent of all patients attending Irish primary care services were found to be insufficiently active to meet current public health recommendations on physical activity. People failing to meet the guidelines were more likely to be female, of older age, have a low level of educational attainment and attend a rural primary care centre.

Forty two percent (42.6%) of primary care patients were classified as moderately active and 10.2% were classified as high active. Those classified as high active were more likely to be male, of younger age, have higher levels of educational attainment and attend an urban deprived primary care centre.

The median amount of total physical activity for all participants was 693MET minutes/week (IQR 319-1140).

Different patterns emerged in the intensity of physical activity carried out, with males and younger age groups carrying out more vigorous intensity activities. Walking was reported more frequently by the urban deprived group than either of the two other primary care areas.

Ten percent of the overall sample reported taking no physical activity at all, but this rose to 20% when reported for the rural sample independently.

Of those not meeting the physical activity guidelines, over a third were considering becoming active in the immediate future and a further quarter within the next six months.

Forty five percent of all participants felt they had an injury or disability that limited their ability to be physically active.

Overall 85% of all participants reported at least one cardiovascular risk factor inclusive of physical inactivity. Physical inactivity was the second most common cardiovascular risk factor after being overweight. Participants who did not meet the physical activity guidelines were more likely to have other cardiovascular risk factors than people meeting the recommendations.

5.3.9 Sitting Time

In this section sitting data from the IPAQ will be presented according to socio-demographic variables and primary care location. Sitting time is presented as a categorical measure of sitting; divided into five two hourly categories and as a continuous sitting score expressed as median (IQR) minutes per weekday.

Sitting Category

Table 21 presents the time spent sitting by participants presented according to socio-demographic variables and primary care location. Overall fifty two percent (n=452) sat for under four hours and 48% (n= 418) sat for more than four hours.

There were significant associations between sitting category and gender (χ^2= 43.92, df=4, p<0.001), age (χ^2=37.54, df=12, p<0.001) and primary care area (χ^2=41.25, df =8, p<0.001)and these are presented graphically in Figures 30 to 32.

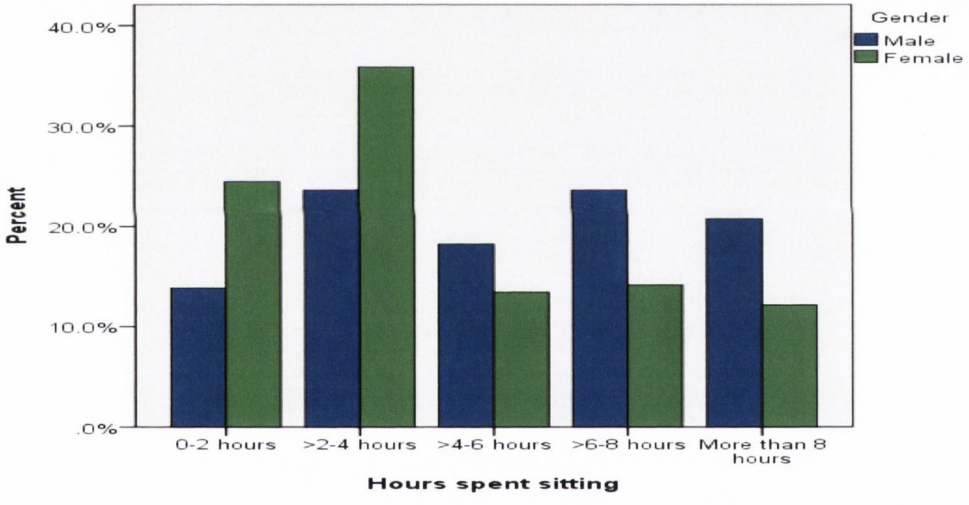

Figure 30 Number of Hours spent Sitting by Male and Female Participants

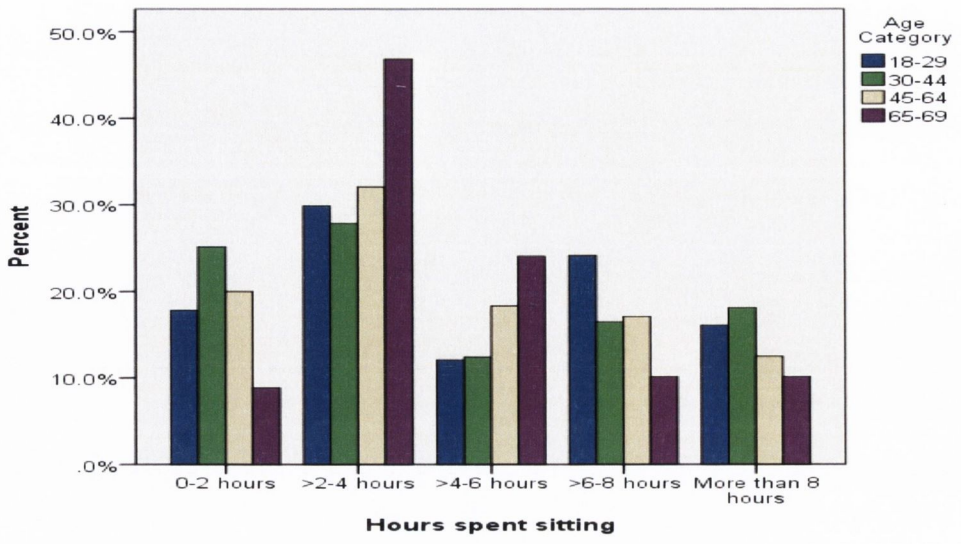

Figure 31 Number of Hours spent Sitting according to Age

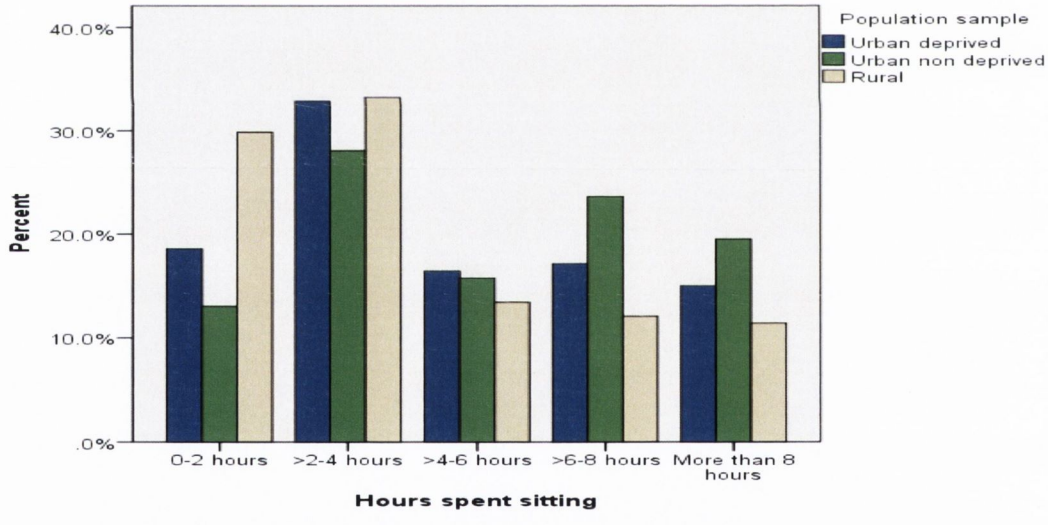

Figure 32 Number of Hours spent Sitting according to Primary Care Location

Table 21 Weekday Sitting Times according to Socio-demographic Variables and Primary Care Location

		0 to 2 hours % (n)	>2 to 4 hours % (n)	>4 to 6 hours % (n)	>6 to 8 hours % (n)	Greater than 8 hours % (n)	p value	Sitting time in minutes median (IQR)	p value
Total [*1]	n= 885	20.6 (179)	31.4 (273)	15.2 (132)	17.6 (153)	15.2 (133)		240 (150-480)	
Gender									
Male	36.2 (320)	13.8 (44)	23.6 (75)	18.2 (58)	23.6 (75)	20.8 (66)	p<0.001	360 (187-480)	p<0.001
Female	63.8 (565)	24.5 (135)	35.9 (198)	13.4 (74)	14.1 (78)	12.1 (67)		240 (120-420)	
Age [*2]									
18-29	20.2 (179)	17.8 (31)	29.9 (52)	12.1 (21)	24.1 (42)	16.1 (28)	p<0.001	270 (180-480)	ns
30-44	42.6 (377)	25.1 (93)	27.8 (103)	12.4 (46)	16.5 (61)	18.1 (67)		240 (120-480)	
45-64	27.2 (241)	20 (48)	32.1 (77)	18.3 (44)	17.1 (41)	12.5 (30)		240 (180-420)	
65-69	9.2 (81)	8.9 (7)	46.8 (37)	24.1 (19)	10.1 (8)	10.1 (8)		240 (180-360)	
Education [*3]									
Primary	15.8 (140)	19 (26)	27 (37)	17.5 (24)	16.8 (23)	19.7 (27)	ns	300 (150-480)	ns
Secondary	35.6 (315)	21.2 (65)	35 (107)	13.1 (40)	17 (52)	13.7 (42)		240 (150-420)	
Third level	47.7 (422)	20.7 (87)	30.6 (129)	16.2 (68)	18.1 (76)	14.5 (61)		240 (180-480)	
Medical Card Holder [*4]									
Yes	51.3 (454)	19.7 (87)	32.9 (145)	16.8 (74)	17.7 (78)	12.9 (57)	ns	240 (172-480)	ns
No	48.6 (430)	21.3 (91)	29.9 (128)	13.6 (58)	17.5 (75)	17.8 (76)		240 (150-420)	
Primary Care Area									
Urban deprived	33.3 (295)	18.6 (52)	32.9 (92)	16.4 (46)	17.1 (48)	15 (42)	p<0.001	240 (180-480)	p<0.001
Urban non deprived	33 (292)	13 (38)	28.1 (82)	15.8 (46)	23.6 (69)	19.5 (57)		345 (180-480)	
Rural	33.7 (298)	29.9 (89)	33.2 (99)	13.4 (40)	12.1 (36)	11.4 (34)		180 (120-360)	

*[1] data missing for 15 participants *[2] data missing for 7 participants *[3] data missing for 8 participants *[4] data missing for 1 participant

Sitting Time

This section examines the weekday sitting time of participants expressed as median minutes per weekday presented in Table 21.

The median sitting time for all participants was 240 minutes per day which is equivalent to four hours sitting per day. There was a statistically significant difference in the median sitting time between the genders ($p<0.001$) with males sitting for two hours more than females per day. This finding is highlighted graphically in the box plot in Figure 33.

There was a significant difference between the median sitting times of participants attending the three different primary care locations as highlighted in Figure 34. Post hoc analysis, examining each of the three possible pairings of primary care location demonstrated significant differences on each pairing (UD Vs UND $p=0.001$, UD Vs R $p=0.002$, UND Vs R $p<0.001$) (alpha level adjusted to 0.016).

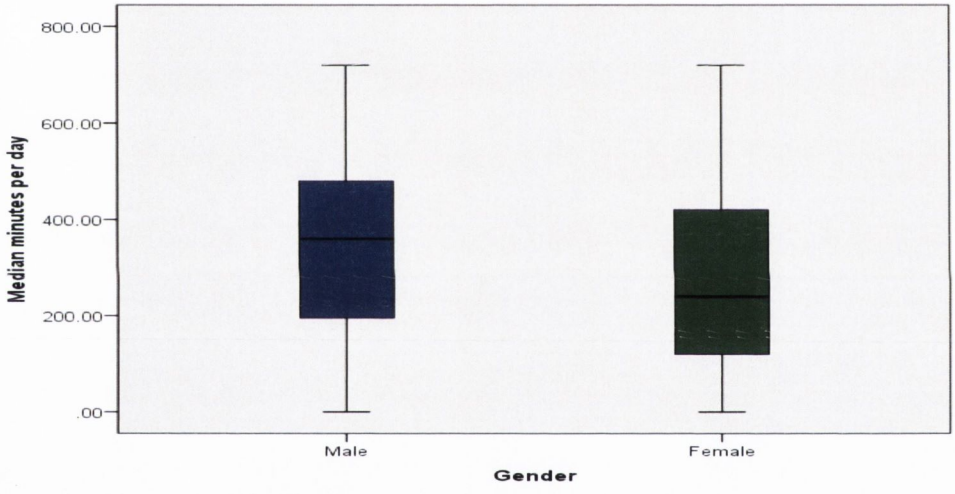

Figure 33 Daily Sitting Time of Males and Females

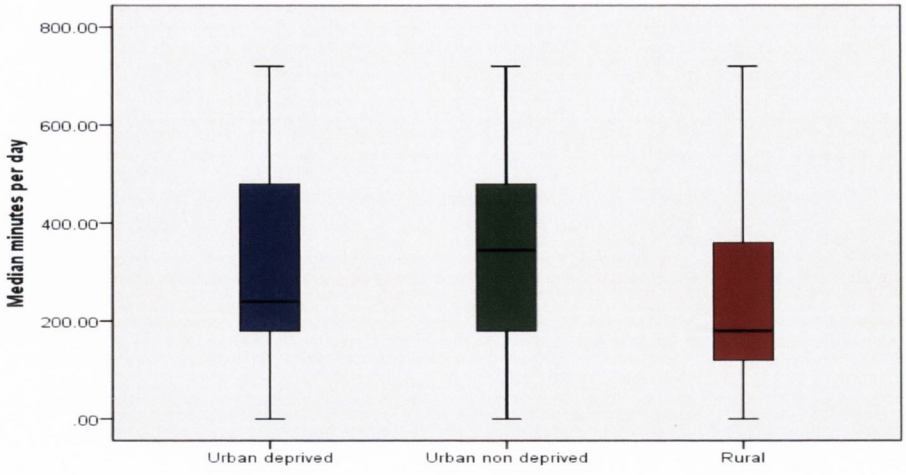

Figure 34 Daily Sitting Time according to Primary Care Location

Correlates of High Sitting Time

Generalised linear regression, scale response, gamma with log link was used to determine whether there was a correlation between socio-demographic variables, PA, cardiovascular/disability variables and sitting time. Results are presented in Table 22. Included in the regression analyses were socio-demographic variables; gender, age, education status, medical card and primary care location. Included in the cardiovascular/disability variables were; the presence of none, one or two CVRFs, previous cardiovascular history and an injury/disability limiting PA. The significant factors remaining in the model after removal of non significant variables are detailed in Table 22. Attendance at the urban non deprived primary care centre and having a disability or injury limiting PA were associated with higher sitting times.

Table 22 Correlates of High Sitting Time

Variable	B	p Value
Gender: (ref male)		
Female	-0.288	p<0.001
Age (scale)	-0.006	p<0.001
Education: (ref primary only)		
Secondary	-0.168	p=0.008
Third level	-0.188	p=0.004
Primary Care Location (ref urban deprived)		
Urban non deprived	0.233	p<0.001
Rural	-0.123	p=0.013
Disability/injury limiting PA (ref no)	0.101	p=0.016

5.3.10 **Physical Activity and Sedentary Time**

There was no significant relationship between sitting time and PA category (low, moderate and high).

Spearman's rho analysis was used to assess for a correlation between time spent sitting and total weekly PA. There was a weak, but statistically significant, negative correlation between sitting time and PA ($r=-0.069$, $p=0.05$), indicating that as people became more physically active, the less time they spent in sitting.

SUMMARY OF THE MAIN FINDINGS ON TIME SPENT SITTING

The median sitting time for all primary care patients was four hours a day. Males sat for an average of two hours longer a day than females.

Overall 20% of the total sample reported sitting for less than two hours a day, and 15% reported sitting for more than eight hours each day. Fifty two percent of participants sat for less than four hours a day and 48% sat for more than four hours a day.

There was a significant difference in the sitting times of participants attending the three different primary care locations. The urban non deprived group reported the highest sitting times and the rural group reported the least sitting.

There was weak evidence to suggest that as people became more physically active, their sitting time decreased.

Attendance at the urban non deprived primary care centre and having a disability or injury limiting physical activity were associated with higher sitting times.

Female gender, increasing age, increasing educational level and attendance at the rural primary care centre were associated with lower sitting times.

5.4 Discussion

5.4.1 Response Rate and Demographic Variables

Overall there was an excellent response rate to this survey with negligible numbers of refusals or incomplete datasets, suggesting that the IPAQ is an acceptable and simple method of population screening in primary care. It also suggests that primary care patients are interested and willing to answer questions on their PA levels.

The study sample contained significantly more females than males, however, the gender distribution did not differ significantly between the three primary care areas and data from the Irish population has previously shown that females of all ages were more likely than males to consult with their GP (Morgan et al., 2008, Central Statistics Office, 2011). The median age of participants at 39, was slightly older than the average age of the general population at 36.1 (Central Statistics Office, 2012a). The overall age profile of participants was quite young with over 60% of the sample aged 44 and under.

There was a higher proportion of medical card holders in the study than the number reported in the general population, which the most recent official figures report at 40% (Department of Health, 2013a). Studies have shown however, that medical card eligibility exerts a significant effect on GP visiting in Ireland, with medical card holders more likely to consult with their GP than non-card holders (Nolan and Smith, 2012, Nolan and Nolan, 2008). The urban deprived sample contained the highest number of medical card holders with 77% of this sample being in receipt of a medical card.

The distribution of participants attending different primary care professionals in this study is similar to the utilisation figures reported in the general Irish population (Central Statistics Office, 2011, Morgan et al., 2008). For example, the most recent health service utilisation figures in 2013 reported 74% of the general population consulting with their GP at least once in the previous 12 months and 6% with a community or public health nurse (Central Statistics Office, 2011). Attendance at an alternative practitioner has been estimated at 9% of the population (Morgan et al., 2008). It was a specific target of this study to recruit patients attending all members of the primary care team. Whilst the GP remains the most consulted primary care professional, other health professionals have also a significant role to play within the area of PA promotion. It was important, therefore, to capture data that was an accurate representation of the diversity of patients attending primary care.

5.4.2 Physical Activity of Primary Care Patients

The overall aim of Study II was to provide a descriptive analysis of the PA levels and sitting behaviours of Irish primary care patients. This is of particular relevance given the importance of primary care as an environment in which to target both primary and secondary prevention of chronic disease (Bodenheimer et al., 2002). It is also particularly relevant and timely within an Irish context, given the ongoing reformation of health services and the increased emphasis on primary care (Department of Health, 2012).

The PA levels of patients with specific diseases such as diabetes (Adeniyi et al., 2010, Fagour et al., 2013, Zhao et al., 2011), cancer (Vermaete et al., 2013, Mason et al., 2013) and stroke (Gebruers et al., 2010, English et al., 2014) have been recently described in the international literature, however only one other study provided a more detailed analysis of the PA levels of primary care patients as a distinct population (Grandes et al., 2008b). This Spanish study found that at least 70% of patients attending their GP did not achieve the minimal PA recommendations; inactivity increased with advancing age, and was more prevalent in women and in younger people. However, as it limited inclusion to people attending GP services only and used the 7 day Physical Activity Recall as its measure of PA, direct comparison with the current study is limited.

Physical Activity Prevalence

The finding that 47% of all primary care patients are insufficiently active and do not meet public health guidelines is a significant and troubling result, given that physical inactivity is a key risk factor in the development of many chronic diseases (Chapter 1 Section 1.4). This compares to general population estimates of 21.4% and 31.1% using worldwide prevalence studies (Hallal et al., 2012, Dumith et al., 2011) and of 27.5% and 34.8% using the most recent European estimates (Bennie et al., 2013, Hallal et al., 2012). This is also a much higher rate of inactivity than previous general population estimates for Ireland, which the SLÁN study reported at 29% (Morgan et al., 2008) and the most recently available study reported at 31.8% (McKee et al., 2012). This is of particular relevance when one considers that the estimates provided by McKee et al (2012) were for adults aged 50 and over and the age profile of the current study participants was much younger.

There are also notable differences when considering the distribution of low activity among the genders. The SLÁN study, which also used the IPAQ to categorise activity levels found that 26% of men and 31% of Irish women were classified as low active. Using the figures provided by Dumith et al (2011), 28% of Irish males and 40% of Irish females were found to be low active. This compares to 41.9% of males and 50.3% of females in the current study. These results would suggest that Irish primary care patients are significantly more inactive than the general population. Unfortunately, as the last available data based on a representative national sample and including all age groups is now over six years old, it is difficult to say with certainty, whether current findings reflect a general trend in decreasing activity in the Irish population as a whole, or are a reflection of reduced PA levels of primary care patients.

As well as having more people classified as low active, primary care patients are less likely to engage in high levels of activity, as classified by the IPAQ, than general population samples. Only 10% of the primary care sample reported high PA levels, compared with 24% of the SLÁN sample and 34% of older Irish adults (Morgan et al., 2008, McKee et al., 2012). The percentage of people carrying out moderate levels of PA is comparable between the current study and SLÁN (42.6% Vs 47% SLÁN) and higher than that reported in older adults (34.4%).

When the total amount of PA in a week is compared with studies providing similar estimates, primary care patients carried out a median of 693MET minutes/week or just under 12MET

hours/week PA. This is half the EU average which was reported as 24 median MET hours/week based on Eurobarometer data gathered in 2003 (Rutten and Abu-Omar, 2004). It is also, almost half the amount of PA reported for Irish people in the same study (23 median MET hours/week PA).

A positive finding from this study was that the proportion of people taking no exercise at all appears to have decreased. Overall 10% of primary care patients reported taking no exercise, in comparison with 27% of the general population as reported in SLÁN (Morgan et al., 2008). It may be that some of the recent focus on PA through the media, together with the launch of the National PA Guidelines for Ireland in 2009 may have gone some way towards increasing participation in adults (Department of Health and Children, 2009b). When planning and budgeting for primary care led PA interventions, it is important to establish the specific needs of the local population. Results from this study would suggest that reliance solely on national level data is likely to underestimate the extent of the problem.

Physical Activity and Gender

Establishing population levels of PA is a key surveillance indicator of public health, providing important information on activity trends as well as equity. This study would suggest that the patterns towards inactivity in primary care are similar to those seen in general populations. Females appear to be more at risk from insufficient activity than males; they are also less likely to engage in higher levels of activity. In this study, females carried out 30% less total PA in a week than males. The actual median difference between men and women was 289 MET-minutes/week which equates to 42 MET minutes/day. This corresponds to 10.5 minutes[7] of moderate intensity activity per day, which, when considered in terms of an intervention perspective may be considered quite small. These findings reflect those seen in large scale population studies both nationally and internationally which have consistently shown that males report higher levels of PA than females (Morgan et al., 2008, Townsend et al., 2012, Devonshire-Gill and Norton, 2013, Bauman et al., 2009, Hallal et al., 2012).

It is informative to examine this gender difference in the context of the intensity of PA. Females performed significantly less vigorous and moderate intensity exercise in a week than males. This suggests that the gender gap in overall PA was accounted for by females' low participation in these vigorous and moderate intensity activities rather than walking which did not significantly differ between the genders. This finding may reflect the reduced participation in organised sport by Irish women of all ages compared to their male counterparts (Lunn et al., 2013). Similar findings were reported in international populations with men of every age more likely to participate in vigorous activity than females (Sjostrom et al., 2006, Hallal et al., 2012).

[7] Calculation based on the IPAQ scoring formula which multiplies minutes of moderate intensity PA by a multiple of four to calculate MET minutes/week.

Physical Activity and Age

PA decreased with increasing age. There was an increase of more than 10% in the proportion of people classified as low active between the youngest and oldest age groups. There was also a decrease of just under 12% in the proportion of people classified as high active between the younger and older age groups. This is similar to the 10% difference between those classified as high active in older compared to younger groups reported by Bauman et al (2009) in the International Prevalence study.

In this research, when the total volume of activity undertaken was examined, the largest decline was seen between the two middle aged categories, with a 25% decrease in total weekly activity between the 30-44 age category and the 45-64 year age category. Overall, there was a decline in PA of 32% between the youngest and the oldest age groups. This decline in PA with age is one of the most consistent findings in PA epidemiology (Sallis, 2000, Kao et al., 2014) with many studies reporting an inverse relationship between age and PA (Devonshire-Gill and Norton, 2013).

Similar to the findings for gender, the decline in age related PA was accounted for by the decreased participation in vigorous intensity activity by older persons; both moderate intensity exercise and walking remained fairly consistent between age groups. This decline in activity as people age is of particular concern given the strong causal relationship between PA and chronic disease (Cavill et al., 2006) and the predicted demographic shift towards an ageing population in Ireland as well as internationally (Connell and Pringle, 2004).

Physical Activity and Primary Care Location/Deprivation

The location/deprivation of the primary care centre had a significant relationship with the PA activity profile of participants. Rural participants of mixed deprivation, were classified the least active, with 60% of this sample failing to meet the PA guidelines. The rural sample also had the highest proportion of participants reporting no exercise in a week at 20%. The rural group engaged in 45% less total PA in a week than the most active urban deprived group. This relationship between the rural location and low activity levels persisted when controlling for potential confounders in the regression analysis. In fact, the rural sample had the highest odds, of all included variables, of being classified as low active.

Unlike the findings for gender and age however, the difference in activity levels between the primary care locations was accounted for by differences in walking activity. The median walking time of rural participants was 229 MET minutes/week (32.7 MET mins/day) which equates to less than ten minutes walking per day. Walking accounted for just 43% of the total weekly activity of rural participants, compared to 62% of the urban non deprived sample and 71% of urban deprived participants. Vigorous and moderate intensity activity levels were similar across the three groups.

The immediate environment in which people live and work influences a person's ability to be physically active (Parks et al., 2003, McCormack and Shiell, 2011). Studies have found that living in a high-walkable neighbourhood is associated with more transportational walking and

cycling, recreational walking and less motorised transport (Van Dyck et al., 2010b, Saelens and Handy, 2008). The urban deprived location in the current study was a city centre location within easy walking access of a number of shopping and leisure facilities and served by an extensive network of pathways, street lighting and pedestrian areas. The weekly walking time of urban deprived participants was the highest of all and equated to 30 minutes walking per day. This was three times higher than rural dwellers and twice as much as the urban non deprived group.

The finding that rural dwellers were the least active is supported by previous research (Martin et al., 2005) where, for example, Parks and colleagues conducted a cross sectional study of 1,818 adults in the U.S. and found that those in rural settings were less likely to meet the PA guidelines (Parks et al., 2003). They described noticeable differences in the perceived importance of places to exercise to rural and urban dwellers. Access to walking trails and exercise equipment were important to urban dwellers, while access to an indoor gym, neighbourhood streets and street lighting were more important to rural dwellers (Parks et al., 2003, Eyler, 2003).

It is important to note the deprivation status of the different primary care locations as well as their geographical location. PA is influenced by socioeconomic variables and a strong link has been found between increasing levels of PA and higher measures of socioeconomic advantage such as household income and education (Devonshire-Gill and Norton, 2013, Dumith et al., 2011). In this study, the deprivation classification of the primary care area was based on the deprivation scores of each of the electoral districts within the primary care catchment area. So for example, all of the three electoral districts within the urban deprived area were classified as high deprivation (Deprivation Index 8, 9, & 10, where 1 denotes low deprivation and 10 denotes high). We can therefore assume with reasonable confidence that the majority of patients attending this primary care centre were of lower socioeconomic status. This could also be confirmed by the fact that 77% of participants attending this area were in receipt of a medical card which is a means tested entitlement to free medical care. Additionally it also had the lowest levels of educational attainment of the three groups. Perhaps surprisingly in light of this, the urban deprived sample in this study were classified the most active and medical card status as a measure of socioeconomic status was not associated with PA. It may be that environmental factors exerted a larger influence on this group, where car ownership and access to transport may have been limited by financial constraints and the large pathway network and local shopping access encouraged walking.

When examining the specific socioeconomic variables used in this study, education was found to have a significant association with total weekly PA. Participants with a third level education performed 41% more weekly activity than participants with a primary education only. Education is the most commonly used indicator of socioeconomic status and has a consistent association with PA, as evidenced by the recent longitudinal study by Hamer and colleagues in the UK (Hamer et al., 2012).

Physical Activity and Cardiovascular Risk Factors

One of the striking findings of this study was the very high prevalence of CVRFs amongst primary care patients with 90% of men and 83% of women presenting with at least one CVRF and 65% of both genders presenting with at least two CVRFs. This is despite the relatively young age profile of study participants and points to a worrying threat in terms of the risk posed for future health. Although it is not possible to infer cause, due to the cross sectional nature of this study, there was an association between an increasing number of CVRFs and decreasing levels of PA. However when CVRFs were examined individually as potential correlates of PA, none were found to contribute significantly. Previously overweight or obesity has been reported as an inverse correlate of PA in adults, but this was not seen in this study (Trost et al., 2002).

As this study used self report as a means of determining the presence of CVRFs, it is likely that our figures provide a conservative estimate of risk and that the true prevalence of CVRFs is actually much higher. In a large population study of US adults, for example, almost a quarter (23%) of overweight women and half (48%) of overweight men perceived themselves as having a normal weight (Yaemsiri et al., 2011). The SLÁN study reported 23.3% of the Irish population as having clinically diagnosed hypertension but on objective clinical testing a further 38.9% of adults aged 45+ had undiagnosed hypertension (Morgan et al., 2008). With CVRFs projected to rise in the Irish population (Department of Health & Children, 2010), primary care must become more focused on delivering interventions designed to impact effectively on lifestyle related risk factors if the benefits of improved pharmacological management of cardiovascular disease are to be preserved.

5.4.3 Sedentary Time of Primary Care Patients

The most important findings from this research regarding sedentary behaviour are that just under half of primary care patients sit for greater than four hours per day; males sit more than females and that sitting times vary by primary care location.

This study found that 48% of Irish primary care patients sit for greater than four hours a day which compares with 41% of adults worldwide (Bauman et al. 2011). The median sitting time for all participants was 240 minutes or four hours per weekday. This is the same as the estimate reported by Bennie and colleagues, for Ireland, in their recent study examining the prevalence and correlates of sitting across 32 European countries using data from the Eurobarometer survey series (Bennie et al., 2013). However it somewhat lower than the pooled median of 300 minutes sitting per day, reported in the same study, for all countries included in the analysis. It is worth noting however that almost a third of study participants sat for greater than six hours daily, this is a very similar to the proportion of the general population sitting for the same time period reported by Sjostrom et al (2006). There was no evidence therefore, from the current study to suggest that primary care patients are any more sedentary than the general Irish population or the European population.

All of these figures, however, must be considered in light of evidence to suggest that when compared to more objective measures of sedentary time there is a tendency to underestimate

sitting with self report (Owen et al., 2010). Objective measures of sitting from several national population studies have reported daily sitting times of between seven to nine hours per day (Matthews et al., 2008, Colley et al., 2011). Further studies using more objective measures of sedentary time are needed, although these studies are very expensive and pose logistical difficulties in large populations (Matthews et al., 2008).

There was a significant difference in the reported sedentary time between the genders, with males sitting for two hours more, per day, than females. Bennie and colleagues (2013) also reported higher sitting times for males but the difference was less marked, with males sitting for 30 minutes more per day than females. An earlier epidemiological study comparing sitting across 20 countries, reported no differences between the genders for the pooled sample, but in country specific analysis, sitting was higher in males for seven countries, higher in females for five, with the remaining eight countries showing no difference between the genders (Bauman et al., 2011).

Whilst the current study reported a greater proportion of younger people (40.2%, n=70) falling into the two highest sitting categories, and there was a trend towards more sitting time in the younger sample, this did not reach statistical significance. In the regression model however increasing age was a predictor of decreasing sitting time. There have been inconsistent findings in the literature regarding sitting times and age. Higher sitting times have previously been reported in younger populations using self report (Bauman et al., 2009, Bennie et al., 2013). A recent review of seven cross sectional accelerometer studies of four different age groups in the Belgian population showed that females of secondary school age were the most sedentary when compared to younger ages and adults (Spittaels et al., 2012). Similarly, findings from a study evaluating participants from the U.S. National Health and Nutrition Examination study (2003-2004) reported two peaks in sedentary behaviour, one in adolescents aged 16 to 19 and the second in older adults aged 70 to 85 (Matthews et al., 2008). It is difficult to make direct comparisons with each of the studies as the ages of each cohort differ and it is most likely that those with younger samples will contain a higher proportion of people in full time education where sitting time is high (Bauman et al., 2011).

Using the regression results in this study, education had a significant relationship with sitting time, with secondary and third level education associated with lower sitting times compared to primary education only. This contrasts with findings by Bennie et al (2013) and Bauman et al (2011). Bauman and colleagues reported significantly more sitting time, amongst participants with 13 or more years of education, compared with less than 13 years of education for 15 of the 19 countries with education data. Unfortunately, as Ireland was not one of the participating countries in Bauman's study, it is not possible to draw comparisons with the present findings. However, similar to the findings of the current study other work has suggested that people with lower levels of educational attainment were more likely to report high TV viewing times (Clark et al., 2010).

There was a significant association between primary care area and sitting time in this study. Participants attending the urban non deprived location reported significantly higher sitting times than either of the other two groups. The median sitting time for this group was 345 minutes (5 hours 45 mins). This was two hours and 25 minutes longer than the least sedentary,

rural sample. Whilst it is not possible to draw firm conclusions from the findings, it may be that more of the urban non deprived sample were employed in professional office based occupations which would require longer occupational sitting. Also, due to the geographical location of the area which is largely residential, there may have been more transport related sitting whilst commuting to work. It was interesting to note that the rural sample reported the least amount of sitting despite also being the least active. Research has only begun to identify the environmental correlates of sedentary behaviour with some conflicting results to date. An Australian study for example reported higher levels of sitting time amongst women with lower levels of neighbourhood walkability (Sugiyama et al., 2007) whilst a Belgian study reported contradictory findings with higher levels of walkability associated with higher amounts of measured sedentary time (Van Dyck et al., 2010a).

Examining the relationship between PA and sitting time was an important consideration of this study to determine if there were subgroups who presented with the combined risks of low PA and high sitting, which would have important implications in terms of public health. There was however, no relationship between sitting time and PA category in this study and only a weak correlation between sitting time and total weekly PA. This implies that there is no evidence from the current study to suggest that inactive people are more likely to present with increased sedentary behaviour or that those who are highly active are less likely to be sedentary. There are a number of potential factors that may have influenced this finding including the relatively young age of participants and the higher proportion of females in the sample.

Participants who were highly active tended to be younger and therefore may have included more people in fulltime study where sitting time is high (Bauman et al., 2011, Chau et al., 2012). In addition, whilst younger people tend to have more leisure time, studies have shown that between 85 to 90% of this leisure time is spent in sedentary activities particularly in screen based activities (Chau et al., 2012). Younger people are also less likely to engage in household activities which would decrease their sitting time (van der Ploeg et al., 2013). The predominance of females in this sample may have also influenced this result, as females are more likely to have lower PA levels and yet may also demonstrate lower sitting times (Bennie et al., 2013, Bauman et al., 2009, Hallal et al., 2012). This was particularly evident in this study where, as discussed, females sat for two hours less per day than males. This may be due to the higher amounts of housework and childcare undertaken by females, both of which have been shown to be associated with lower sitting times (Brown et al., 2003).

There are conflicting results in the literature regarding the association between PA and sedentary time as measured with self reported questionnaires. There is evidence from some large epidemiological studies to suggest an inverse relationship between sitting time and PA levels (Bauman et al., 2011, Bennie et al., 2013) suggesting that more active people will spend less time sitting. There is however, evidence from others to support the present findings that sedentary time is independent of PA (Sugiyama et al., 2008, Burton et al., 2012). A recent study using objectively measured muscle electromyographic activity also reported no correlation between PA and sitting time, with some evidence suggesting that adults who engage in higher levels of PA may compensate for this by being more sedentary during their non active periods (Finni et al., 2014). Further studies using more objective measures should

examine these behaviours concurrently. At present, findings from this study would highlight the importance of screening for both PA and sedentary behaviour as separate behaviours in the primary care population as they may present in different populations. An important exception to this however, appears to be people with disabilities. Having a disability was found to be an independent correlate for both low PA and high sitting time and points to a subgroup of the primary care population who are at increased risk from these combined risk factors.

Sedentary behaviour is becoming increasingly established as a risk factor for several adverse health outcomes, independent of PA (Thorp et al., 2011, Healy et al., 2008, Healy et al., 2011, Dunstan et al., 2010). Whilst the current study did not find that primary care patients sit any more than the general population, nonetheless there remains cause for concern. Nearly half of all participants sat for greater than four hours a day and almost a third sat for greater than six hours. This finding cannot be considered in isolation and must be viewed in tandem with the very high prevalence of CVRFs and physical inactivity already presenting in this population. This is one of the first studies to provide a descriptive analysis of sitting times in Irish adults. It points to the need for further research to identify consistent social and environmental attributes that are associated with high levels of sitting.

There are also important implications for public health, where to date the focus has been predominantly on determining the prevalence of people meeting the PA guidelines irrespective of their sedentary behaviours. The combined health risks of low activity rates together with high sedentary time point to a specific subset of the population where targeted intervention seems specifically warranted.

5.4.4 **Limitations of this study**

The limitations of this study are acknowledged. This was cross sectional study providing a descriptive analysis of PA and is unable to infer causal influence of any variables. As with any means of self report PA measure, the IPAQ is open to bias from overestimation of activity and problems with recall. This was discussed in Chapter 2, Sections 2.8.1.and 2.8.3. However, the IPAQ is widely used in studies internationally, is validated as a population screening tool (Bauman et al., 2011) and was chosen to allow comparison with national and international data. Whilst particular care was taken to limit bias in the sampling, this survey used a regional sample so care must be taken when extrapolating the results nationally. The use of electoral districts rather than individual participant addresses as the unit of analysis to determine deprivation may have resulted in some loss of specificity in this measure, as there may be locations within an electoral district that have higher or lower socioeconomic status. However, as discussed previously, other indictors of socioeconomic standing such as education and medical card usage would support their accuracy.

In Section 5.3.4 the prevalence of no PA in a week was analysed according to socio-economic variables. Whilst the statistical procedures used in this analysis were correct and did not violate any assumptions, it is acknowledged that the overall numbers were small (n=89) which limits the applicability and interpretation of these results. The bias towards female gender in

the study sample, together with the use of self report to capture cardiovascular data have been discussed in the previous sections.

The data was collected at one time point during the winter months and thus does not account for any seasonal variation that may exist in PA or sedentary behaviour. It may have been that the rural population would have demonstrated increased PA during the spring or summer months when there may have been increased occupational PA associated with farming tasks, for example.

The omission of "occupation" from the demographic questionnaire in Study II was unfortunate, as it would have aided in the analysis both of the sitting and PA data. It was not possible, therefore, to determine whether PA and sitting behaviours were influenced by the occupational demands of a person's employment, nor to control for this in the analysis of PA and sitting between the three primary care areas. Whilst the IPAQ does include both occupational PA and sitting in its measurement, it is included as part of an overall measure and not as a distinct domain which would allow for more in-depth analysis.

In addition, a decision was taken when designing study II not to request medical details from participants attending primary care. This was taken after consideration of the ethical implications of requesting personal medical information in a public waiting room and to limit the intrusiveness of the research. However, the finding that 45% of participants felt that they had an injury or disability that limited their ability to be active, highlights the need for further work investigating the medical conditions that cause people to restrict their PA. It is likely, that in reality, restricting PA may not be necessary in many of these cases and could in fact actually benefit some of the typical conditions seen in primary care such as those of the respiratory, circulatory and musculoskeletal systems. It may be however, that these patients are more in need of professionally supported PA programme tailored for their underlying condition and its presentation.

Chapter 6 Study III: Feasibility of a Physical Activity Pathway for Primary Care

6.1 Introduction

Based on the findings from Studies I and II, there was an evident need to improve the PA screening and promotional practices of primary care professionals with a view to positively influencing PA behaviour of primary care patients. Although many health professionals were delivering PA promotion as part of everyday practice, the overall picture was one of ad hoc recruitment procedures, informal assessment means and limited use of evidence based interventions. This was compounded by the findings of Study II which identified the primary care population as a much more inactive cohort than the general population with particularly vulnerable subgroups such as older persons, females and rural dwellers.

The governmental framework for improved health and wellbeing in Ireland (2013-2025) sets a target of increasing by 20%, the proportion of people who are undertaking regular physical activity (Department of Health, 2013b). This framework together with the National Cardiovascular Health Policy 2010-2019 (Department of Health & Children, 2010) highlight the important role of primary care in increasing awareness and surveillance of risk factors and in supporting interventions to improve health and wellbeing.

There is a need to establish a systematic and evidence based approach to screening and promoting PA in Irish primary care services. Such an approach would seek to combine formalised screening methods, together with a number of recommended PA interventions and be applicable to the wide spectrum of patients seen in primary care. One method of doing this is through the use of a PA pathway which would help integrate PA into primary care.

The PA Clinical Pathway "Let's Get Moving" was developed by the Department of Health in England in collaboration with National Health Service London (NHS) and Natural England (Appendix X). It is based on the NICE Public Health Guidance "Four Commonly Used Methods to Promote Physical Activity"(National Institute for Health and Clinical Excellence, 2006). This guidance, which was recently updated, endorses the use of brief PA interventions in primary care as being clinically effective and economically efficient in the long term (National Institute for Health and Care Excellence, 2013).

The PA care pathway consists of five key stages; recruitment, screening, intervention, delivery and completion. It is a means of systematically recruiting and screening patients PA levels to determine if they are meeting the minimal PA guidelines. Individuals not meeting the guidelines are offered a brief intervention based on the principles of motivational interviewing[8] and supported by other recommended strategies such as written materials, goal setting and follow up appointments (National Institute for Health and Care Excellence, 2013,

[8] Motivational interviewing is a collaborative, person-centred form of guiding to elicit and strengthen motivation for change. MILLER, W. R. & ROLLNICK, S. 2002. *Motivational interviewing: Preparing people for change,* New York Guilford Press.

Orrow et al., 2012, Lin et al., 2010). Based on their risk, personal preferences and readiness to change their behaviour, individuals are then signposted to local PA opportunities. These can include structured activities such as walking groups, sports clubs and exercise classes and self directed activities such as pedometer programmes, parks and active travel. Patients stratified as high risk may be signposted to condition specific classes such as pulmonary rehabilitation and weight management programmes, as available in their area.

Whilst to date, there has not been an effectiveness trial examining the ability of the pathway to effect behaviour change, a process evaluation of the pathway has been carried out in a convenience sample of six general practices in London (Bull and Milton, 2010). Two different methods of recruiting patients onto the pathway were examined; disease register and opportunistic, and data regarding the patient flow through the pathway over a 12 week period were presented. It estimated the time requirements of delivery and presented qualitative feedback from practitioners on its implementation.

Overall the pathway was found to be a well accepted and feasible option in primary care and a number of recommendations were made to improve practitioner adherence to the intervention protocols. It is now available for wide scale implementation and may be commissioned for use by primary care trusts in the NHS in the UK. It is designed so that it can be flexibly adapted to fit within existing services of the commissioning area or address the needs of a particular target population.

Although the feasibility study only focussed on GPs, practice nurses and healthcare assistants delivering the intervention within NHS primary care trusts, it is envisaged that the pathway will be used in the wider primary care environment to include pharmacists, exercise professionals, dietetics and PTs as well as other service providers such as private gyms and community services. As such it has yet to be established whether this model may be suitable for use in health systems outside of the UK and by professions other than those included in the feasibility study.

Study III investigated the acceptability and clinical feasibility of introducing this pathway for use by primary care PTs in Ireland. PTs were asked to review the components of the pathway in the context of their own role, expertise and services to determine, whether the pathway as a model, was the most appropriate fit for their service. PTs were also asked to identify any additional training or resources that might be required for its implementation. Adoption of a PA pathway in primary care would provide the physiotherapist with a clear outline of the process required to improve the frequency of PA screening as well as guiding them in the use of evidence based interventions.

The overall aim of this study was to agree, through a Delphi consensus process, a PA pathway suitable for use by PTs in Irish primary care services.
The specific objectives of Study III were;

1. To agree criteria for recruitment onto the PA pathway;

2. To seek consensus for each of the component parts of the PA pathway and;

3. To determine if there were additional training needs and resources required to support implementation of the PA pathway.

6.2 Methodology

This study utilised a modified Delphi approach. This process attempts to achieve a convergence of opinion among experts on a specific topic, over a series of rounds or iterations. A three round Delphi was chosen for the purpose of this study. A full description of this methodological approach including justification for the number of iterations, together with its associated advantages and disadvantages are given in Chapter 3.

6.2.1 Expert Panel

The sampling procedures and criteria for selection of the expert panel for this study are described in full in Chapter 3, Section 3.2.4. Purposive sampling was used to identify a panel of 40 expert PTs with representation from different grades and workplaces to ensure diversity of opinion.

The population of interest were primary care PTs, of a senior grade, working within the province of Leinster in the Republic of Ireland and meeting one of the following inclusion criteria;

- Employed in a senior position with a minimum of three years post qualification work experience
- Employed in a physiotherapy manager post
- Employed in a clinical specialist post
- Working in a HSE primary care facility
- Working in a private practice

PTs were excluded from the study if they;

- Had less than three years post qualification work experience
- Were employed in a post other than that of a senior, manager or clinical specialist
- Were employed in a facility other than a HSE primary care facility or a private practice
- Were unable to commit to the three round Delphi process

6.2.2 Study Procedure

During the month of April 2013, the manager or principal PT of five physiotherapy departments meeting the inclusion criteria were contacted by the researcher via email. This email provided introductory details to the project, outlined the commitment required of participants and requested participation in the study. Once departments indicated their interest in the project, a date was chosen for interested staff to attend an introductory education session. It was emphasised that attendance at this session did not signal a commitment to participate. The education sessions were delivered by the researcher in each of the five participating sites.

The introductory education session served two purposes; the first was to provide participants with a detailed explanation of the PA pathway and to explain its function and use within the UK primary care system. The second was to explain the Delphi process to participants and to ensure they were fully informed of the commitment required, in terms of the multiple contacts and the importance of returning the questionnaires within the agreed timeframes. Participants were encouraged to ask any questions or request further clarification during this session. A copy of the presentation used during the education sessions is included in Appendix IX.

Following the education session, the researcher distributed the first round questionnaires to consenting participants for immediate completion. Once the questionnaires were completed they were returned to the researcher, who inputted and analysed the data and emailed round two questionnaires to participants within the agreed time frame of two weeks. Participants were requested to return the completed second round questionnaires within another two week period. An email reminder was sent to each participant towards the end of that timeframe. Stamped addressed envelopes were distributed for the follow up rounds at the time of the education session. Round two questionnaires were again analysed by the researcher and the process repeated for round three. A flow chart representing the data collection process is presented in Figure 35. Data collection occurred between May and June 2013 and took a total of eight weeks to complete the three round process.

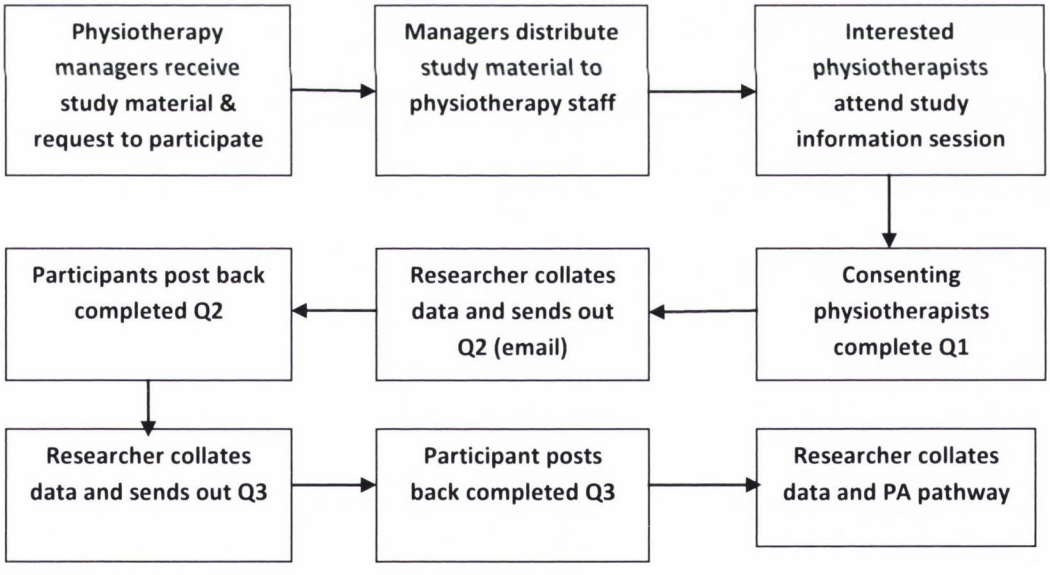

Figure 35 Flowchart of Data Collection Process Study III

6.2.3 Study Questionnaires

Round One Questionnaire

As this research was concerned with establishing consensus on a pre-existing PA pathway, a semi structured questionnaire was used for round one. The process guiding the generation of

statements and questions for the round one questionnaire are addressed in Chapter 3, Section 3.2.1.

The first round questionnaire consisted of seven sections and is included in Appendix VI.

Section one questioned participants on the best method of recruiting patients onto the PA pathway. Questions one to six presented a series of recruitment options and asked participants to indicate their agreement/disagreement with each statement on a seven point Likert scale; where one indicated a low level of agreement (do not agree) and seven indicated a high level of agreement (highly agree). Questions seven and eight were open ended questions asking participants to describe the best mechanism for recruiting patients onto the pathway and to outline any criteria that would prevent entry onto the pathway.

Sections two to five of the questionnaire were designed to address each of the four different parts of the PA pathway; screening, intervention, delivery and completion. In each section of the questionnaire participants were asked to indicate their agreement/disagreement with the inclusion of each step of the PA pathway using the seven point Likert scale. Open ended questions were used to capture any additional comments and to allow participants to suggest alternative options where they felt it appropriate. Participants were also asked to record the condition specific classes that were available in their area as part of the questions relating to intervention.

Section six examined the clinical feasibility and usefulness of the pathway to the clinical practice of participants. Participants were asked to highlight any specific training needs and additional resources that would be required to support delivery of the pathway.

The final section of the questionnaire requested demographic and professional qualification details. The PA pathway was included as an appendix with each of the questionnaires.

Rounds Two and Three Questionnaires

Rounds two and three took the form of structured questionnaires incorporating feedback and new statements generated as a result of the preceding round. The process of reduction and categorisation of the data is discussed fully in Chapter 3, Section 3.2.2.

A number of different items of feedback were provided to participants in the follow up questionnaires. At the start of each section participants were informed of the number of statements that had reached consensus in the previous round. Items reaching consensus were removed from subsequent questionnaires. All follow up questionnaires included graphical representation of the distribution of group responses for each statement, as well as the previous response of the individual participant. For the round two questionnaire, participants received feedback on the number of new statements generated as a result of responses from the open ended questions. For the round three questionnaire, some additional explanations and feedback were included with some statements.

The second and third round questionnaires followed the same format and presentation as the round one questionnaire except that section seven (demographic details) was removed. As in round one, participants were asked to indicate their agreement/disagreement with each statement using the seven point Likert scale. Participants were also requested to state their reason for changing their score from the preceding round, if appropriate. Three additional appendices related to the pathway were included in the second and third round questionnaires for reference purposes.

The second and third round questionnaires are included in Appendix VI.

6.3 Data Management and Analysis

Data from each round of questionnaires were assigned a numerical code, inputted and analysed using SPSS version 19.0 (SPSS, Inc., Evanston, IL). Each round of data was cleaned twice to identify any errors or omissions.

Descriptive statistics were used to examine each statement for consensus. The level of consensus was determined by calculating the median, interquartile range (IQR) and the percentage agreement with each statement.

Consensus was defined as at least 70% of participants scoring either a six or a seven, on a seven point Likert scale, where the median was equal to six or seven, and the IQR was less than or equal to one. Two questions were negatively worded so consensus was based on a Likert score of equal to one or two, these questions are highlighted in Tables 24 and 26.

The use of the median and IQR rather than the mean and standard deviation are recommended for use in the Delphi methodology (Murphy et al., 1998). The IQR is a measure of statistical dispersion, and is the difference between the third and first quartiles. A level of consensus where the IQR ≤ 1 represents an agreement level where 50% of the observations fall within one point on a measure.

Content analysis techniques, verified by a second researcher, were used to analyse the qualitative data received from the open ended questions of round one and used to generate new statements for inclusion in round two. More details on the analyses of this study, together with Kappa statistics for interrater reliability are provided in Chapter 3, Section 3.2.5.

6.4 Results

6.4.1 Professional Details

Overall, 43 PTs who attended the introductory sessions consented to participate in the study. Two PTs did not meet the inclusion criteria and thus were unable to participate, leaving a final sample size of 41.

The demographic and professional details of participants are presented in Table 23. The majority of participants were female, were qualified for more than 11 years and were employed in a senior physiotherapy position. The mean number of years that participants had worked in primary care was 6.8 years with a range from 1 to 23 years. Almost a quarter of participants held a Masters degree which specifically included components of PA promotion or exercise prescription. Almost a fifth were working in a private practice and the remainder were employed in HSE primary care services.

Table 23 Study III Demographic and Professional Details

Panel professional details	**N=41**
Gender n (%)	
Male	2 (4.9)
Female	39 (95.1)
Years since qualification n (%)	
5-10	11 (26.8)
11-15	17 (41.5)
16-20	8 (19.5)
>20	5 (12.2)
Employment grade n (%)	
Senior	34 (82.9)
Manager	4 (9.7)
Clinical Specialist	3 (7.3)
Public or private employment n (%)	
HSE (public)	33 (80.5)
Private Practice	8 (19.5)
MSc that included exercise prescription n (%)	
Yes	9 (22)
No	32
Mean number of years working in primary care (95% CI)	6.8 (5.2-8.4)

6.4.2 Round One Results

The results of round one, based on the questionnaire responses from 41 participants are presented in Table 24. Overall 28 of 43 (65%) statements achieved consensus in round one and thus were incorporated into the final pathway. These items were removed from the round two questionnaire. No section of the pathway achieved full consensus on this round.

The qualitative analysis of open ended questions generated 20 new statements based on the major themes identified, for inclusion in round two and these are presented in Table 25. Nine of these statements related to additional training and resources required to deliver the programme. The remainder suggested amendments or additions to the recruitment, screening and completion sections of the pathway. There were no additional statements generated in relation to the intervention or delivery components of the pathway.

A number of condition specific services were available to PTs for higher risk exercise referrals including classes for back and neck pain, falls risk, pulmonary rehabilitation, cardiac rehabilitation, Parkinson's disease, multiple sclerosis, arthritis, weight management and active retirement groups.

Amongst the minor themes generated as a result of the qualitative analysis were the additional concerns reported by private practitioners who identified that it may be difficult to deliver this pathway to a patient who was paying to attend physiotherapy for treatment of a specific condition or injury. It was also reported that arranging follow up assessments might be problematic due to the financial nature of their appointments and that offering the pathway as a separate financial package may be an option to overcome this.

Table 24 Responses to Round One Questionnaire

ROUND 1	Median response (IQR)	% rated 6 or 7	Consensus reached	Item included in final pathway	Item Included in round 2
Section 1 RECRUITMENT					
It is appropriate that ALL patients attending physiotherapy should be eligible for entry onto the pathway?	6(1)	78	Yes	Yes	No
It is appropriate that ONLY higher risk patients (e.g. pts with CV risk factors) attending physiotherapy should be eligible for entry onto the pathway?*[1]	2 (2)	70.7	No	No	Yes
It is appropriate to recruit the general public onto the pathway by offering dedicated PA appointments	6 (2)	58.6	No	No	Yes
It is appropriate to allow other health professionals to refer patients to physiotherapy for PA promotion	6 (1)	87.8	Yes	Yes	No
It is appropriate to allow patients to self refer to physiotherapy for PA promotion	6 (2)	68.3	No	No	Yes
It is important to promote this service to the public (for e.g. posters displayed waiting rooms, GP surgery)	6 (1)	80.5	Yes	No	No
Section 2 SCREENING					
The GPPAQ is the most appropriate PA screening tool for the physiotherapist	6 (1)	51.2	No	No	Yes
The questions used to assess walking are appropriate	6 (1)	53.7	No	No	Yes
Patients who are not interested in receiving a PA intervention should be given an information leaflet on the PA guidelines as they exit the pathway	6 (1)	95.1	Yes	Yes	No
Patients who are not interested in receiving a PA intervention should be invited to return for a brief intervention in the future if they are interested	7 (1)	85.4	Yes	Yes	No
Section 3 INTERVENTION					
It is appropriate to assess a patient's readiness to change using the appropriate scale	7 (1)	95	Yes	Yes	No
Patients not ready to change their behaviour should be offered a follow up appointment	6 (5)	53.6	No	No	Yes
Patients not ready to change their behaviour should be given an information leaflet on the PA guidelines as they exit pathway	7 (1)	92.7	Yes	Yes	No
For those ready to change it is appropriate to use the ACSM risk stratification criteria to categorise patients into high and low risk	6 (1)	90.2	Yes	Yes	No
Physiotherapists are appropriately trained to carry out the brief intervention	5 (2)	43.9	No	N/A	Yes
The brief intervention should be based on the principles of motivational interviewing	6 (1)	75.7	Yes	Yes	No
Training in the principles and application of motivational interviewing would be beneficial for this pathway	7 (1)	92.7	Yes	N/A	No
The brief intervention does not need to be based on a specific theoretical model*[2]	2 (3)	58.5	No	N/A	Removed
It is appropriate to set activity goals with the patient	7 (1)	95.1	Yes	Yes	No
It is appropriate to give the patient written information on the benefits of PA	7 (1)	97.6	Yes	Yes	No
It is appropriate to signpost the patient towards activities suitable for their clinical need	7 (1)	92.7	Yes	Yes	No
It is important to provide the patient with written materials detailing the local opportunities to be active	7 (1)	92.7	Yes	Yes	No

Section 4 DELIVERY					
All of the following low to medium risk activities should remain part of the pathway					
Green exercise (e.g. outdoors)	7 (1)	97.6	Yes	Yes	No
Walk Group	7 (1)	90.2	Yes	Yes	No
Sports club	7 (1)	78.1	Yes	Yes	No
Leisure Club	7 (1)	80.5	Yes	Yes	No
Community centre	7 (1)	78.1	Yes	Yes	No
Class programmes	7 (1)	87.8	Yes	Yes	No
Active travel	6 (2)	73.2	No	No	Yes
Pedometer programme	7 (1)	80.5	Yes	Yes	No
Active workplace	6 (2)	75.6	No	No	Yes
Parks and green spaces	7 (1)	87.8	Yes	Yes	No
Active daily living	7 (1)	80.5	Yes	Yes	No
Dance	7 (1)	82.9	Yes	Yes	No
Mass participation events	6 (2)	73.2	No	No	Yes
All of the following high risk activities should remain part of the pathway					
Exercise referral scheme	7 (1)	90.2	Yes	Yes	No
Condition specific programmes	7 (1)	90.3	Yes	Yes	No
Section 5 COMPLETION					
The patient should be given a follow up appointment for 3 months after brief intervention	6 (1)	82.9	Yes	Yes	No
The patient should be given a follow up appointment for 6 months after brief intervention	6 (2)	68.3	No	No	Yes
Patients who have relapsed should be coached again	5 (2)	46.4	No	No	Yes
Patients who have relapsed should be offered further follow up appointments	6 (3)	56.1	No	No	Yes
Section 6: CLINICAL FEASIBILITY					
This PA pathway would be useful to my practice	6 (1)	78	Yes	Yes	No
It would be feasible to introduce this PA pathway to my practice	6 (2)	51.2	No	No	Yes

*[1] Question negatively worded therefore score of 1 or 2 represents consensus

*[2] This item was removed from round 2 questionnaire as the majority of participants indicated they were unsure

Table 25 Statements Added to Round Two as a Result of Qualitative Analysis

SECTION 1 RECRUITMENT: 4 new statements generated
1. It is important that the PA pathway is integrated into other preventative programmes for e.g. obesity or diabetes programme
2. It is appropriate to exclude patients who have unstable medical conditions from entry onto the pathway
3. It is appropriate to exclude patients who have a disability or physical impairment (that prevents them from being physically active) from entry onto the pathway
4. All patients should at least be eligible for entry onto the SCREENING part of the pathway
SECTION 2 SCREENING: 5 new statements generated
1. Using a pedometer as well as the GPPAQ would be helpful in establishing an objective measure of PA
2. It would be helpful if the screening part of the pathway was carried out by other health professionals (e.g. GP or Allied Health Professional) before referring to physiotherapy for PA promotion
3. The decision to deliver the brief intervention as part of a routine appointment or as a separate appointment is at the discretion of the physiotherapist dependant on the individual patients circumstance
4. Assessment of the patient's readiness to change their PA behaviour should be carried out in the SCREENING part of the pathway
5. It may be appropriate to carry out a health risk questionnaire such as the PAR Q (PA Readiness Questionnaire) to determine if people are safe to exercise
SECTION 3 INTERVENTION : No new statements generated
SECTION 4 DELIVERY: No new statements generated
SECTION 5 COMPLETION: 3 new statements generated
1. It may be appropriate to follow up SOME patients more frequently than 3 and 6 months
2. It may be appropriate to contact patients requiring more regular follow up by telephone
3. The coaching of patients who have relapsed should be dependent on their motivation to change
SECTION 6 CLINICAL FEASIBILITY OF THE PATHWAY: 8 new statements generated
1. Training in methods to screen PA levels in the population would be beneficial
2. Further training in the use of the Lets get Moving pathway would be beneficial
3. It is appropriate for ALL primary care physiotherapists to receive training about the pathway
4. It is appropriate for SOME primary care physiotherapists to receive training about the pathway
5. Additional physiotherapy staff are required to deliver the pathway
6. Additional administration staff are required to support the pathway
7. Printed promotional and educational materials are needed to support the pathway
8. Details of locally available opportunities to be active are required to support the pathway

6.4.3 **Round Two Results**

All of the 41 participants completed round two of the process (100% response rate). The results from round two are presented in Table 26. The shaded area of the table highlights the 20 new statements that were generated as a result of the qualitative analysis in round one and are therefore modifications to the original pathway or associated training needs or resources.

Overall 19 of 34 (55.8%) statements received consensus in round two, and were incorporated into the final pathway. The remaining statements were carried through to the final round, seven of which originated in the round one questionnaire.

The delivery section of the pathway achieved full consensus on this round.

6.4.4 **Round Three Results**

40 participants (97.5% response rate) completed the third round and results are presented in Table 27. Overall 11 of the 14 (78.5%) remaining statements achieved consensus on the final round including all of statements concerned with screening and feasibility.

The following three items failed to reach consensus, the final statement originated in the round 1 questionnaire.

- SECTION 1 RECRUITMENT:
  It is appropriate to exclude patients who have a disability or physical impairment (that prevents them from being physically active) from entry onto the pathway
- SECTION 3 INTERVENTION: Physiotherapists are appropriately trained to carry out the brief intervention
- SECTION 5 COMPLETION: Patients who have relapsed should be coached again

Table 26 Responses to Round Two Questionnaire

ROUND 2	Median response (IQR)	% rated 6 or 7	Consensus reached	Item incorporated into final pathway	Include in round 3
Section 1 RECRUITMENT					
It is appropriate that ONLY higher risk patients (e.g. pts with CV risk factors) attending physiotherapy should be eligible for entry onto the pathway?*[1]	2 (1)	85.4	Yes	Yes	No
It is appropriate to recruit the general public onto the pathway by offering dedicated PA appointments	6 (1)	73.2	Yes	Yes	No
It is appropriate to allow patients to self refer to physiotherapy for PA promotion	6 (1)	82.9	Yes	Yes	No
It is important that the PA pathway is integrated into other preventative programmes for e.g. obesity or diabetes programme	7 (1)	97.5	Yes	Yes	No
It is appropriate to exclude patients who have unstable medical conditions from entry onto the pathway	5 (3)	43.9	No	No	Yes
It is appropriate to exclude patients who have a disability or physical impairment (that prevents them from being physically active) from entry onto the pathway	4 (3)	19.6	No	No	Yes
All patients should at least be eligible for entry onto the SCREENING part of the pathway	7 (1)	87.8	Yes	Yes	No
Section 2 SCREENING					
The GPPAQ is the most appropriate PA screening tool for the physiotherapist	6 (1)	61	No	No	Yes
The questions used to assess walking are appropriate	6 (1)	63.4	No	No	Yes
Using a pedometer as well as the GPPAQ would be helpful in establishing an objective measure of PA	6 (1)	73.2	Yes	Yes	No
It would be helpful if the screening part of the pathway was carried out by other health professionals (e.g.GP or AHP) before referring to physiotherapy for PA promotion	5 (2)	48.6	No	No	Yes
The decision to deliver the brief intervention as part of a routine appointment or as a separate appointment is at the discretion of the physiotherapist dependant on the individual patients circumstance	6 (1)	78.1	Yes	Yes	No
Assessment of the patient's readiness to change their PA behaviour should be carried out in the SCREENING part of the pathway	6 (2)	65.8	No	No	Yes
It may be appropriate to carry out a health risk questionnaire such as the PAR Q to determine if people are safe to exercise	6 (1)	75.6	Yes	Yes	No
Section 3 INTERVENTION					

Patients not ready to change their behaviour should be offered a follow up appointment	6 (5)	56.1	No	No	Yes
Physiotherapists are appropriately trained to carry out the brief intervention	5 (2)	43.9	No	No	Yes
Section 4 DELIVERY					
All of the following low to medium risk activities should remain part of the pathway					
Active travel	7 (1)	85.4	Yes	Yes	No
Active workplace	7 (1)	85.4	Yes	Yes	No
Mass participation events	7 (1)	87.9	Yes	Yes	No
Section 5 COMPLETION					
The patient should be given a follow up appointment for 6 months after brief intervention	6 (1)	78	Yes	Yes	No
Patients who have relapsed should be coached again	5 (1)	41.5	No	No	Yes
Patients who have relapsed should be offered further follow up appointments	6 (2)	73.2	No	No	Yes
It may be appropriate to follow up SOME patients more frequently than 3 and 6 months	6 (1)	61	No	No	Yes
It may be appropriate to contact patients requiring more regular follow up by phone	6 (1)	68.3	No	No	Yes
The coaching of patients who have relapsed should be dependent on their motivation to change	7 (1)	87.8	Yes	Yes	No
Section 6: CLINICAL FEASIBILITY					
Training in methods to screen PA levels in the population would be beneficial	7 (1)	90.2	Yes	Yes	No
Further training in the use of the Lets get Moving pathway would be beneficial	6 (1)	87.8	Yes	Yes	No
It is appropriate for ALL primary care physiotherapists to receive training about the pathway	6 (1)	80.4	Yes	Yes	No
It is appropriate for SOME primary care physiotherapists to receive training about the pathway*[2]	2 (5)	53.6	No	No	Removed
Additional physiotherapy staff are required to deliver the pathway	6 (2)	42	No	No	Yes
Additional administration staff are required to support the pathway	6 (1)	82.9	Yes	Yes	No
Printed promotional and educational materials are needed to support the pathway	7 (1)	97.6	Yes	Yes	No
Details of locally available opportunities to be active are required to support the pathway	7 (1)	100	Yes	Yes	No
It would be feasible to introduce this PA pathway to my practice	6 (2)	61	No	No	Yes

*[1] Question negatively worded therefore score of 1 or 2 represents consensus

*[2] This item was removed from round 2 questionnaire as the preceding question (ALL Physiotherapists) achieved consensus

Statements in the shaded area were generated as a result of the qualitative analysis of round 1 and therefore represent modifications to the original pathway or identify resource or training needs

Table 27 Responses to Round Three Questionnaire

ROUND 3	Median response (IQR)	% rated 6 or 7	Consensus reached	Item incorporated into final pathway
Section 1 RECRUITMENT				
It is appropriate to exclude patients who have unstable medical conditions from entry onto the pathway	7 (1)	82.5	Yes	Yes
It is appropriate to exclude patients who have a disability or physical impairment (that prevents them from being physically active) from entry onto the pathway	4 (3)	22.5	No	No
Section 2 SCREENING				
The GPPAQ is the most appropriate PA screening tool for the physiotherapist	6 (1)	70	Yes	Yes
The questions used to assess walking are appropriate	6 (0)	80	Yes	Yes
It would be helpful if the screening part of the pathway was carried out by other health professionals (e.g. GP or AHP) before referring to physiotherapy for PA promotion	6 (1)	72.5	Yes	Yes
Assessment of the patient's readiness to change their PA behaviour should be carried out in the SCREENING part of the pathway	6 (0)	90	Yes	Yes
Section 3 INTERVENTION				
Patients not ready to change their behaviour should be offered a follow up appointment	7 (1)	92.5	Yes	Yes
Physiotherapists are appropriately trained to carry out the brief intervention	4 (2)	40	No	No
Section 4 DELIVERY				
Section 5 COMPLETION				
Patients who have relapsed should be coached again	6 (1)	55	No	No
Patients who have relapsed should be offered further follow up appointments	6 (1)	85	Yes	Yes
It may be appropriate to follow up SOME patients more frequently than 3 and 6 months	6 (1)	70	Yes	Yes
It may be appropriate to contact patients requiring more regular follow up by phone	6 (0)	77.5	Yes	Yes
Section 6: CLINICAL FEASIBILITY OF THE PATHWAY				
Additional physiotherapy staff are required to deliver the pathway	6 (1)	80	Yes	Yes
It would be feasible to introduce this PA pathway to my practice	6 (1)	70	Yes	Yes

Statements in the shaded area were generated as a result of the qualitative analysis of round 1 and therefore represent modifications to the original pathway or identify resource or training needs

6.5 Discussion

6.5.1 Response Rate

There was an excellent response rate to this Delphi process, with the loss of only one participant in the final round. Although predominantly a female sample, there was good representation from different professional grades adding to the heterogeneity of the sample and thus the validity of the Delphi process (Goodman, 1987). Participants were highly experienced; over 70% were qualified for greater than ten years and many had significant clinical experience within primary care suggesting that the sample was sufficiently expert to contribute to the process.

6.5.2 Recruitment onto the Pathway

Overall there was a high degree of consensus achieved among PTs regarding the procedural components of a PA pathway suitable for use in Irish primary care services. The Physical Activity Care Pathway "Let's Get Moving" was accepted as a clinically feasible option to Irish primary care PTs with some modifications and with the support of additional resources.

The first section of the pathway concerns the methods by which patients are recruited onto the programme. The feasibility study in the UK investigated two modes of recruitment onto the pathway; opportunistic and disease register (Bull and Milton, 2010). In the current study participants agreed that all patients attending physiotherapy should be eligible for recruitment onto the pathway but they also suggested a more active approach to recruitment. This included allowing other health professionals such as GPs to refer patients to physiotherapy for PA promotion and allowing members of the general public to self refer for this intervention. Active promotion of the pathway through posters and leaflets displayed in medical centres and community buildings was encouraged.

During the feasibility study in the UK, opportunistic recruitment onto the pathway yielded very low recruitment rates. The authors conservatively estimated that the 378 patients assessed for eligibility over the 12 week recruitment period, was from a total of approximately 5,900 consultations, yielding an estimated recruitment rate of 6%. Qualitative data suggested that this was due to practitioners making their own subjective appraisal of a patient's suitability and motivation to participate. It is likely that a combination of approaches such as those suggested by study participants would maximise recruitment rates.

In contrast to the UK study, disease registers were not identified as a potential mode of entry by PTs working in Ireland. This may reflect the limited availability of such registers outside of the acute sector in Ireland where for example, only 30% of GPs reported "always" or "usually" using a register to identify or track their diabetes patients (Darker et al., 2011). Another consideration is the lack of shared electronic health records in Ireland. Whilst 82% of GPs use electronic records in primary care (Darker et al., 2011), these are usually local to the GP and generally not shared or integrated with other professionals (Irish College of General

Practitioners, 2011), meaning that PTs would be reliant on the GP or practice nurse to identify and refer suitable persons. Developing the IT infrastructure further to include formal disease registers which incorporate evidence based pathways and electronic alert systems capable of prompting the health professional when to screen or refer for PA, for example, would be beneficial.

PTs in this study clearly identified PA promotion as an important component of their role and recognised the increased opportunity for public education and preventative interventions though primary care led programmes. They also identified however, that additional physiotherapy staff and administrative support were required to support the programme. For example in the UK, recruiting patients via a disease register proved much more successful, resulting in better recruitment and completion rates, together with better patient outcomes, it was however also more costly than using an opportunistic approach (Boehler et al., 2011). It is likely that additional financial backing is required to successfully deliver this programme within the current limited primary care sector in Ireland.

Whilst participants in this study also felt that the pathway should be promoted and advertised to the general population, it may be that resource and financial barriers limit its delivery, by PTs, to high risk populations such as those with known CVRFs or pre-existing chronic diseases or that it is delivered only to those with existing physiotherapy appointments both of which would minimise the cost impact. Whilst this " high risk" approach is a cost effective use of resources it has limited potential to impact on the populations' health as a whole (Rose, 1985).

Participants clearly identified the benefit of integrating the PA pathway into other preventative programmes in primary care, such as weight management and diabetes care. The systematic method of screening and promoting PA provided by the pathway, aligns with the strategic aim of the Department of Health to increase the focus on primary prevention and early intervention aiming to reduce the onset of chronic disease (Department of Health, 2012).

6.5.3 **Modifications to the Pathway**

There were a number of modifications or additions to the original pathway suggested by participants. This included the use of a pedometer as well as the General Practice Physical Activity Questionnaire (GPPAQ), to obtain a more objective measure of PA during the screening process and the use of an additional health risk questionnaire to determine if people are safe to exercise. The Physical Activity Readiness Questionnaire (PAR-Q) was suggested as an option (American College of Sports Medicine, 2010). PTs also suggested that the screening component of the pathway could be carried out by other health professionals such as GPs who could then refer to physiotherapy for the intervention.

The GPPAQ was accepted as a suitable assessment by PTs achieving consensus, albeit on the third round. Previous work has found the GPPAQ acceptable for use in routine consultations in general practice, however time constraints were still identified as a barrier, despite GPs and practice nurses finding the GPPAQ easy to use and quick to administer (Heron et al., 2014, Bull et al., 2008). It is therefore interesting to note that PTs felt an additional objective measure such as a pedometer should be added to the screening process. This may reflect the different

working patterns of the professions, with GPs providing more single consultations to patients and PTs generally providing more prolonged treatment delivered over a number of repeated visits. This offers PTs increased opportunity to incorporate more detailed screening methods into their practice. It would be interesting to determine whether professions offering more repeated appointments would incorporate the GPPAQ into consultations more frequently than the previously reported rates of 6% and 8.9% by general practice staff (Bull and Milton, 2010, Heron et al., 2014).

Consensus was reached on all of the intervention components of the pathway except that PTs felt that patients' "readiness to change" should be assessed earlier in the pathway during the screening phase.

Amongst the completion components of the pathway, whilst PTs did not agree that patients who had relapsed should be coached again, they did agree that they should be offered further follow up appointments and that further coaching should be dependent on their motivation to change. This would suggest that this should be measured or screened again as part of the completion phase. Other suggested alterations were that some patients may benefit from more frequent follow up than the suggested three and six months and that it was appropriate to deliver this to some patients via telephone.

6.5.4 **Training Needs**

PTs have the underlying knowledge to assess and prescribe PA across the lifespan and across all of the different body systems, having particular expertise in adapting exercise prescriptions for those with chronic diseases especially of the neuromuscular, musculoskeletal and pulmonary systems. Despite this, the statement that PTs were appropriately trained to deliver the brief intervention did not achieve full consensus and participants particularly identified a need to develop their skills in motivational interviewing. They also identified deficits in knowledge of population approaches to screening.

A recent study investigated the PA and exercise promotion content of physiotherapy undergraduate curricula in Ireland (O'Donoghue et al., 2011). It highlighted gaps in content regarding PA prevalence and determinants, exercise for public health, strategies for changing PA behaviour and exercise prescription for lifestyle diseases. In Study I of this research, only 50% of PTs accurately recalled the PA guidelines clearly outlining deficits in knowledge regarding key public health statements. A more recent cross sectional study investigating the management of lifestyle related risk factors by PTs found that whilst 60% of primary care PTs reported receiving training in PA and exercise prescription in the last year, the numbers that received training on specific patient education strategies (24%) and on approaches such as motivational interviewing (18%) were much lower (O'Donoghue et al., 2014). Practitioners in the UK receive a two day training course in motivational interviewing as part of the PA pathway and it is likely that a programme such as this would also benefit PTs.

As Irish physiotherapy services continue to transition from hospital based delivery to primary care focused delivery, it is imperative that PTs mirror the general shift in the focus of healthcare from one which treats sickness and disease to one which prioritises prevention and

health promotion. Population based approaches to PA and behavioural strategies to encourage positive lifestyles must become essential components of undergraduate physiotherapy curricula and part of ongoing professional development activities.

6.5.5 Additional Considerations of Private Practitioners

The final consideration must be given to the stated concerns of private physiotherapy practitioners in their ability to deliver the pathway effectively. There is an obvious difference between delivering the pathway in the Irish primary care sector which is a mix of public and private health service provision and in the UK, which operates a universal healthcare coverage system, the NHS. While consensus on the pathway was achieved, PTs working privately highlighted their concerns about promoting PA and particularly about arranging follow up appointments for fee paying patients. This is especially relevant if the pathway is to become more widely promoted by other professions in Ireland, in particular GPs, who as the biggest primary healthcare providers, have a mixture of fee paying and publicly funded patients. At present, GPs do not receive reimbursement for PA promotion in their publicly funded patients and as evidenced by the private PTs may find it more difficult to address with fee paying patients. There is some support amongst GPs for targeted payments for the management of chronic disease (Darker et al., 2011) and given the wealth of evidence supporting the role of PA in both the prevention and management of chronic disease (US Department of Health and Human Services, 2008a); it must be included as a performance indicator in any such initiative.

6.5.6 Limitations

There are a number of limitations to this study. Firstly, a modification to the Delphi process was made whereby participants attended an education session at the start of the process. This was deemed necessary to allow for familiarisation with the pathway and to ensure clarification of the protocol. It cannot be assumed however, that there was not some discussion among participants as a result of this process and that opinions may have been altered in response.

This was a regional sample, of which the majority of participants were female and employed in the public health service. The most recent gender profile of members of the Irish Society of PTs in Ireland, suggests that 77% of its practicing membership is female and that 50% are privately employed.[9] There are limitations therefore, in extrapolating results of the current study to the national physiotherapy population. There may be additional considerations associated with delivering the pathway in privately funded health services, a finding which warrants further investigation. This study only investigated the feasibility of the pathway amongst a physiotherapy sample and whilst to date PTs have not been included in any of the previous studies of the pathway, there may be more of an acceptance of the pathway and PA promotion in general amongst a profession specialised in non invasive physical interventions.

There are a number of questions remaining in relation to the use of the pathway in Irish primary care services, most notably the acceptance of the pathway to other primary care

[9] Private correspondence with Irish Society of Chartered Physiotherapists, based on 2014 membership figures

professionals such as GPs and practice nurses and the impact that public/private service provision may exert on equity and access to the pathway.

Chapter 7 Discussion

7.1 Summary of the Main Findings of this Research

The deleterious impact of physical inactivity on health and wellbeing is well established, as are the associated economic consequences of increased healthcare costs and lost productivity (Chapter 1, Section 1.4). The high prevalence of physical inactivity coupled with an increasingly sedentary lifestyle signals a significant and widespread threat to public health (Hallal et al., 2012, Buaman et al., 2011). The evidence that certain interventions are effective in increasing PA and that health professionals can positively impact on a patient's behaviour, underline the importance of prioritising PA promotion in primary care (National Institute for Health and Care Excellence, 2013). The aim of this thesis was to investigate the prevalence and patterns of PA and sedentary behaviour in a primary care population in Ireland and to describe how health professionals incorporate PA promotion into their clinical practice. The main findings of this research are again presented briefly in this section, followed by a detailed discussion of some of the major findings and finally a critique of the methods used. Study II, which focussed on the prevalence and patterns of PA and sedentary behaviour in the primary care population will be discussed first, followed by the findings from Studies I and III which will be presented together, as both relate to professional practice in PA promotion.

This research was set in the context of the programme of ongoing transformation of Irish primary care services with increased focus on protecting health and wellbeing through primary prevention, and early intervention aiming to reduce the onset of chronic disease (Chapter 1 Sections 1.10.2 to 1.10.4). As outlined previously, PA is explicitly targeted in the government health strategy (Healthy Ireland) with a specific indicator to increase by 20% the proportion of the population undertaking regular PA (Department of Health, 2013b). This is also a specific target of the National Cardiovascular Health Policy 2010–2019 which recommends regular audit and surveillance of PA levels (Department of Health & Children, 2010). The importance of accurate research together with monitoring and evaluation is prioritised in two of the six thematic areas targeted in Healthy Ireland (Department of Health, 2013b). Therefore, establishing accurate baseline measures of PA is of direct importance and relevance to these strategies and can be used to help target funding, inform the development of promotional strategies, and with ongoing surveillance, examine the effectiveness of public health strategies. The literature review of PA prevalence studies in Chapter 1 (Section 1.12) highlighted significant gaps in the surveillance data of the Irish population with a limited and outdated dataset for PA and almost no data on sedentary behaviour, other than prevalence estimates for sitting.

Study II provided a detailed descriptive analysis of the prevalence and patterns of PA and sitting time in a primary care population. Results suggested very high levels of physical inactivity amongst this population, with 47% of all patients failing to meet the PA recommendations and only 10% classified as highly active. Particular sub-groups of participants were more likely to be inactive, including females ($p=0.005$), older persons ($p=0.054$), people with lower levels of educational attainment ($p=0.006$) and people who classified themselves as having a disability or injury limiting their ability to be physically active ($p=0.009$). In general there was a very high prevalence of CVRFs reported amongst the sample

with 85.3% (n=755) of participants having at least one CVRF, inclusive of physical inactivity. In addition to the high prevalence of physical inactivity, just under half (48%) of the sample reported sitting for more than four hours a day. Males were more likely to report higher sitting times ($p<0.001$) and sat for two hours more per weekday than females.

A significant strength of this study was the stratification of the sample by the urban/rural location of the primary care centre and by its deprivation index. This allowed detailed comparisons between the three primary care areas and produced some very interesting results. Participants attending the rural mixed deprivation centre were classified the least active ($p<0.001$). Just under 60% (59.4%) of the rural sample failed to meet the PA recommendations and almost a fifth (19%) of the sample reported no PA at all in the last week. This was much higher than the prevalence of no PA reported in the other two groups (urban deprived 6.4%, urban non deprived 4.5%). The rural sample engaged in 45% less PA in a week than the most active group. Somewhat surprisingly, participants attending the urban deprived centre reported the highest levels of activity ($p<0.001$), however despite this, 38% of this sample still failed to meet the PA recommendations.

The difference in PA seen between the three primary care areas was accounted for by differences in the time spent walking ($p<0.001$), rather than differences in the amount of vigorous or moderate intensity activity. Walking accounted for 43% of the total weekly activity of rural participants, 62% of the urban non deprived group and 71% of the total weekly PA of the urban deprived participants. Rural participants reported median walking times which equated to less than ten minutes of walking per day. This was half the walking time reported by the urban non deprived group and a third of that reported by the urban deprived group.

Patients attending the urban non deprived centre reported the highest time spent sitting (median 345mins/day, $p<0.001$), which was two hours and 45 minutes longer than the least sedentary sample. The rural group as the most active, perhaps somewhat paradoxically also reported the least amount of sitting (median 180mins/day, $p<0.001$).

In the discussion of Study II, prevalence estimates for the primary care population were discussed in the context of national PA prevalence estimates for Ireland (Chapter 5, Section 5.4.2). Comparing the physical inactivity prevalence rate of 47% reported for the primary care population in this research, with prevalence rates of 29% (Morgan et al., 2008) and 31.8% (McKee et al., 2012) for the general population of Ireland, it is clear that the primary care population is a much more inactive cohort than the general population. This contrast is particularly stark when considering the least active rural sample, who have approximately twice the prevalence of inactivity that that of the general population. This research would suggest that reliance on national level data has the potential to underestimate, and in some instances, significantly underestimate the problem of inactivity. The discrepancies in PA and sitting time even between different primary care areas points to the importance of establishing baseline data on the local population served by primary care centres where it is likely that factors such as deprivation status and geographical location impact on activity. This has implications for the distribution and targeting of funding and may assist primary care professionals to direct PA interventions to those that are most in need. Overall, Study II examined PA and sitting time from the perspective of the primary care patient and highlighted

a worrying profile of high rates of inactivity coupled with significant sedentary behaviour, often in the presence of other concurrent CVRFs.

Studies I and III both addressed PA promotion from the perspective of the primary care professional. The design and objectives of Study 1 were informed by the literature review in Chapter 1 (Section 1.9), which examined the knowledge and practice of GPs and PTs in relation to PA promotion. The review highlighted a lack of studies investigating the knowledge of health professionals regarding the PA public health recommendations and a paucity of detail about what constitutes PA screening and counselling in clinical practice. The PA practice of PTs was rarely examined or described in the literature. The lack of standardisation of questioning used in the literature also limited the comparability of existing studies. Therefore, a questionnaire survey was undertaken in Study I to determine whether GPs and PTs were knowledgeable about the PA public health recommendations and to establish their routine practice in the screening and promotion of PA in primary care.

Amongst the major findings of this study was the poor overall knowledge of both professional groups regarding the PA guidelines. Less than a third of GPs and half of PTs reported the correct parameters. PA screening practices were varied, with some differences reported between the two professional groups. The largest proportion of GPs reported screening PA in an opportunistic manner (41%) or if it directly related to a patient's presenting compliant (37%). The largest proportion of PTs reported screening PA in all patients (34%) or if it related to a person's presenting complaint (28%). The use of any formalised method of screening, such as a validated questionnaire was reported by less than 5% of both groups. The majority of patients with CVRFs were likely to receive PA counselling particularly by GPs, but PA promotion, as a primary preventative strategy to healthy individuals, occurred less frequently. Thirty eight percent of GPs and 20% of PTs reported that they were unlikely to counsel these patients. Overall, education and counselling was the intervention used most frequently by both groups (GP 76%, PT 97%). GPs utilised onward referrals to other professions more often than PTs whereas PTs used written materials, exercise diaries and follow up appointments more often than GPs. The most frequently reported barriers to practice were time constraints (GP 51%, PT 50%) and poor patient compliance with advice (GP 34%, PT 66%). The majority of both professions (GP 71%, PT 92%) indicated that they felt confident providing PA advice to their patients.

The final study of this research was developed in response to the results from both Studies I and II. In light of the poor findings in relation to the PA levels of patients in primary care and the potential for improvement with respect to the PA promotional practices of healthcare professionals, a mechanism of systematically screening and promoting PA in primary care was evaluated. Study III investigated the acceptability and clinical feasibility of introducing a PA clinical pathway for use in Irish primary care services using a purposive sample of senior PTs. The PA pathway was developed by the Department of Health in England and is currently available for commissioning by primary care trusts in the UK (Department of Health UK, 2010). It consists of five key stages; recruitment, screening, intervention, delivery and completion. In general, the PA pathway was accepted as a clinically feasible option by Irish primary care PTs, with some modifications and the support of additional resources, which included additional staffing and addressing educational needs. PTs felt that all patients attending physiotherapy

should be eligible for the pathway, as well as suggesting a more active approach to recruitment which included allowing patients to self refer and permitting other professionals to refer to physiotherapy for PA intervention. Respondents stated that referring professions should have completed the recruitment and screening components of the pathway. PTs also suggested that the pathway should be integrated into other preventative and chronic disease management programmes in primary care. Amongst the modifications suggested were; the use of a pedometer as well as the GPPAQ to assess PA and the use of more frequent follow up appointments when appropriate. Participants also suggested that further coaching for those who had relapsed should be dependent on their motivation to change. Education needs, particularly with respect to skills in motivational interviewing and population approaches to screening were identified by PTs. PTs employed in private practice highlighted additional concerns about promoting PA to patients who were attending physiotherapy for a specific condition or injury and expressed particular concern about arranging follow up appointments for fee paying patients.

7.2 Analysis of Key Points

7.2.1 Physical Inactivity: Not an Equally Distributed Risk

As demonstrated in Study II, participation in PA by patients attending primary care services was poor, with many patients also reporting high periods of sedentary time. Of particular importance were the significant disparities found between the PA levels of different groups, dependant on individual factors such as age and gender, as well as by socioeconomic factors such as education and environmental factors such as urban/rural divide. This would suggest that the burden of physical inactivity and its associated health outcomes is not distributed evenly across society.

PA is a complex behaviour that is affected by multiple diverse factors and interventions are most effective when they alter or address the underlying variables that influence PA (Trost et al., 2002). As previously discussed in Chapter 5 (Section 5.1) a common approach to the study of PA is to integrate ideas from several different theories into an ecological model (Bauman et al., 2012). Ecological models provide an overarching framework, or set of theoretical principles, for understanding the interrelations among diverse personal and environmental factors in human health and illness (Stokols, 1996).

Bauman et al (2012) in their review of the correlates and determinants of PA in adults, found consistent evidence for 36 separate correlates since 1999, including 20 separate determinants. Correlates, determined from studies using a cross sectional design establish statistical associations between specific factors or "correlates" and the studied behaviour, however they cannot infer a causal relationship (Bauman et al., 2002). Longitudinal observational studies can however identify factors that have strong causal associations with PA and these are known as determinants (Bauman et al., 2002, Bauman et al., 2012).

Gender, age and educational attainment have been found to be amongst the most consistent correlates of PA, findings echoed in this research and discussed in Chapter 5 (Section 5.4.2).

Females, older age and lower educational status were all associated with low PA participation in this study and being male and low educational status were associated with higher sitting times. Health status or perceived fitness to exercise as well as self efficacy, which is a person's confidence in their ability to be physically active on a regular basis, have also emerged as consistent correlates for PA (Trost et al., 2002, Plonczynski, 2003, Allender et al., 2008, Bauman et al., 2012). There is also emerging evidence that these two factors may also be determinants of PA in older adults (van Stralen et al., 2009). In Study II, half of all participants not achieving the PA recommendations felt they had a disability or injury limiting their PA and this was a significant predictor of low PA, as well as being an independent correlate for higher sitting time. There is evidence to suggest that persons with disabilities are much less likely to engage in physically active lifestyles than people without disabilities and in general, the determinants of health in persons with disabilities are much less understood (Centers for Disease Control and Prevention, 2010). This points to a significant inequality in the threat posed from physical inactivity to this group and highlights a particular need to target people with disabilities in health promotional activities. Many barriers to PA for people with disabilities have been reported; including limited accessibility to the built and natural environment, an inability to pay for fitness membership, a lack of knowledge on where and how to exercise, limited knowledge of exercise professionals on providing advice for people with disabilities and a lack of understanding of the importance of exercise in improving their condition or health (Meyers et al., 2002, Rimmer et al., 2004).

Recently more interest has focussed on the influence of environmental and global correlates on PA. The differences in global PA prevalence were highlighted in the literature review in Chapter 1 (Section 1.12) and factors thought to influence PA at a global level include the economic development of a state, its urbanisation and the social and cultural norms associated with PA in that country (Bauman et al., 2012, Dumith et al., 2011).

Environmental factors have received increased focus in the last decade with factors such as neighbourhood design, recreational facilities, aspects related to transport and social environment and aesthetics all showing some evidence as correlates for total PA (van Stralen et al., 2009, Duncan et al., 2005, Saelens and Handy, 2008, Bauman et al., 2012, Owen et al., 2004). Of particular interest is how correlates may differ between different domains of PA. For example, the aesthetic attributes of the environment, factors such as convenience of pathways and trails, the accessibility of destinations (parks, shops) and perceptions about traffic are thought to be significant correlates for walking or leisure time activity (Owen et al., 2004). They are not, however, associated with transport related activity (Wendel-Vos et al., 2007), where emerging evidence suggests that aspects related to neighbourhood design such as walkability and street connectivity may be important (Saelens and Handy, 2008, Panter and Jones, 2010). Environmental variables are likely to explain some of the differences in the PA levels reported between the rural and urban samples in Study II, especially in light of the finding that differences in PA levels were explained by differences in walking between the three areas. This was a very important finding and has been discussed previously in Chapter 5 (Section 5.4). Understanding why the rural sample in this research displayed such significantly higher levels of physical inactivity than both of the urban groups is an essential component in targeting health inequalities. The finding that walking time contributed much less to the total weekly PA of the rural group compared to the other two groups is a significant finding and

suggests that environmental influences may have had a large impact on the rural samples ability to engage in walking for travel and recreational purposes. Conversely, the finding that the urban deprived group were the most active and that almost three quarters (71%) of this activity primarily consisted of walking is another important finding. It highlights the potentially positive impact that a well lit and highly connected urban environment may have over its inhabitants, who because of their poorer socioeconomic status might be expected to demonstrate lower levels of PA. Of course, it is acknowledged that other factors may have influenced this group's decision to walk more, such as lower car ownership, along with the rising cost of fuel and public transport, coupled with the current challenging economic environment.

Previous population studies in Ireland have typically not included this distinction between rural and urban populations except perhaps for the annual Irish Sports Monitor report where, unlike the findings of this thesis, they reported no differences in recreational walking among persons living in rural and urban locations (Ipsos MRBI and Irish Sports Council, 2014). These contrasting findings highlight the risk of using general population data to calculate and plan for primary care populations. It must also be cautioned that the Irish Sports Monitor report used different measurement scales, different data collection methods and only provides basic prevalence estimates rather than performing statistical analysis on its data, so direct comparison with this PhD research is limited. The important implications of these findings and how it may shape policy and health are discussed further in Section 7.3.1.

Study II clearly highlighted that, at present, much inequity exists when it comes to the threats imposed by physical inactivity and sedentary behaviour. A key principle of the ecological approach to PA is that by understanding all of the potential factors that can impact on PA, a more integrated approach to intervention can be developed. This targets PA at several different levels, thereby improving the chance of success (Bauman et al., 2012). Amongst the overarching principles of Healthy Ireland are to increase the proportion of people who are healthy at all stages of life and to reduce health inequalities that exist in Irish society by targeting particular health risks, but also by addressing the broader determinants of health (Department of Health, 2014).

There is a well proven social gradient to health, with people of lower socioeconomic status experiencing more ill health than people who are better off (Marmot, 2010). These health inequalities are caused by the broader determinants of health; the unequal distribution of power, income, goods and services which in turn impact on the circumstances of people's lives; their access to healthcare, education, their conditions of work and leisure, their home and communities, – and therefore their chances of leading a fulfilling life (Commission on Social Determinants of Health, 2008). To achieve a more equitable distribution of health it is therefore necessary to target action across all of the social determinants of health and to achieve this, action is needed across many different sectors of society and across the whole of government (Marmot, 2010). Reducing the inequalities in health has the potential to impact society in many ways including the economic benefits gained from reduced illness, their associated losses in productivity and tax revenues and the higher costs of welfare support and treatment payments. Healthy Ireland uses a "Health in All Policies" approach. At its core this recognises that population health is not only a product of health sector activities but to a large

extent is determined by living conditions and other societal and economic factors and therefore is often best influenced by policies and actions beyond the health sector (Ståhl et al., 2006).

In order to promote PA in line with national targets a greater depth of understanding regarding the individual, environmental and social influences on PA in the Irish population is essential and this research contributes to this task. PA interventions and programmes must be based on the stated needs of the population, ensuring equity in terms of access and that hard to reach populations are targeted. Any policies or interventions promoting PA need to take into consideration the most appropriate options for targeting the local population according to their specific needs, characteristics, PA domain and national resources, while aiming to be participatory and socially inclusive, particularly of the most vulnerable groups (World Health Organisation, 2010a). This research points to the need to extend the reach of PA further into the community aiming to target the causes of physical inactivity, as well as the need to address the PA of higher risk populations attending primary care.

7.2.2 The Scope and Reach of Physical Activity Guidelines

Policy action and resource allocation need to be directed by clear evidence based statements that establish both the harms and the benefits to health of the relevant behaviour (Bull and Bauman, 2011). Evidence based statements are typically presented in the form of a public health recommendation developed as a result of a definitive review of the available evidence, in consultation and in consensus with expert groups and cumulating in the release of a position statement from an authoritative agency.

The development of the PA recommendations including the release of the National PA Guidelines for Ireland was presented in Chapter 1 (Section 1.6). National PA guidelines help guide policy action within countries and provide the basis for developing programmes and partnerships within the relevant sectors (Bull and Bauman, 2011). They also provide a certain amount of leverage and influence in encouraging governments to act on their agreed policy statements. Having nationally endorsed PA guidelines provides all relevant parties including health professionals, with a clear set of scientific statements upon which to base their communication and counselling strategies. They are, therefore, an important and useful tool in the overall strategy to promote PA in a country. The WHO advise that PA guidelines are used by all relevant stakeholders to communicate valid and consistent messages on the frequency, duration, intensity, type and total amount of PA for health (World Health Organisation, 2010a).

Recent studies investigating the knowledge of PA guidelines by general populations and specific patient groups have generally shown very poor levels of awareness (Cunningham et al., 2013, Knox et al., 2013, Hunter et al., 2014, Marques et al., 2014, O'Dwyer et al., 2014). For example, in the UK a recent study found that only 18% of the general population accurately reported the PA guidelines (Knox et al., 2013). Significant demographic disparities were also reported with disadvantaged population groups, such as men with lower educational and employment status and older adults being less knowledgeable about the guidelines.

In the US the situation was even more stark, with less than 1% of adults recalling the correct guidelines when surveyed in 2009 (Knox et al., 2013). However, this was only ten months after a change in the guidelines had been disseminated to the public and may account for some of the discrepancy between the UK and US figures. Whilst knowledge alone is unlikely to stimulate a behaviour change, individuals need to be aware of their own behaviour in the context of the recommended behaviour in order to initiate change (Snyder, 2007).

One of the likely reasons for the poor knowledge of the PA guidelines by the public is the failure of health professionals to fully and correctly promote these guidelines to their patients. Study 1 highlighted the generally poor knowledge of PTs and GPs of the PA guidelines and would suggest that PA advice and education given by these professionals was unlikely to be based on promoting the correct activity parameters. The literature review in Chapter 1 (Section 1.9) reported similarly disappointing findings for healthcare professionals' knowledge of the guidelines in Australia and the UK (Shirley et al., 2010, Daley et al., 2008, Douglas et al., 2006a). This is of particular relevance as evidence suggests that disadvantaged groups who generally have higher levels of morbidity, access primary care services more regularly than non disadvantaged groups (Nolan and Smith, 2012, Nolan and Nolan, 2008). Therefore, such visits may be a lost opportunity to promote PA to those who have most to benefit.

Some of the potential reasons for this are the number of different PA guidelines available, the updating of parameters as evidence becomes available and of the recent shift by some authorities (for example the WHO and authorities in the US and UK), from the "30 minutes moderate to vigorous PA X 5 days a week" message (Haskell et al., 2007) to the more global recommendation of "150 minutes per week of moderate to vigorous PA" (US Department of Health and Human Services, 2008b, World Health Organisation, 2010a). This may have resulted in some confusion amongst professionals about the specific parameters endorsed by different authorities. The widespread availability of all of the different reports on the internet and the vast array of general information available on PA, often with varying degrees of accuracy, can prove difficult to navigate for busy professionals. Unifying guidelines across countries and providing consistent statements in clinical documents, in line with global recommendations, would lead to a clearer message and potentially improve the retention of information by healthcare professionals and the general public alike.

Study I demonstrated that dissemination and diffusion of relevant and appropriate information, such as evidence based guidelines and key national documents needs to be improved. In their document "Pacific Physical Activity Guidelines" the WHO outline a framework for implementing a comprehensive communication strategy to increase awareness and adoption of the PA guidelines at regional and country levels (World Health Organisation, 2008c). The framework also outlines a systematic process to monitor and evaluate the success, or otherwise of the dissemination process. Dissemination strategies to raise awareness of the guidelines, initially promote gaining high level governmental endorsement and then raising awareness of the guidelines to the relevant professional groups, agencies and stakeholders. Dissemination strategies include presentations at workshops or meetings, inclusion of the guidelines in strategic documents on NCD management, mailing copies of the guidelines to the relevant health authorities and including information in newsletters. Additionally, having culturally relevant published formats of the guidelines available, creating web links to the

guidelines through health and non-health agencies and extending invitations to health professionals to attend information workshops were advised. An overarching strategy for effectively communicating the guidelines to the public is recommended with adequate funding allocated to ensure the reach and coverage of the campaign. Process indicators assess whether planned dissemination strategies have been implemented successfully, for example, the number of workshops that have been set up to promote the guidelines. Impact indicators are linked to the impact evaluation, for example the percentage of healthcare professionals who are aware of, and understand the national PA guidelines.

Although no formal report exists, the researcher is aware of a number of attempts to disseminate the national PA guidelines in Ireland. These include national press and media coverage at the time of the launch, a dedicated website aimed at the general public and health professionals, web links within the websites of several health and non health agencies and inclusion of the guidelines in professional newsletters. Since the release of the guidelines a dedicated on-line course in PA promotion has been established and endorsed by a number of professional bodies including the Irish Society of Chartered Physiotherapists and the Irish Council of General Practitioners, as part of their recognised continuing professional education programmes. Despite this, the scope and reach of the guidelines does not appear to be optimal. Some of this may also be explained by the lack of a clear designated body targeted with the task of ongoing promotion of the guidelines and the failure to incorporate them as one part of an overall strategy to promote PA at a national level.

National level guidelines are the starting point from which a more comprehensive strategy targeting PA can be planned. To achieve effective change in awareness and set the agenda for behaviour and environmental change, the WHO advise that the development and dissemination of national PA guidelines should be seen as one element of a broader policy and planning process to promote PA (World Health Organisation, 2004a).

7.3 Implications for Practice

The following section discusses the overall results from this research, primarily in the context of the Governments programme of reform of the health services. This research provides a timely and informative overview of PA in healthcare, at a time when many proposed changes offer a unique opportunity to integrate PA into primary care in a meaningful and effective way.

Given the importance of primary care in the promotion of PA (Chapter 1, Section 1.8), Study I highlighted several areas in which the practice of health professionals could be optimised to ensure the best outcome. The first area requiring improvement was to increase the frequency of PA screening, so that it becomes a routine part of every primary care consultation as advocated by the WHO and the Toronto Charter (World Health Organisation, 2010a, Global Advocacy Council for Physical Activity, 2010). This was discussed in Chapter 4 (Section 4.4.3), where the use of formalised PA questionnaires was advocated, and also in Chapter 6 (Section 6.5.3) where the use of the GPPAQ (General Practice Physical Activity Questionnaire) as part of a PA pathway was accepted as clinically feasible option by primary care PTs.

In general, this research found a high degree of support regarding the importance of their role in PA promotion amongst health professionals studied. However, results from Study I also point to significant scope for improvement in the area of PA screening, so that it becomes a more formalised and consistent task in primary care. One method advocated nationally in the US is to encourage health professionals to view PA as a "vital sign" that should be evaluated at every consultation (Patrick et al., 2009), an approach supported by others (Sallis, 2011). Integrating PA screening into electronic medical records alongside other measures of vital signs would assist the clinician in this task, as well as providing a useful prompt or reminder. Although only GPs and PTs were examined as part of this research, there is justification to extend the scope of PA screening to all members of the primary care team including practice nurses, dieticians, occupational therapists, psychologists and administration staff, as well as beyond the traditional bounds of the primary care centre to include community pharmacists and health workers working with vulnerable groups such as older people, ethnic minorities and people with disabilities. All of this would require additional resources, particularly directed towards education, that should be coordinated as part of a national effort to increase PA.

The overall findings from Study I would strongly suggest that a more integrated and consistent approach to PA promotion is required within primary care and the high prevalence of physical inactivity and sedentary behaviour demonstrated by primary care patients would also support this view. Many of the planned restructures of Irish health services have the potential to impact positively on the PA levels of patients and the wider population and there are several ongoing opportunities to incorporate PA screening and promotion into existing and planned primary care initiatives. A number of these will be discussed in the following sections

Physical Activity: An Integral Component of Integrated Care

An important finding from Study III was the suggestion that the PA clinical pathway should be incorporated into existing and planned chronic disease management programmes. In line with its strategic restructuring, the Department of Health has made a commitment to create a new model of integrated care which has been proposed in response to the ageing population, the increased incidence of chronic disease and the need to re-orientate existing services away from acute reactive care towards more preventative and structured care, that is co-ordinated around the needs of patients (Department of Health, 2012). Integrated care is defined as an organising principle for care delivery with the aim of achieving improved patient care through better co-ordination of services provided (Shaw et al., 2011). Integrated care seeks to improve the quality of care for individual patients, service users and carers by ensuring that services are well co-ordinated around their needs (Goodwin et al., 2012).

There is no single accepted best practice model of integrated care, rather the focus should be on clinical and service level integration so that care can be better provided around the needs of individuals, which is of particular importance when care is being delivered by a number of different organisations and professionals (Curry and Ham, 2010).

In the context of Irish health services, this includes building service delivery to ensure the full cycle of care for all of the major conditions or diseases a patient may have, that extends from

primary prevention to self care to acute care (Department of Health, 2012). Particular emphasis is put on preventing occurrence of the problem in the first instance and with effective early management through greater emphasis on self care and enhanced primary care services. There are a number of mechanisms that have been used internationally to support integration and these include integrated care pathways, funding models, organisational models, strengthening of primary care services, alignment of system incentives and developments in communication and information technology (Darker, 2014).

There are several opportunities to incorporate PA promotion into this new planned model of care and given the wealth of evidence supporting the use of PA to prevent and manage many chronic diseases it would seem both negligent and financially imprudent not to do so. Indeed improving the PA levels of primary care patients has the potential to positively impact on many of the Governments stated targets with respect to integrated care. The PA care pathway in Study III provides a strong starting point in terms of a clinical tool that could systematically guide clinicians through the process of incorporating PA screening and promotion into these coordinated packages of care. It is based on best practice guidelines (National Institute for Health and Care Excellence, 2013), promotes co-ordination of services between health sectors and community partners and reduces the variation and inconsistency of approach between clinicians. In their systematic review on the processes that make a successful integrated model of healthcare Suter and colleagues talk of the need to deliver standardised care delivered by interprofessional teams that promotes continuity of the care process (Suter et al., 2009). They identified that shared evidence-based protocols, such as best practice guidelines, clinical care pathways and decision-making tools, are essential to the functioning of interprofessional teams and help to standardise care across services, thus enhancing quality of care. The strong consensus gained on most of the component parts of the PA pathway in Study III suggests that with additional resources, this may an acceptable and feasible tool for clinical use.

The Role of Physical Activity within Chronic Disease Management Programmes

Integrated care pathways were developed in the late 1990s as a basis for planning and agreeing pathways of care for particular conditions or procedures and have been advocated as a means of improving the continuity and quality of care a patients receives, as well as improving outcomes (Darker, 2014).

In 2008, the Irish Government first identified its intention to develop chronic disease management programmes as part of the overall strategy to re-orientate the health services towards a more integrated model of care (Department of Health and Children, 2008). The WHO defines a disease management programme as a means to coordinate care, focusing on the whole clinical course of a disease. Care is organised and delivered according to scientific evidence and patients are actively involved in order to achieve better outcomes (Velasco-Garrido et al., 2003).

At present in Ireland, this new model of care is at its most advanced in relation to diabetes (Harkins, 2008). The aim is to establish a more formalised and structured approach to managing type 2 diabetes across primary, secondary and tertiary care with the majority of care

provided through local primary care centres and specialist visits provided at least once every one to two years. In order to understand the current provision for PA within chronic disease management programmes, the guideline document describing the type 2 diabetes integrated care programme was examined to determine how PA was included as part of the overall programme (Harkins, 2008).

The assessment of PA was included under "review lifestyle factors", with the general guidance to include smoking, PA and diet as part of this screening process. It was recommended that the patient is regularly reviewed by the practice nurse and/or the GP and that PA, as well as other lifestyle factors are regularly monitored. There is no stated guidance regarding the use of a formalised means of assessment, nor advice to determine if patients are meeting the PA guidelines. The document does not state which member of the team is responsible for PA screening and management in the diabetic patient. The members of the multidisciplinary team listed as being involved in the care of diabetes patients include the GP, nurse, podiatrist, dietician and ophthalmologist with access to specialist services such as cardiology, vascular, nephrology, and endocrinology. A profession with a specialisation in exercise, for example physiotherapy, is not mentioned as part of the multidisciplinary team. In contrast, there are much more specific guidelines given with respect to dietetic referral and it is also explicitly stated that all people with type 2 diabetes should have an annual review with a dietician.

The diabetes programme promotes the use of advice on healthy lifestyle choices which includes nutrition and PA and it is suggested that individual advice is given to patients based on their stage of change. PA guidelines are included as part of the overall guidance on intervention, however these are based on the older US recommendations from 1996 and those of the European Cardiovascular Society from 2003, both of which have since been updated (US Department of Health and Human Services, 1996, De Backer et al., 2003). Specific PA recommendations for patients with diabetes, as advocated by the American Diabetes Association, are also included in the document which is a positive inclusion (Sigal et al., 2006). It is worth noting, however, that these too have been updated since publication of the diabetes document and again signals a potential cause for confusion amongst practitioners as discussed in Section 7.2.2 (Colberg et al., 2010). Screening for conditions that may contraindicate more vigorous forms of exercise such as cardiovascular disease or predispose to injury such as peripheral neuropathy, as well as pre-existing levels of PA is advised. There is no guidance on how to manage higher risk patients in need of supervised exercise referral or to whom they should be referred.

A practice based diabetes disease register is encouraged as part of the programme; PA is not however included as one of its suggested contents. An audit structure is included as a means of monitoring the quality of care. PA is not included among the suggested process or outcome measures.

Overall on consideration of the integrated care programme for diabetes there are several areas in which the guidance on PA could be improved. Whilst there is a clear recognition of the importance of PA both in the prevention and management of diabetes, there is a lack of clear guidance about who is responsible for this aspect of a patient's care and also a lack of clear procedures regarding its assessment and promotion. In view of the findings from Study I, we

know that PA screening and promotion is already inconsistent and that knowledge of PA guidelines is poor. A failure to clearly address these issues in this and other chronic disease management programmes is unlikely to improve the overall management of PA and represents a significant lost opportunity to promote consistent messages and practices amongst health professionals.

There are a number of suggested areas in which the promotion of PA can be improved within the diabetes programme. Firstly, the inclusion of a formalised method of assessment is warranted, one which may be easily administered by all members of the diabetic care team and one which identifies whether a patient meets the recommended minimal levels of PA. The inclusion of the PA pathway as part of an overall strategy to manage PA in this programme would eliminate many of the problems identified, providing a formalised method of assessment in the GPPAQ and then prompting the health professional to refer for further intervention, if required. Active involvement of the patient is encouraged by determining their readiness to change and discussion of their individual goals and preferences helps determine the PA option most suitable to their needs. It also provides a route for referral to supervised exercise programme, based on clinical need, which may be required for those diabetic patients identified as higher risk such as those with established cardiovascular disease, peripheral arterial disease or with impaired glycaemic control or neuropathy.

Under the direction of Healthy Ireland, there is an ongoing project to review the present GP exercise referral scheme in Ireland and to develop a new National Exercise Referral Framework (NERF), which is currently in draft format (Dublin City University et al., 2014). Study I found that the GP exercise referral scheme, as it currently stands, was used by just over 10% of GPs and 3% of PTs. The NERF document outlines the new framework, describing the proposed exercise routes a patient may take dependant on their risk stratification. Patients requiring high level supervision are directed towards a NERF high support centre which will have an element of medical cover, ideally will be located in primary care centres with exercise provided by suitably qualified personnel. Those with moderate risk, but still requiring supervision, will attend a NERF approved exercise facility which may be a leisure centre or community based programme such as walking. Those patients categorised as low risk are guided towards self directed opportunities for exercise, dependant on their individual preferences. Most interestingly, this exercise referral framework is based on an adapted version of the PA pathway used in Study III and whilst it maintains the five different stages of the pathway it uses a different PA screening questionnaire. It is reassuring to see that the merits of the PA pathway have been endorsed by a nationally representative group of Irish PA experts.

The findings from this PhD research would therefore support the planned exercise referral framework with the specific recommendation that it is included as an integral component of all chronic diseases management programmes. It is also advocated that the roll out and evaluation of the NERF is included under the remit of a national PA plan to ensure that it is one of a number of coordinated approaches to improving population levels of PA. This shall be discussed further under recommendations for policy. In addition, there is also a need to clearly define who bears overall responsibility for PA screening and ongoing monitoring as well as identifying named professionals who are appropriately qualified to deliver supervised exercise programmes.

PA, as one of the four key lifestyle factors contributing to chronic disease should be routinely included as one of the component parts of all chronic disease registers. It should also be a specific outcome measure included as part of any audit process to monitor and evaluate chronic disease programmes. PA can be included as a process indicator for example "the percentage of people receiving PA screening with the GPPAQ each year" or as an outcome indictor measuring risk factor control, for example "the percentage of people meeting the PA guidelines". Collating this information at regional and national level would do much to fill the PA surveillance gap for the Irish population and help determine whether governmental targets to increase PA levels are actually being met.

An additional but important consideration is that PA promotion within the health services must not solely be focused on those with chronic disease or high risk. Both professions in Study I were more likely to promote PA to patients with established CVRFs rather than healthy individuals. Whilst of course it is a positive finding that PA promotion is offered to those with risk factors, promotion must also be targeted at those that are healthy and at a wider population level.

Electronic Patient Records and How They May Facilitate Better Physical Activity Practice

Advanced system wide information and technology systems including computerised clinical information systems that allow data management and effective tracking of utilisation and outcomes are essential to supporting integrated care (Darker, 2014, Suter et al., 2009). Electronic information systems that facilitate effective communication thus have significant potential to impact on PA. At present in Ireland, the majority of GPs have electronic medical records and use an electronic referral system to refer to hospital consultants (Irish College of General Practitioners, 2011). However, the vast majority of other members of the multidisciplinary team use paper records.

The Irish Government has committed to the development and upgrade of information and communication capacity within primary care (Department of Health, 2012). These information technology systems have the potential to support the delivery of integrated care via the shared electronic record, the use of clinical decision support systems and the ability to identify and target at risk patients (Pike and Mongan, 2014). Computerised clinical information systems can be used to collect and track multiple processes and outcomes (Suter et al., 2009). These can include activity levels, process indicators such as timeliness or adverse events, as well as outcomes, such as quality of care and impact for each patient as well as the population.

There is also much scope within these systems for improving the PA practices of primary care clinicians which may in turn impact on patient PA levels. Incorporating a simple assessment of PA such as the GPPAQ into the shared electronic record, as well as the ability to identify patients not meeting the PA guidelines would be of great importance. The PA screening assessment is simple enough to be administered by any member of the multidisciplinary team seeing a patient as part of their standard assessment. Patients identified as not meeting the PA guidelines are then offered further intervention, based on a clinical decision prompt received by the assessing clinician, and referred electronically to locally agreed personnel (for example,

the primary care PT or practice nurse) who are trained to deliver the brief intervention. Results of the screening assessment are available to all relevant health professionals, avoiding the need for duplication and could for example; form part of the GPs cardiovascular screen or part of the dietician's assessment of obesity, as well as being incorporated into ongoing surveillance of risk factors for chronic disease and into established disease registers. Including PA screening as a routine part of all professionals assessment in the shared electronic record has the potential to improve the ad hoc and opportunistic screening practices reported in Study I. It may also impact on the infrequent screening of PA in healthy populations, thus improving the use of PA as a primary preventative strategy.

Having a centralised electronic mechanism for collating and aggregating information on risk factors such as physical inactivity provides information for an evidence base of need of the local population, which can support funding applications to provide interventions or enhanced services. Other capabilities such as the ability to track patients with certain diseases and to provide reminders for preventative screening appointments or recall systems to ensure follow up, would all greatly enhance the ability of the practitioner to effectively promote PA. Using alert tools to identify, for example, when a predetermined number of patients with low PA levels have been screened could then prompt the relevant professional to schedule a group education or intervention class greatly enhancing the efficiency and coordination of such an approach. The ability to integrate clinical and financial information would be helpful in determining the cost effectiveness of PA interventions with a view to facilitating future service planning.

Information and communication technology has much to offer in terms of building efficiencies into the process of integrated care and there are several mechanisms whereby it could theoretically impact positively on a primary care team's ability to screen and promote PA as one aspect of an overall programme to prevent and manage chronic disease.

Restructured payment scheme

As outlined in Chapter 1 (Section 1.10.3) the Government is moving towards the introduction of a single tier multi – payer model of universal health insurance (UHI) covering both hospital and primary care (Health Service Executive, 2014a).

Under this scheme everyone will purchase a universal health insurance policy from their preferred provider which will provide cover for a comprehensive package of healthcare services. In designing the future insurance system a key question is what services should be provided as part of the standard basket of care funded by UHI and what services should be provided or funded directly by the State (Health Service Executive, 2014b). However, it has already been determined that health and wellbeing services should be excluded from the standard UHI package and financed via a separate Health and Wellbeing Fund with the exception of health promotion and education that are provided as part of structured care and chronic disease programmes. Whilst it is difficult to predict, without more detail what this will mean in terms of equity of access to PA, it would suggest that the focus from the UHI perspective is on secondary prevention and the use of PA for management of chronic diseases

rather than their prevention. It is unclear how patients or health professionals will access or be encouraged to access this health and wellbeing fund and how this will be prioritised in terms of population health and primary prevention.

There was strong consensus from Study III that implementation of the PA pathway in primary care must be accompanied by increased resources. Indeed there is ongoing debate in Ireland about the transfer of services from secondary to primary care without the equivalent transfer of resources and the inadequate funding allocated to primary care services in the first place. There is a strong call from the Irish Medical Organisation for the implementation of an incentivised payment scheme to encourage GPs to manage chronic disease, as well as additional resource allocation to primary care infrastructure (Irish Medical Organisation, 2014). Irish GPs have expressed support for targeted payments for chronic disease management (Darker et al., 2011). At present, providers are not generally incentivised to provide many of the services such as lifestyle advice and appointment reviews that are required for effective chronic disease management. However there is a commitment from the Government, despite a weak evidence base for its effectiveness, to using incentives to drive performance, particularly in the area of chronic disease management (Scott et al., 2011b).

Pay for performance is a payment model that rewards healthcare providers for meeting pre established targets for delivery of healthcare services by financial incentives (Conrad and Perry, 2009). Whilst there are many different types of payment schemes, most operate on the basis of financially rewarding health workers for performance and quality. An example of this is the Quality and Outcomes Framework (QoF) for GPs in the UK which ties 25% of their income to the quality of care delivered (Doran et al., 2008). Data on quality of care is extracted automatically from a single common electronic medical record held by practices. There are a number of specific indicators grouped under the main medical specialities which have included specific indictors relating to assessment of PA. These include the numbers of patients aged 16 to 75 with assessment of PA using the GPPAQ and the percentage of patients aged 16 to 75 scoring "less active" on the GPPAQ who have a brief intervention recorded (Tucker, 2014). Should such a system be incorporated into the financial restructuring of primary care payments, this research would strongly support the use of specific measurable outcome indicators targeting PA screening and promotion.

Privately operating PTs who were surveyed as part of Study III expressed concern about the use of the PA pathway particularly with respect to follow up appointments with self funded patients. Attendance at private physiotherapy clinics is either paid for by the patient personally or if that person has private medical insurance they may receive reimbursement for approximately half of the cost of each appointment, for a total of seven visits a year. At present, the majority of people still attend physiotherapy in response to an injury or to receive treatment for a medical condition, so it will require a significant mind shift on the part of both the public and the practitioner to establish health promotion as an equally relevant and important activity. This will require action on several fronts including education of practitioners, advertising to the public, as well as more active attempts to provide competitively priced packages of care targeting PA promotion and actively advocating for insurers to include health promotion as part of their range of benefits. This does not preclude

the use of existing appointments as a cost effective means of providing brief interventions or general information (National Institute for Health and Care Excellence, 2013).

7.4 Implications for Policy

The Need for a National Physical Activity Plan

The high prevalence of physical inactivity reported in Study II together with the unequal distribution of risk clearly suggests the need for an overarching policy to effectively promote PA at multiple different levels of society. In order to ensure that as many people as possible are given the opportunity to be physically active a national strategic planning process aimed at identifying policies, practices, and initiatives that will have the collective effect of increasing population levels of PA is necessary (Pate, 2009).

The Toronto Charter for Physical Activity in line with the recommendations set out in the WHO's Non Communicable Disease Action Plan (2008) and the Global Strategy on Diet, Physical Activity and Health (2004) outline the guiding principles for a population based approach to PA (Global Advocacy Council for Physical Activity, 2010, World Health Organisation, 2004a, World Health Organisation, 2008a). Amongst the guiding principles are recommendations that countries and organisations implement sustainable actions in partnerships at national, regional and local levels and across multiple sectors to achieve the greatest impact.

The Toronto Charter calls for action across four key areas; the implementation of a national PA policy and action plan, the introduction of policies that support PA, reorientation of services and funding to prioritise PA and the development of partnerships and collaborations across sectors to support population wide participation. Many of the key areas highlighted in this charter were discussed in Chapter 1 (Sections 1.7.1. to 1.7.5.) and include the introduction of policies to support PA such as in the areas of urban and rural planning, fiscal policies such as incentives to support participation, education systems that prioritise physical education and transportation systems that support walking and cycling.

The high levels of walking reported by participants living in the urban deprived location in Study II, demonstrate the potentially positive effect that environmental influences and urban planning can have on a high risk population. Conversely the low levels of general PA and walking demonstrated by rural participants signals the need to develop rural planning and transport policies that encourage and facilitate PA in this environment. The reliance of rural populations on cars for transport in Ireland is an acknowledged reality, where there is often little choice in terms of public transport or active transport such as walking and cycling. Indeed the trends for motorised transport in Ireland are stark with, for example, an increase of 72% in the total number of vehicles licensed in Ireland in the ten year period between 1996 and 2006 (Department of Transport, 2009). This has far reaching consequences with more vehicles travelling at peak times, resulting in longer commutes and thus more time spent sedentary. The associated increase in traffic pollution and greenhouse gases contributes to poorer health and chronic diseases (Lavin et al., 2011).

The Government, in its transport policy for Ireland has stated its intent to invest in walking and cycling, as well as improving public transport as a viable alternative to car transport. Many provisions and targets in this policy have the potential to impact positively on PA and indeed there are already some examples of successful outcomes. One such scheme is the Green Schools Travel Programme (An Taisce, 2014). In 2006 around 55,000 students were driven or drove less than two kilometres to their place of education and a further 150,000 were driven two to four kilometres to their place of education (Department of Transport, 2009). The Green Schools Travel Programme works with local stakeholders in an educational capacity to address safety and practical concerns that would prevent students from walking, cycling carpooling or using public transport to get to school. Although the primary aim is to ease congestion by decreasing the number of private cars delivering students to school, the programme also recognises the health benefits that can be achieved by increasing PA. Between 2008 and 2010 it resulted in a 27% reduction in private car use with a corresponding increase in walking, cycling and public transport (Department of Transport, 2009).

Another example of a successful transport initiative which has resulted in an increase in cycling is the Dublin bike sharing scheme (Dublin City Council, 2014). This is a self service bike rental scheme that allows people to commute on bike between 100 stations in the city. Figures on its website suggest that it currently has over 42,000 subscribers, with over eight million rentals since its launch and an average journey time of thirteen minutes. Incorporating PA into everyday activities is considered to be one of the most sustainable ways of increasing activity and replacing short car trips with walking and cycling thus represents a significant opportunity to improve the PA of adults and children. Where this is impractical, for example in rural environments, encouraging the use of public transport instead of car use, will have likely benefits, as such trips usually involve walking to and from transport hubs (Besser and Dannenberg, 2005). The results from Study II highlight the real importance of including rural communities and environments in any policies that may influence PA and indeed would suggest that an even more targeted and determined strategy may be required to overcome the challenges imposed by rural dwelling.

Additional government policies such as a tax incentive scheme to encourage bike ownership, as well investment in a national cycle network and the publication of a national cycling policy framework are all positive steps in reaching the overall governmental target of ensuring 10% of all journeys are made by bike by 2020 (Department of Transport, 2009). Similar commitment has been proposed in terms of improving the infrastructure and planning to promote urban walking and to encourage the use of state lands for recreational walking and hiking.

A national PA plan provides the direction, support and coordination of the many sectors that are involved, as well as focusing resources and providing accountability (Global Advocacy Council for Physical Activity, 2010). Key requirements are the input from a wide range of stakeholders and identification of clear leadership. The national PA plan should adopt and promote the use of evidence based guidelines and include combinations of different strategies designed to target the different individual, social, cultural and environmental factors influencing PA. It should clearly describe the roles and actions of the relevant stakeholders and provide an implementation plan that defines accountability, timelines and funding.

As highlighted previously in the discussion regarding the PA guidelines there is often an extensive gap in the dissemination of relevant knowledge to the appropriate parties. A criticism levelled at several national PA plans in the past is their failure to provide a clear path and detailed process of accountability to determine the short and long term success of the plan (Bornstein et al., 2009). A comprehensive plan should discuss how it will measure its success in reaching its target audience and the impact it has on practice. For example, a theory based study of the dissemination of the US national PA plan among PA practitioners in public health found that while awareness of the plan was high at 79%, a high proportion of respondents had never or infrequently consulted the plan (Evenson et al., 2013). Ongoing monitoring and evaluation is necessary in order to examine the relative success of each programme with the provision for ongoing review and improvement. Indeed PA plans are often referred to as "living documents" that change in response to feedback (Pate, 2009).

The Irish Governments Framework for Improved Health and Wellbeing (Healthy Ireland) was outlined in Chapter 1, Section 1.10.4. As part of its overarching goal to increase the health and wellbeing of the population, a Health and Wellbeing Programme has been set up to co-ordinate and monitor actions within the framework. As discussed previously, one of the actions of this group is to commit to develop a plan to promote increased physical activity across the population as an exemplar of how Healthy Ireland will work. To this effect a cross-sectoral working group has been set up co-chaired by the Department of Health and the Department of Transport, Tourism and Sport to oversee the development of this plan which is currently in draft format.

An important component of this PA plan will be how it supports and guides the health services to provide leadership in the role of PA promotion, how it funds training and ongoing education for staff and how it restructures and funds services that optimise the organisation of services across clinical and community resources. For example, the National PA Plan in the US provides health workers with six strategies identified as being key to promoting health (Pate, 2014). These include making PA a patient "vital sign" that is assessed on every visit, the use of a systems approach to promotion which encourages the development of a national network of programmes developed in conjunction with insurers and the inclusion of PA training in the education of all health professionals. This research strongly endorses the need for a national PA for Ireland.

Educational Requirements to Support Physical Activity

One of the ongoing themes that has resulted from this research is the need for education and training of primary care staff with respect to PA promotion. This was discussed in light of the poor knowledge of PA guidelines in Study I (Chapter 4 Section 4.4.2) and also identified as necessary by participants reviewing the feasibility of the PA pathway in Study III.

PA must be given dedicated time in both the formalised undergraduate education of health sciences programmes and within the continuing professional education programmes of health

professionals. This research has identified gaps in several areas pertaining to PA promotion. These include knowledge regarding public health guidelines, basic screening assessments for PA, basic skills in behavioural interventions such as motivational interviewing and population approaches to PA promotion. Coordination and development of curricula that include specific components relating to clinical work in disease prevention and lifestyle management is essential. The focus of teaching needs to change with more explicit focus on population health and disease prevention rather than the current overreliance on the medical model of diagnosis and treatment. Training on exercise referral and basic screening practices should be included as basic undergraduate content on all courses relating to exercise and healthcare. There is also a need for coordination of the content of curricula between different professions, because at present, no one profession possesses the full spectrum of knowledge and skills necessary to effectively promote PA effectively, leading to fragmentation of service provision and a reliance on multiple professions (Matheson et al., 2013). There is an underrepresentation of lifestyle intervention and PA promotion in the undergraduate curricula of medical and other health professions (Dunlop and Murray, 2013, Weiler et al., 2012a, O'Donoghue et al., 2011). A recent questionnaire survey of final year medical students in the UK found that inactivity was incorrectly perceived to be the least important risk factor to global mortality (Dunlop and Murray, 2013). A study in Australia identified gaps in knowledge about PA and health, gaps in understanding of contemporary policy and gaps in translation strategies amongst a group of 115 key PA professionals attending a national PA conference in 2007 (Bellew et al., 2010).

As well as addressing training strategies to address gaps in knowledge, education must be accompanied by effective translation and dissemination policies to improve the diffusion of key guidelines, as well as more effective links between researchers, policymakers and practitioners, as well as across government/non-government sectors (Bellew et al., 2010). There is scope for widespread dissemination of training materials delivered online with, for example, a recently developed E-learning PA module already completed by 1,025 GPs in Ireland in 2013 (Health Service Executive, 2013a). This was developed by multiple partners including national society representatives from general practice, practice nursing, physiotherapy and sports and exercise medicine in conjunction with the HSE. It signals the growing commitment to open learning and use of the internet to encourage widespread dissemination of educational materials produced and endorsed by multiple partners. It is important that such materials are regularly updated to reflect changes in research and evidence based guidelines and to include details of new service developments and policy changes. The development of further initiatives, to include for example, skills that are widely applicable across many areas of health promotion such as motivational interviewing is also advocated (Lundahl et al., 2013, Lai et al., 2010). It is important that education programmes are coordinated as one aspect of an overall plan to target PA with oversight from public health experts and academic partners.

7.5 Critical Appraisal of this Work

The limitations of the three studies completed for this thesis have previously been presented at the end of each study chapter (4 to 6). In addition, the chosen methodologies including

study design, sampling procedures and the design and use of the questionnaires in Studies I and III have each been critically evaluated in Chapters 2 and 3.

The decision to use the IPAQ together with a thorough discussion of its measurement properties and the respective merits and limitations of self reported PA questionnaires were presented in Chapter 2 (Section 2.81 to 2.8.3). It is acknowledged that all self report questionnaires are limited as they rely on participant recall and accurate reporting of PA. Thus, PA questionnaires such as the IPAQ have the capacity to over or underestimate true rates of inactivity, which has in turn, implications for planning and resourcing in population health (Lee et al., 2011). There are noted advantages to using more direct objective methods of PA measurement such as accelerometers, which have improved precision and accuracy through the removal of the issues of recall and response bias (Trost et al., 2005). They may also be able to capture some of the information not captured in self-report methods, for example, incidental daily movement and low intensity activities. They too however, also possess their own limitations, such as the inability to capture arm movements and various types of PA such as static work and water based activities (Powell and Rowlands, 2004). They are also time and cost intensive and intrusive to participants rendering them difficult to apply in larger epidemiologic settings (Prince et al., 2008).

PA questionnaires on the other hand are frequently used in population studies due to their low cost, low participant burden and generally high acceptance (Dishman et al., 2001). The IPAQ was chosen as it is one of the most widely used tools in surveillance studies and in national health surveys and thus is widely comparable amongst studies and countries (Guthold et al., 2008, Bauman et al., 2009b). It was also used in the national health survey in Ireland (SLÁN) which was an important consideration for this research as it allowed the results from Study II describing the PA of primary care patients to be discussed in the context of general population estimates (Morgan et al., 2008). It must however be noted that the sampling frames and procedures were different for both studies, so direct comparison is limited.

The inclusion of data relating to sitting is a significant strength of this research, as population estimates of sitting are seldom reported and as discussed in Chapter 1 (Section 1.12.4) there are no descriptive analyses of sitting for Irish populations. Despite the acceptable measurement properties of the IPAQ for sitting (Rosenberg et al., 2008), there are still limitations imposed by the reliance on a single question to determine weekday sitting time. The IPAQ does not allow for the categorisation of sitting into different domains, for example, work, leisure and transport as it does with PA data. This limits the amount of analysis and interpretation and highlights the need for further surveillance studies using tools which allow differentiation of sitting into different categories.

The omission of "occupation" from the demographic questionnaire in Study II was unfortunate, as it would have aided in the analysis both of the sitting and PA data. It was not possible, therefore, to determine whether PA and sitting behaviours were influenced by the occupational demands of a person's employment, which would have important implications in designing appropriate interventions. In addition, a decision was taken when designing study II not to request medical details from participants attending primary care. This was taken after consideration of the ethical implications of requesting personal medical information in a public

waiting room and to limit the intrusiveness of the research. However, the finding that 45% of participants felt that they had an injury or disability that limited their PA highlights the need for further work investigating the medical reasons that cause people to restrict their PA. It is likely, that in reality, PA should not be restricted in many of these cases and may in fact benefit many of the conditions normally seen in primary care such as those of the respiratory, circulatory and musculoskeletal systems. It may be however, that these patients are more in need of professional education and support to commence a PA programme tailored for their underlying condition and its presentation.

Overall there were excellent response rates achieved for each of the three studies of this research, in particular with respect to Studies II and III. This has previously been acknowledged as a strength of this research in each of the individual study chapters (Sections 4.4.1, 5.4.1 and 6.5.2). Particular care was taken in the design of each study in order to maximise response and recruitment rates. This included the extensive piloting of the questionnaire and the use of repeated personalised contacts in Study I. In Study II, a decision was taken by the researcher to personally collect all of the data rather than arrange for the distribution of the IPAQ by the reception staff or primary care professionals. This meant that the researcher was available to answer any queries with respect to the questionnaire and to assist, where necessary, with its completion. In Study III, the personalised delivery of the education session by the researcher, to participants in their place of work, resulted in an excellent level of co-operation with the Delphi methodology, a process which is often weakened by high attrition rates (Keeney at al., 2001).

There are some additional points that warrant discussion. The first is in relation to the choice of professional groups included in Studies I and III. Study I included both GPs and PTs but did not extend the survey to the wider primary care team, which it could be argued, may also play a role in the screening and promotion of PA in primary care. This is particularly the case for practice nurses whose role in PA promotion has received much attention in the literature (Douglas et al., 2006a, Douglas et al., 2006b, Puig Ribera et al., 2005, Harris et al., 2013). It is therefore acknowledged that the description of current practices pertaining to PA promotion in primary care may be incomplete and that in some instances may be underestimated. This limitation is somewhat ameliorated by the inclusion of the question relating to onward referral by GPs to the practice nurse which was found to be 16%. The decision whether to include practice nurses in the study was given much thought at the time of the research design. There were however, serious concerns regarding the ability to limit sampling error with this group, as there is no central register of practice nurses and attempts to procure mailing lists through professional education networks and the national nursing board were limited in terms of coverage and accuracy. Generically addressed questionnaires could have been sent to GP practices in the knowledge that some would include practice nurses. However, this would have introduced an element of bias, as questionnaires to both GPs and PTs were personally addressed and it would not have been possible to accurately follow up non-responders or account clearly their reasons for non-response. The strict adherence to rigorous sampling methods along with multiple personally addressed contacts and a carefully designed and piloted questionnaire resulted in a good (GPs 65%) to excellent (PTs 89%) response rate to Study I and allows reasonable confidence that the results are representative and accurate for the two professions surveyed.

The decision to conduct Study III using only a sample of PTs was taken based on several factors. Firstly, the possibility of conducting an intervention trial to determine the clinical effectiveness of the pathway to increase PA was considered. However, results from the process evaluation trial carried out in the UK did not support this approach (Bull and Milton, 2010, Bull et al., 2008). The UK trial which has been previously discussed (Chapter 6, Section 6.1) found low rates of patient recruitment despite the pathway being well accepted by clinicians. Participating clinicians received two days training to orientate them in the delivery and implementation of the pathway as well as a follow up site visit by a member of the evaluation team which included one-on-one tuition. They were additionally in receipt of three different sets of patient and health practitioner materials and an electronic database which helped collate and track patient progress through the pathway.

It was therefore considered beyond the scope and funding capacity of this PhD to conduct an intervention trial, as implementation of the pathway without the support of additional resources and training was unlikely to yield positive results. A decision was taken that a preliminary study investigating the acceptability and feasibility of the pathway for use in Irish primary care was more suitable at this time, as well as helping to inform future work in this area. In order to ensure consensus was reached, the Delphi approach was determined to be the best choice of methodology. Based on the GP response rates obtained in Study I and the methodological requirement of the Delphi to maintain a high response rates over three successive iterations, it was deemed an unsuitable methodology for inclusion of GPs. The generally positive opinions of PTs regarding the suitability of the pathway for use in Irish primary care, support the additional funding and resources that would be required to conduct a larger process evaluation of the pathway or an intervention trial. The use of this pathway, albeit in a modified version in the planned National Exercise Referral Framework also supports the need for further large scale investigation of this pathway in Ireland.

7.6 Implications for Future Research

There are a number of interesting research questions that arise from this research. One in particular relates to the question of how PA correlates may differ in various domains of activity. Following on from the results of Study II an interesting perspective would be to investigate further why the walking of the urban deprived sample was so much higher than that of the other two samples. Was this increased walking primarily related to transport or leisure and how much did the local environment and/or personal socioeconomic variables influence an individual's choice? Similar research should be directed towards the rural sample as the most inactive, to determine the relative contribution that each of the various individual, environmental and socioeconomic variables exert on PA. These questions have potential to impact positively on the design of suitable PA interventions, whereby improved understanding of the local population and its immediate environment can help tailor PA programmes accordingly.

Establishing regular surveillance data similar to that produced in Study II on both PA and sedentary behaviour of the Irish population is of absolute importance, so that trends in activity over time can be tracked and followed. This would serve as an indicator of the effectiveness or

otherwise, of any interventions or policy changes implemented as a result of the national PA plan and with use of the correct surveillance tools allow for meaningful comparisons among different groups of people and against international estimates. There is an urgent need to capture more data on the sedentary behaviours of the Irish population using more descriptive study tools which measure the different domains of sedentary behaviour, as well as using more objective measures such as accelerometers. Additionally the research regarding specific correlates of sedentary behaviour is very much in its infancy, as are studies investigating the potential impact of different interventions.

There is also a need to establish surveillance data on the PA levels and sedentary behaviour of people with disabilities. At present, there is a lack of research in this area and findings from this thesis would suggest that people with disabilities are at particular risk from physical inactivity.

There were positive findings towards the PA clinical pathway utilised in Study III, however the widespread acceptability of this pathway would need to be determined amongst a much broader spectrum of professionals. Gaining insight to the acceptability and satisfaction of this pathway from the perspective of the service user would also be important. The use of the pathway as a clinical tool needs to be evaluated further both in terms of the feasibility of its implementation in primary care and its associated costs, but also in terms of its effectiveness to support behaviour change in patients.

7.7 Conclusion

Physical inactivity and sedentary behaviour contribute significantly to the development of many chronic diseases, which in turn exert a significant burden on affected individuals, their families, the health system and wider society. At a time when there is ongoing commitment to develop and expand primary care services in Ireland, together with a specific emphasis on disease prevention and health promotion, there is a unique opportunity to incorporate effective PA intervention programmes into health provision.

Population surveillance studies help to describe and quantify the distribution of risk from problems such as physical inactivity and are the basis for effective public health planning. Findings from this research have highlighted the significant problems of physical inactivity and sedentary behaviour that exist in the primary care population and described important associations between PA and individual, social and environmental factors. This research has also provided a detailed overview of the PA promotional practices that are currently being used by primary care clinicians. Findings would point to ongoing challenges to ensure that evidence based guidelines, formalised and consistent screening and proven PA interventions are incorporated into routine practice. One method of achieving this is through the use of a PA clinical pathway which combines formalised screening methods, with a number of recommended PA interventions and is applicable to the wide spectrum of patients seen in primary care. Preliminary work suggests that this is an acceptable and feasible approach to primary care clinicians.

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APPENDICES

Appendix I: Letters of Ethical Approval

Ethical Approval Study I

THE UNIVERSITY OF DUBLIN
TRINITY COLLEGE

SCHOOL OF MEDICINE
FACULTY OF HEALTH SCIENCES

Trinity College, Dublin 2, Ireland
Tel: +353 1 896 1476
Fax: +353 1 671 3956
email: medicine@tcd.ie

Professor Dermot Kelleher, MD, FRCPI, FRCP, F Med Sci
Head of School of Medicine
Vice Provost for Medical Affairs

Ms Fedelma McNamara
School Administrator
email: medschadmin@tcd.ie

Ms Emer Barrett
Physiotherapy,
Trinity Centre for Health Sciences,
St James Hospital,
D8

Tuesday, 20 July 2010

Study: Physical activity in the management of cardiovascular disease in the primary care setting

Dear Applicant (s),

Further to a meeting of the Faculty of Health Sciences Ethics Committee held in May 2010, we are pleased to inform you that the above project has been approved without further audit.

Yours sincerely

Prof. Orla Sheils
Chairperson
Faculty of Health Sciences Ethics Committee

Cc
Dr Juliette Hussey, Physiotherapy,
Trinity Centre for Health Sciences,
St James Hospital,
D8

Dr Darker,
Public Health and Primary Care,
Trinity Centre for Health Sciences,
AMNCH,
D24

Ethical Approval Study II

THIS NOTEPAPER MUST NOT BE USED FOR PRESCRIPTIONS OR INVOICING PURPOSES

Ursula Ryan Ph: 4142342 email: Ursula.Ryan@amnch.ie
Secretariat Fax 4142371

Ms. Emer Barrett
Discipline of Physiotherapy
School of Medicine
Trinity Centre for Health Sciences
St. James's Hospital
Dublin 8

THE ADELAIDE & MEATH HOSPITAL, DUBLIN
INCORPORATING
THE NATIONAL CHILDREN'S HOSPITAL

TALLAGHT, DUBLIN 24, IRELAND
TELEPHONE +353 1 4142000

August 2nd. 2011

Re: Determining the physical activity profile of patients attending primary care

Please quote this reference in any follow up to this letter: 2011/08/05 Chairman's Action

Dear Ms. Barrett,

Thank you for your Submission dated June 23rd. 2011.

The Vice-Chairman, on behalf of the Research Ethics Committee, has given full ethical approval to this amendment.

Yours sincerely

Ms. Ursula Ryan
Secretary,
SJH/AMNCH Research Ethics Committee

Ethical Approval Study III

COLÁISTE NA TRÍONÓIDE, BAILE ÁTHA CLIATH

Dámh na nEolaíochtaí Slainte,
Foirgneamh na Ceimice
Colaiste na Tríonóide,
Baile Átha Cliath 2, Éire.

TRINITY COLLEGE DUBLIN

Faculty of Health Sciences,
Chemistry Building,
Trinity College,
Dublin 2, Ireland.
T:- +353 (0)1 8964255

Emer Barrett
School of Medicine
Trinity Centre for Health Sciences
St James's Hospital
Dublin 8

Ref: 120919

Title Of Study: Investigating the content and clinical feasibility of a physical activity pathway in primary care Physiotherapy services by means of the Delphi process

Dear Emer,

Further to a meeting of the Faculty of Health Sciences Ethics Committee held in September 2012, we are pleased to inform you that the above project has been approved without further audit.

Yours sincerely,

pp Fiona Brown

Dr. Ruth Pilkington
Chairperson
Faculty Research Ethics Committee

Appendix II: Focus Group Format Study I Pilot

FOCUS GROUP FORMAT

Introduction

1. Participants to sign consent form

2. Introduce myself and thank participants

3. Tape record proceedings and explain same

4. Provide a very brief introduction to the research project and its aims

5. Explain again that this is the pilot stage of the research so all opinions valued and sought.

6. Explain purpose of focus group and how it will run

Purpose

To determine if I have omitted anything important from the questionnaire

To get their feedback regarding the questionnaire format and clarity

To discuss any particular issues that were found when analysing results

Format

Should last maximum of 30 mins

Participants to begin by reading the introductory letter again and completing the amended questionnaire

Participants' requested to highlight any questions they find confusing or unclear as they go

Time taken to complete the amended questionnaire recorded by researcher.

QUESTIOING SCHEDULE FOR FOCUS GROUP AND TELEPHONE FOLLOW UP

A. Introductory letter

Was it interesting or is there anything you would suggest that I change in order to improve participation?

Do you think it was relevant to physiotherapists/GPs? Is there anything I could do to make it more relevant?

What did you think of the length of the letter?

B. Questionnaire

How did you find the questionnaire?

Is there anything particularly important to physical activity promotion that you feel I have omitted from the questionnaire?

Is each question worded clearly?

Prompt any problem questions that are highlighted from analysis of pilot results for example consistently omitted answers i.e. could screening and promotion be combined to one?

Was the questionnaire easy to follow?

Did you feel like discontinuing with the study at any stage?

Is the questionnaire too long?

Is there anything that you would change that would help you to fill out the questionnaire more easily?

C. Mode of Survey

Would you liked to have the option of completing this survey online?

If Yes – would you have preferred the initial contact to be via email rather than post?

D. Summary

Provide a short summary of main changes as suggested by participants, ensure agreement

"Have I missed anything?"

Explain that taped proceedings will be transcribed and is available to any participant as requested

Appendix III: Focus Group and Interview Proceedings Study I Pilot

A. **Summary of focus group taped proceedings (PTs)**
B. **Summary of follow up phone interviews (GPs)**

A. SUMMARY OF FOCUS GROUP TAPED PROCEEDINGS

Date: 19/05/2010

Present:

Researcher: Emer Barrett (EB), Moderator: Seamus Toomey (ST)

Participants: INSERTED NAMES

Venue: INSERTED PARTICPATING UNIT NAME

The focus group proceedings were taped and the following is a summary of the discussion. Exact proceedings were not transcribed as the purpose of group was to receive feedback and inform the questionnaire and survey method.

Written notes were taken by EB and ST during the focus group.

Report of Proceedings

1. Introductions made and participants thanked.

2. Participants were given a brief introduction to research project and it aims.

3. Purpose of focus group and its format explained.

4. Consent forms signed by participants.

5. Amended questionnaire and introductory letter distributed. Participants asked to read letter and complete questionnaire. Requested to highlight any problematic areas or typos as they completed questionnaire.

6. The process was timed, took 4 to 5 minutes.

7. Following completion the original pilot questionnaires were distributed to individual participants for comparison/discussion.

8. Tape recorder started.

Questioning schedule

Questions posed by the researcher highlighted in bold.

A. Introductory letter

Was it interesting or is there anything you would suggest that I change in order to improve participation?

Majority of participants still felt the letter was too long – only scanned the information.

Needed to be shorter, longer length "turns you off". Reading through it but not really taking it in.

One participant suggested presenting information in bullet point format.

One participant suggested adding "As Physiotherapists" to Physiotherapists routinely use PA and exs.....

Majority felt paragraph describing how physiotherapists use exercise was unnecessary as known to all in the profession.

Suggested that the key point was that the majority of the research to date has been done with GP and PNs. This was felt to be a motivating factor to complete the questionnaire.

Including the time taken to complete was useful and again encouraged participants to complete.

One participant felt that sentence "We wish to describe the current practice" was incorrect, others agreed. Recommended changing wording to "investigate/determine".

Do you think it was relevant to physiotherapists/GPs? Is there anything I could do to make it more relevant?

Yes

No – research being done on different professions is the most relevant point

What did you think of the length of the letter?

A/A

B. Questionnaire

How did you find the questionnaire?

Well sectioned.

Easy to fill in.

Better than the last one.

Is there anything particularly important to physical activity promotion that you feel I have omitted from the questionnaire?

One participant felt it would be useful to determine what level of physical activity patients would have to acquire before you would be happy to discharge them.

How do you determine when you are happy with their PA level?

At what outcome level do you discharge them?

Sometimes you (PT) just give advice and they (patients) need to follow it through. They might tell you they do it 3 times a week. You might be happy with leaving them with advice.

Is each question worded clearly?

Prompt any problem questions that are highlighted from analysis of pilot results for example consistently omitted answers i.e. could screening and promotion be combined to one?

Q8 – 12 Pilot

EB drew their attention to screening section (Q 8 – 12) from pilot questionnaire which was removed in its entirety. Reason for same explained to participants. Participants agreed with this – felt it was almost like they were answering the same questions again.

Q4 Pilot/Q3 Main

Participant asked about whether I was seeking her own opinion Vs international guidelines. Explained that this question seeks to establish our awareness of international guidelines. This was clear to other participants.

Q 20 Pilot/ Q14 Main

EB highlighted that answering options were changed from "YES/ NO" to "tick all that apply", people felt that this was better.

Q 15 Main

EB highlighted that this question was a new addition, participants felt it was the question which took the longest.

Some participants felt that some of the promotional activities were equally as important as each other.

Discussed what the purpose of the question is – "Which do you use most often" or "most important".

Participant - Some pts just need verbal advice, some will be much better if you write it down so that is a difficult question to answer. Participant - Using a certain promotional activity the most and the most helpful activity are two different things.

One participant interpreted that question completely differently – she answered "GP exs Scheme" as being something that she would like to use i.e. interpreted the question as what would be the most helpful to your practice if available to you.

Wording needs to be changed.

I asked about ranking top three activities that you do most often – all agreed that that would be better.

What do you use most often? Participant - Is it our wish list or something that we would love to have but we don't find helpful because we don't have it to use it.

Discussed putting in a separate question "if you had a choice what would be the most helpful to you "and then another separate question asking you to rank what you use most often"

After review of focus group information decision taken to add additional question asking which ONE promotional activity most beneficial to practice

Q 22 Pilot /Q16 Main

EB highlighted that answering options were changed from "YES/ NO" to "tick all that apply", people felt that this was better.

Explained wording changes "Which of these factors" – all agreed new wording better, more clear.

Participant asked about defining screening – did I mean formal or informal. Explained that definition of screening given in colour at the start of each section, the questionnaires that I had distributed were in black and white – all agreed that colour would highlight definition... a few of the participants didn't read this therefore v important that it needs to be in colour to draw the eye.

Was the questionnaire easy to follow?

Yes, Definitely much better.

Looks and feels lighter when double sided – more inclined to complete.

Did you feel like discontinuing with the study at any stage?

No

Is it too long?

A/A

Is there anything that you would change that would help you to fill out the questionnaire more easily?

Colour paper requested and Q15

One extra Q ok

C. Mode of Survey

Would you liked to have the option of completing this survey online?

Yes X2

No X4 – easier to ignore.

Option maybe desirable.

Can't ignore post.

If Yes – would you have preferred the initial contact to be via email rather than post?

N/A (postal survey decided at this stage)

D. Summary and Close

Short summary of main changes as suggested by participants, ensured agreement.

"Have I missed anything?"

Much easier than last time, read much better. Easier to follow, feels lighter in my hand.

Thanks expressed and offer of in-service made.

Copy of proceedings will be transcribed and is available to anybody who contacts me.

Results of study will be circulated on completion.

B. SUMMARY OF TELEPHONE FOLLOW UP INTERVIEWS

Following discussion with the GPs and analysis of the returned questionnaires the following changes were implemented to the questionnaire.

Q4 Removed Course Attendances.

Removed In-service training programmes.

Removed current research literature.

The purpose of this question was to capture if international and national guidelines were been assimilated and used by GPs in their practice therefore the other options were removed.

Q7-11 Removed all questions regarding screening practice.

On analysis of pilot Q7 -11 were almost always answered the same as Q14 -18. It is assumed that to promote PA with patients a degree of assessment would have to have been carried out prior to this. Therefore for brevity these questions were removed.

Q12 The option of accelerometer was removed.

The wording IPAQ was added as an example of a patient questionnaire. The words self reported were removed as some scales may be delivered by the clinician.

Q13 The method of answer was changed from a forced response "Yes / No" option to a" tick all that apply" option. Although this has been found to increase the risk of primacy effects, analysis of the pilot found that a number of subjects 4/9 responded to this question by ticking

the yes box only. An option of ranking the answers was not chosen as this is best reserved for questions with less than 5 choices of response.

Q 20 This was removed and replaced with a new question asking GPs to indicate which service would be most beneficial to their practice.

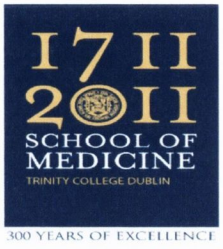
Q 21 The method of answer was changed from a forced response "Yes / No" option to "tick all that apply" option.

The wording of the question was also changed following feedback that the initial question was unclear.

Q27 This question was removed. Similar data was captured in Q24 asking subjects how long they have worked in primary care.

Appendix IV: Questionnaires Study I

GP Questionnaire Study I



Physical Activity in the Management of Cardiovascular Disease in Primary Care

This questionnaire will only take 5 to 7 minutes to complete. Most of the questions ask you to place a tick (✔) in the box next to your answer. All questionnaires will be treated with the strictest confidence.

Thank you for taking the time to complete this questionnaire.

Emer Barrett, School of Medicine, Trinity Centre for Health Sciences, St James Hospital, Dublin 8
barrete@tcd.ie Tel: 01 896 2120

I wish to opt out of this study ☐

Section 1: Physical Activity Information

1. Do you feel it is part of your role to assess/promote physical activity in your patients?

YES ☐ **NO** ☐ **UNSURE** ☐

If **NO** please state whose role you feel it is _____

2. In your opinion do you think that overall physical activity levels in Ireland are:

Please tick ✔ one box only

Increasing a lot	Increasing a little	Staying the same	Decreasing a little	Decreasing a lot	Unsure
☐	☐	☐	☐	☐	☐

3. As far as you are aware what are the current minimal weekly physical activity recommendations for healthy adults?

Frequency _____ times per week

Minimum Duration _____ minutes per session

Intensity **Low** ☐ **Moderate** ☐ **High** ☐

Unsure ☐

4. Do you use any of the following to source information on physical activity?

	Yes	**No**
National Dept of Health Guidelines	☐	☐
International Guidelines	☐	☐
ICGP Website	☐	☐
Other Professionals	☐	☐
Other (please outline)		

_____

Section 2: Physical Activity Screening

Physical activity screening may include any assessment (either verbal or physical) of a patient's physical activity level

5. Do you use established protocols for physical activity screening?

YES ☐ **NO** ☐

If **yes** please provide brief details _____

6. Please place a tick ✓ in the box following the statement which most accurately describes your physical activity (PA) screening practices

	Please tick ✓ one box only
I don't screen any of my patients PA levels	☐ → Please go to Q 8
I screen patients on an ad hoc basis	☐
I only screen patients if linked to their presenting complaint	☐
I only screen patients if they request information	☐
I screen all of my patients	☐
Other (please outline)	

7. Do you use any of the following screening methods?

	Yes	No
Specific questioning on assessment	☐	☐
Patient questionnaire (e.g. IPAQ)	☐	☐
Pedometer	☐	☐
Other (please outline)		

Section 3: Physical Activity Counselling

Physical activity counselling may include <u>any</u> intervention (either verbal or otherwise) undertaken by a health professional that aims to increase a patient's level of physical activity

8. Please place a tick ✓ in the box following the statement which most accurately describes your physical activity counselling practices

	Please tick ✓ one box only
I don't counsel any of my patients	☐ → Please go to Q 15
I counsel patients on an ad hoc basis	☐
I only counsel patients if linked to their presenting complaint	☐
I only counsel patients if they request information	☐
I counsel all of my patients	☐
Other (please outline)	

9. How likely or unlikely are you to promote physical activity in an apparently healthy patient?

Very likely	Likely	Unlikely	Very unlikely
☐	☐	☐	☐

10. How likely or unlikely are you to promote physical activity in a hypertensive patient?

Very likely	Likely	Unlikely	Very unlikely
☐	☐	☐	☐

11. How likely or unlikely are you to promote physical activity in a patient with hypercholesterolemia?

Very likely	Likely	Unlikely	Very unlikely
☐	☐	☐	☐

12. How likely or unlikely are you to promote physical activity in an overweight patient?

Very likely	Likely	Unlikely	Very unlikely
☐	☐	☐	☐

13. How likely or unlikely are you to promote physical activity in a patient with diabetes?

Very likely	Likely	Unlikely	Very unlikely
☐	☐	☐	☐

14. Do you use any of the following promotional activities?

	Please tick ✓ all that apply
Informal education/advice	☐
Provision of written materials	☐
Referral to physiotherapy	☐
Referral to exercise specialist	☐
Referral to practice nurse/community nurse	☐
Referral to GP Exercise Prescription Scheme	☐
Referral to a gym	☐
Behaviour modification	☐
Provision of exercise diary	☐
Provision of follow up appointments	☐

Other (please outline) _____

15. Choosing from the list of promotional activities in Q14 which <u>one</u> would be MOST beneficial to your practice? Consider all promotional activities listed even if unavailable to you.

_____

16. Which of these factors might prevent you from promoting physical activity amongst your patients?

	Please tick ✓ all that apply
Not my professional role	☐
Poor patient compliance with advice	☐
Lack of knowledge	☐
Lack of patient educational resources	☐
Lack of time	☐
Low perceived importance of physical activity	☐
Do not know what services available	☐
Lack of protocols	☐

Other (please outline) _____

17. To what extent do you agree or disagree with this statement. "I feel confident providing patients with advice regarding physical activity"

Strongly agree	Agree	Neither agree or disagree	Disagree	Strongly disagree	No opinion
☐	☐	☐	☐	☐	☐

Section 4: Professional and demographic details

18. Have you undertaken any postgraduate courses that have included components specifically related to physical activity or exercise prescription?

YES ☐ **NO** ☐

If **yes** please provide brief detail _____

19. How many years (or whole year equivalents) **have you been working in primary care?** _____

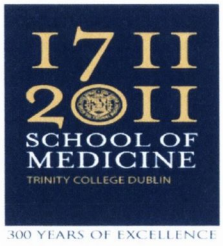
20. In which geographical area do you work?

Dun Laoghaire ☐	**Dublin South East** ☐	**Dublin South City** ☐
Dublin South West ☐	**Dublin West** ☐	**Kildare West Wicklow** ☐
Wicklow ☐	**Laois Offaly** ☐	**Longford/Westmeath** ☐

21. Are you male or female?

Male ☐ **Female** ☐

THANK YOU FOR TAKING THE TIME TO COMPLETE THIS QUESTIONNAIRE
PLEASE RETURN IN THE STAMPED ADDRESSED ENVELOPE



Physical Activity in the Management of Cardiovascular Disease in Primary Care

This questionnaire will only take 4 to 7 minutes to complete. Most of the questions ask you to place a tick (✔) in the box next to your answer. All questionnaires will be treated with the strictest confidence.

Thank you for taking the time to complete this questionnaire.

Emer Barrett, School of Medicine, Trinity Centre for Health Sciences, St James Hospital, Dublin 8
barrete@tcd.ie Tel: 01 896 2120

I wish to opt out of this study ☐

Section 1: Physical Activity Information

1. Do you feel it is part of your role to assess/promote physical activity in your patients, if not directly linked to their presenting complaint?

YES ☐ **NO** ☐ **UNSURE** ☐

2. In your opinion do you think that overall physical activity levels in Ireland are:

Please tick ✔ one box only

Increasing a lot	Increasing a little	Staying the same	Decreasing a little	Decreasing a lot	Unsure
☐	☐	☐	☐	☐	☐

3. As far as you are aware what are the current minimal weekly physical activity recommendations for healthy adults?

Frequency _____ times per week

Minimum Duration _____ minutes per session

Intensity **Low** ☐ **Moderate** ☐ **High** ☐

Unsure ☐

4. Do you use any of the following to source information on physical activity?

	Yes	**No**
National Dept of Health Guidelines	☐	☐
International Guidelines	☐	☐
Courses attendances	☐	☐
Other Professionals	☐	☐

Other (please outline) _____

Section 2: Physical Activity Screening

Physical activity screening may include any assessment (either verbal or physical) of a patient's physical activity level

5. Do you use established protocols for physical activity screening?

YES ☐ **NO** ☐

If **yes** please provide brief details _____

6. Please place a tick ✔ in the box following the statement which most accurately describes your physical activity (PA) screening practices

	Please tick ✔ one box only
I don't screen any of my patients PA levels	☐ → **Please go to Q 8**
I screen patients on an ad hoc basis	☐
I only screen patients if linked to their presenting complaint	☐
I only screen patients if they request information	☐
I screen all of my patients	☐
Other (please outline) _____	

7. Do you use any of the following screening methods?

	Yes	No
Specific questioning on assessment	☐	☐
Patient questionnaire (e.g. IPAQ)	☐	☐
Pedometer	☐	☐
Other (please outline) _____		

Section 3: Physical Activity Counselling

Physical activity counselling may include <u>any</u> intervention (either verbal or otherwise) undertaken by a health professional that aims to increase a patient's level of physical activity

8. Please place a tick ✔ in the box following the statement which most accurately describes your physical activity counselling practices

	Please tick ✔ one box only
I don't counsel any of my patients	☐ → **Please go to Q 15**
I counsel patients on an ad hoc basis	☐
I only counsel patients if linked to their presenting complaint	☐
I only counsel patients if they request information	☐
I counsel all of my patients	☐
Other (please outline) _____	

9. How likely or unlikely are you to promote physical activity in an apparently healthy patient?

Very likely	Likely	Unlikely	Very unlikely
☐	☐	☐	☐

10. How likely or unlikely are you to promote physical activity in a hypertensive patient?

Very likely	Likely	Unlikely	Very unlikely
☐	☐	☐	☐

11. How likely or unlikely are you to promote physical activity in a patient with hypercholesterolemia?

Very likely	Likely	Unlikely	Very unlikely
☐	☐	☐	☐

12. How likely or unlikely are you to promote physical activity in an overweight patient?

Very likely	Likely	Unlikely	Very unlikely
☐	☐	☐	☐

13. How likely or unlikely are you to promote physical activity in a patient with diabetes?

Very likely	Likely	Unlikely	Very unlikely
☐	☐	☐	☐

14. Do you use any of the following promotional activities?

	Please tick ✔ all that apply
Informal education/advice	☐
Provision of written materials	☐
Referral to exercise specialist	☐
Referral to practice nurse/community nurse	☐
Referral to GP Exercise Prescription Scheme	☐
Referral to a gym	☐
Behaviour modification	☐
Provision of exercise diary	☐
Provision of follow up appointments	☐
Other (please outline)	_____

15. Choosing from the list of promotional activities in Q14 please rank the three activities that would be MOST beneficial to your practice. Consider all promotional activities listed even if unavailable to you.

1. _____

2. _____

3. _____

16. Which of these factors might prevent you from promoting physical activity amongst your patients?

	Please tick ✔ all that apply
Not my professional role	☐
Poor patient compliance with advice	☐
Lack of knowledge	☐
Lack of patient educational resources	☐
Lack of time	☐
Low perceived importance of physical activity	☐

Do not know what services available ☐
Lack of protocols ☐
Other (please outline) _____

17. To what extent do you agree or disagree with this statement. "I feel confident providing patients with advice regarding physical activity"

Strongly agree	Agree	Neither agree or disagree	Disagree	Strongly disagree	No opinion
☐	☐	☐	☐	☐	☐

Section 4: Professional and demographic details

18. Have you undertaken any formal postgraduate courses (diploma level or higher) that have included components specifically related to physical activity or exercise prescription?

YES ☐ **NO** ☐

If **yes** please provide brief details _____

19. How many years (or whole year equivalents) **have you been working in primary care?** _____

20. In which geographical area do you work?

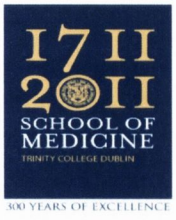
Dun Laoghaire ☐	**Dublin South East** ☐	**Dublin South City** ☐
Dublin South West ☐	**Dublin West** ☐	**Kildare West Wicklow** ☐
Wicklow ☐	**Laois Offaly** ☐	**Longford/Westmeath** ☐

21. Are you male or female?

Male ☐ **Female** ☐

THANK YOU FOR TAKING THE TIME TO COMPLETE THIS QUESTIONNAIRE
PLEASE RETURN IN THE STAMPED ADDRESSED ENVELOPE

Appendix V: Questionnaire Study II



How active are you?

As part of a research study in Trinity College Dublin we are interested in finding out more about the physical activity levels of patients attending primary care.

At present we are interested in surveying people who;

- Are between the ages of **18 – 69 years**

  &

- Do not attend any structured exercise classes given by the HSE.

  Examples of this would be cardiac rehab or back exercise classes.

We are hoping to get as many people as possible to take part whatever your activity level.

To take part you would need to fill out the following questionnaire which should take about 5 minutes to complete.

There is a research physiotherapist available if you have any questions or would prefer someone to fill the form in with you – please ask the receptionist.

There is more information about this study in the Patient Information Leaflet which you may take home with you or contact:
Emer Barrett at 01 896 2110, Email: barrete@tcd.ie

Thank you for your time and help!

Part One
INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the **last 7 days**. Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

Think about all the **vigorous** activities that you did in the **last 7 days**. **Vigorous** physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Think *only* about those physical activities that you did for at least 10 minutes at a time.

1. During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, digging, aerobics, or fast bicycling?

   _____ **days per week**

   ☐ No vigorous physical activities → ***Skip to question 3***

2. How much time did you usually spend doing **vigorous** physical activities on one of those days?

   _____ **hours per day**

   _____ **minutes per day**

   ☐ Don't know/Not sure

Think about all the **moderate** activities that you did in the **last 7 days**. **Moderate** activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal. Think only about those physical activities that you did for at least 10 minutes at a time.

3. During the **last 7 days**, on how many days did you do **moderate** physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking.

   _____ **days per week**

   ☐ No moderate physical activities → ***Skip to question 5***

4. How much time did you usually spend doing **moderate** physical activities on one of those days?

_____ **hours per day**

_____ **minutes per day**

☐ Don't know/Not sure

Think about the time you spent **walking** in the **last 7 days**. This includes at work and at home, walking to travel from place to place, and any other walking that you might do solely for recreation, sport, exercise, or leisure.

5. During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time?

_____ **days per week**

☐ No walking → ***Skip to question 7***

6. How much time did you usually spend **walking** on one of those days?

_____ **hours per day**

_____ **minutes per day**

☐ Don't know/Not sure

The last question is about the time you spent **sitting** on weekdays during the **last 7 days**. Include time spent at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading, or sitting or lying down to watch television.

7. During the **last 7 days**, how much time did you spend **sitting** on a **week day**?

_____ **hours per day**

_____ **minutes per day**

☐ Don't know/Not sure

8. Thinking now about regular physical activity, by that I mean taking part in vigorous exercise or sport 3 times per week for a minimum of 20 minutes at a time or more general activities like walking, cycling or dancing 5 times per week for at least 30 minutes a day.

With that in mind please read the following five statements and tick which **ONE** best describes how physically active you have been over the last 6 months.

1. No I do not exercise regularly and I do not intend to do it in the next six months ☐
2. I do not exercise regularly, but I intend to do it in the next six months ☐
3. I do not exercise regularly but I intend to do it in within the next month ☐
4. I have been exercising regularly for less than six months ☐
5. I have been exercising regularly for more than six months ☐

Part 2

This is the final part of the questionnaire in which we ask some questions about you and your medical history. These will help us understand more about the physical activity levels of people of different ages and with different conditions. All these details will be kept confidential and shall only be viewed by the research physiotherapist.

9. Are you male or female? Male ☐ Female ☐

10. What age are you? .....

11. Have you ever been diagnosed with the following?

Heart attack (also called a myocardial infarction)	Yes ☐	No ☐
Angina	Yes ☐	No ☐
Stroke	Yes ☐	No ☐

12. Have you ever had the following medical procedure?

Coronary artery bypass graft (CABG)	Yes ☐	No ☐
Angioplasty	Yes ☐	No ☐

13. In the last 12 months, have you been told by a health professional that you have high blood pressure?

Yes ☐ No ☐

14. Are you on medication for high blood pressure?

Yes ☐ No ☐

15. In the last 12 months, have you been told by a health professional that you have high cholesterol?

Yes ☐ No ☐

16. Have you ever been told by a health professional that you have diabetes?
(Women who developed diabetes only during pregnancy please tick NO)

Yes ☐ No ☐

17. Do you smoke?

Yes ☐ No ☐

18. Given your age and height, would you say that you are?

About the right weight ☐ Too heavy ☐ Too light ☐ Not sure ☐

19. What is your weight? _____ stones _____ pounds (or _____ kilos)

20. What is your height? _____ feet _____ inches (or _____ cm)

21. Have you an injury, disability or medical condition which limits your physical activity?

Yes ☐ Please outline .....
No ☐

22. What is the highest level of education you have completed to date?

	Please tick one only
Some primary (not complete)	☐
Primary or equivalent (age 5 – 12)	☐
Intermediate/ junior/ Group Certificate/O level or equivalent	☐
Leaving Certificate/A level or equivalent	☐
Diploma/ Certificate	☐
Primary degree	☐
Postgraduate/ Higher degree	☐
Do not wish to answer	☐

23. Do you currently have or are you eligible for a medical card? Yes ☐ No ☐

24. Which medical professional are you attending today?

.....

This is the end of the questionnaire, thank you for participating.
Please drop completed questionnaires in the box at reception.

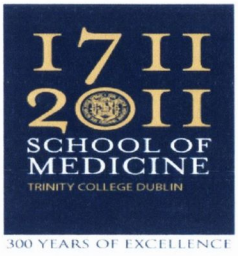
Appendix VI: Questionnaires Study III

Questionnaire Round 1

Questionnaire Round 2

Questionnaire Round 3

Questionnaire Round 1



Investigating the feasibility of a physical activity (PA) clinical pathway for use by primary care Physiotherapy services

PLEASE REFER TO THE PHYSICAL ACTIVITY (PA) PATHWAY AT THE END OF THIS DOCUMENT WHEN COMPLETING THIS QUESTIONNAIRE

All questionnaires will be treated with the strictest confidence

Emer Barrett, School of Medicine, Trinity Centre for Health Sciences, St James Hospital, Dublin 8
barrete@tcd.ie Tel: 01 896 2120

I wish to opt out of this study ☐

Thank you for taking the time to complete this questionnaire

Section 1 of the pathway: **RECRUITMENT**

Please indicate your agreement with the following statements by circling the appropriate number

1. It is appropriate that ALL patients attending Physiotherapy should be eligible for entry onto the pathway?

1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

2. It is appropriate that ONLY higher risk patients (e.g. pts with CV risk factors) attending Physiotherapy should be eligible for entry onto the pathway?

1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

3. It is appropriate to recruit the general public onto the pathway by offering dedicated PA appointments

1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

4. It is appropriate to allow other health professionals to refer patients to Physiotherapy for PA promotion

1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

5. It is appropriate to allow patients to self refer to Physiotherapy for PA promotion

1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

6. It is important to promote this service to the public (for e.g. posters displayed waiting rooms, GP surgery)

1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

7. What do you think is the best mechanism for recruiting patients onto the PA pathway?

_____

8. Do you think there are any particular criteria that should exclude entry onto the pathway?

_____

Section 2 of the pathway: **SCREENING**

1. The GPPAQ is the most appropriate PA screening tool for the Physiotherapist

1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

If you do not agree **(score of 4 or less)** why?

_____

2. If you do not agree that the GPPAQ is the most appropriate assessment tool can you suggest an alternative? (E.g. IPAQ, Single item measure, pedometer)

_____

3. The questions used to assess walking are appropriate

1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

4. Patients who are not interested in receiving a PA intervention should be given an information leaflet on the PA guidelines as they exit the pathway

1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

5. Patients who are not interested in receiving a PA intervention should be invited to return for a brief intervention in the future if they are interested

1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

6. Do you think the brief intervention should be delivered as a separate appointment or as part of routine treatment?

Separate appointment ☐ Routine appointment ☐ Not Important ☐

7. Do you have any additional comments to make about the SCREENING part of the pathway?

_____

Section 3 of the pathway: **Intervention**

1. It is appropriate to assess a patient's readiness to change using the appropriate scale

1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

2. Patients not ready to change their behaviour should be offered a follow up appointment

1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

3. Patients not ready to change their behaviour should be given an information leaflet on the PA guidelines as they exit pathway

1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

4. For those ready to change it is appropriate to use the ACSM risk stratification criteria to categorise patients into high and low risk

1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

5. Physiotherapists are appropriately trained to carry out the brief intervention

1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

6. The brief intervention should be based on the principles of motivational interviewing

1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

7. Training in the principles and application of motivational interviewing would be beneficial for this pathway

1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

8. The brief intervention does not need to be based on a specific theoretical model

1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

9. It is appropriate to set activity goals with the patient

1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

10. It is appropriate to give the patient written information on the benefits of PA

1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

11. It is appropriate to signpost the patient towards activities suitable for their clinical need

1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

12. It is important to provide the patient with written materials detailing the local opportunities to be active

1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

13. Do you have any additional comments to make about the INTERVENTION part of the pathway?

_____

Section 4 of the pathway: Delivery

All of the following low to medium risk activities should remain part of the pathway

1. Green exercise (e.g. outdoors)
1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

2. Walk Group
1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

3. Sports club
1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

4. Leisure Club
1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

5. Community centre
1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

6. Class programmes
1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

7. Active travel
1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

8. Pedometer programme
1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

9. Active workplace
1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

10. Parks and green spaces

1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

11. Active daily living

1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

12. Dance

1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

13. Mass participation events

1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

All of the following high risk activities should remain part of the pathway

14. Exercise referral scheme

1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

15. Condition specific programmes

1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

16. What are the condition specific programmes available in your area?

_____

Section 5 of the pathway: Completion

1. The patient should be given a follow up appointment for 3 months after brief intervention

1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

2. The patient should be given a follow up appointment for 6 months after brief intervention

1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

3. Patients who have relapsed should be coached again

1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

4. Patients who have relapsed should be offered further follow up appointments

1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

5. Do you have any additional comments to make about the COMPLETION part of the pathway?

_____

Section 6: Clinical feasibility of the pathway

1. This PA pathway would be useful to my practice

1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

2. It would be feasible to introduce this PA pathway to my practice

1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

3. Please indicate any specific training needs you may have associated with delivery of the pathway

_____

_____

4. Please indicate any additional resources you may require to deliver the pathway

_____

_____

Section 7: Professional and demographic details

1. Have you undertaken any formal postgraduate (diploma level or higher) courses that have included components specifically related to PA or exercise prescription?

YES ☐ **NO** ☐

If **YES** please provide brief detail _____

2. Please indicate how long you have been qualified:

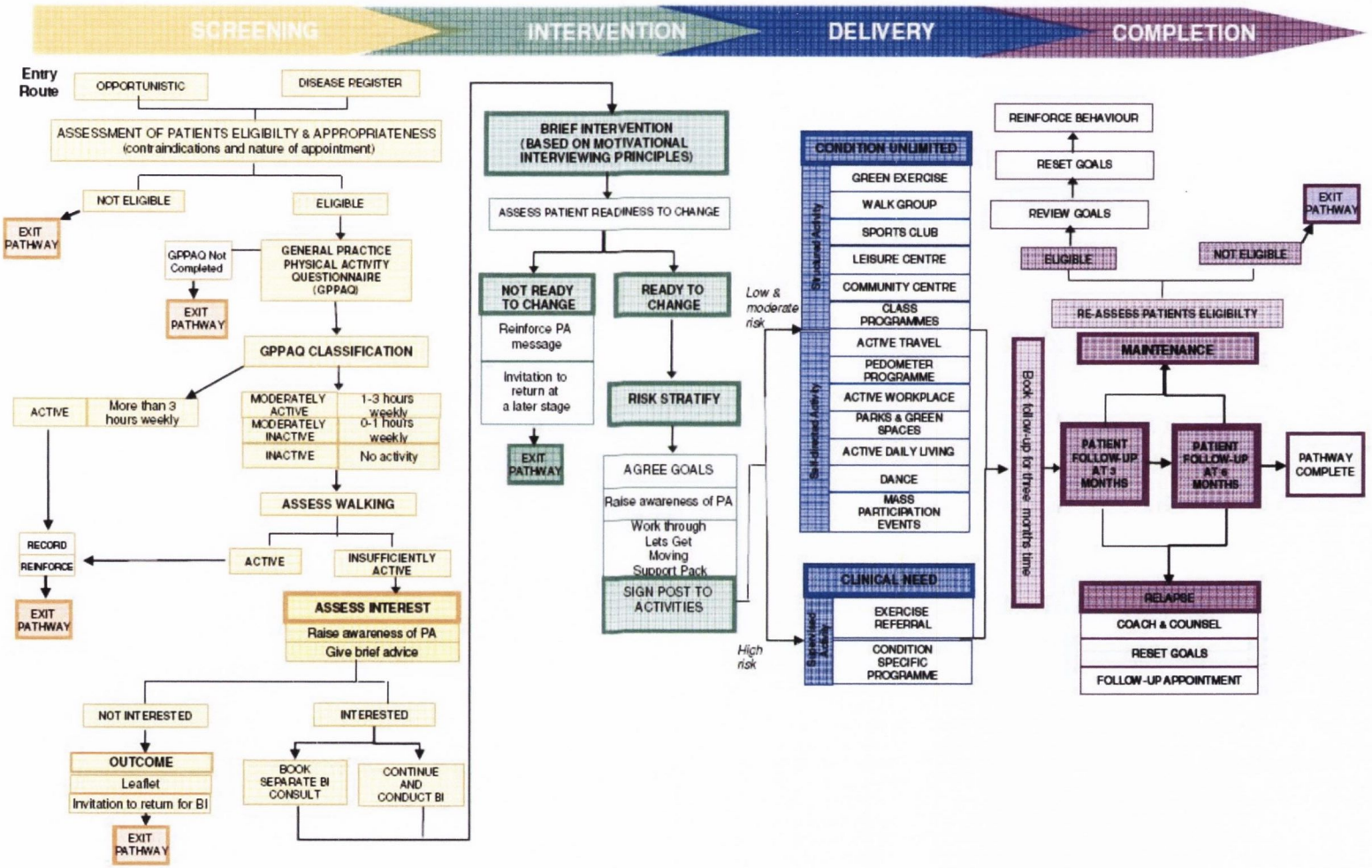
< 5 years ☐ 5 – 10 years ☐ 11 – 15 years ☐ 16 – 20 years ☐ > 20 years ☐

3. How many years (or whole year equivalents) **have you been working in primary care?** _____

4. Are you male or female?

Male ☐ **Female** ☐

THANK YOU VERY MUCH FOR TAKING THE TIME TO COMPLETE THIS QUESTIONNAIRE


SCREENING
INTERVENTION
DELIVERY
COMPLETION
Entry Route
OPPORTUNISTIC
DISEASE REGISTER
ASSESSMENT OF PATIENTS ELIGIBILTY & APPROPRIATENESS (contraindications and nature of appointment)
NOT ELIGIBLE
ELIGIBLE
EXIT PATHWAY
GPPAQ Not Completed
EXIT PATHWAY
GENERAL PRACTICE PHYSICAL ACTIVITY QUESTIONNAIRE (GPPAQ)
GPPAQ CLASSIFICATION
ACTIVE
More than 3 hours weekly
MODERATELY ACTIVE
1-3 hours weekly
MODERATELY INACTIVE
0-1 hours weekly
INACTIVE
No activity
ASSESS WALKING
RECORD
REINFORCE
EXIT PATHWAY
ACTIVE
INSUFFICIENTLY ACTIVE
ASSESS INTEREST
Raise awareness of PA
Give brief advice
NOT INTERESTED
INTERESTED
OUTCOME
Leaflet
Invitation to return for BI
EXIT PATHWAY
BOOK SEPARATE BI CONSULT
CONTINUE AND CONDUCT BI
BRIEF INTERVENTION (BASED ON MOTIVATIONAL INTERVIEWING PRINCIPLES)
ASSESS PATIENT READINESS TO CHANGE
NOT READY TO CHANGE
Reinforce PA message
Invitation to return at a later stage
EXIT PATHWAY
READY TO CHANGE
RISK STRATIFY
AGREE GOALS
Raise awareness of PA
Work through Lets Get Moving Support Pack
SIGN POST TO ACTIVITIES
Low & moderate risk
High risk
CONDITION UNLIMITED
Signposted activity
GREEN EXERCISE
WALK GROUP
SPORTS CLUB
LEISURE CENTRE
COMMUNITY CENTRE
CLASS PROGRAMMES
ACTIVE TRAVEL
PEDOMETER PROGRAMME
ACTIVE WORKPLACE
PARKS & GREEN SPACES
ACTIVE DAILY LIVING
DANCE
MASS PARTICIPATION EVENTS
CLINICAL NEED
Supervised activity
EXERCISE REFERRAL
CONDITION SPECIFIC PROGRAMME
Book follow-up for three months time
REINFORCE BEHAVIOUR
RESET GOALS
REVIEW GOALS
ELIGIBLE
NOT ELIGIBLE
EXIT PATHWAY
RE-ASSESS PATIENTS ELIGIBILTY
MAINTENANCE
PATIENT FOLLOW-UP AT 3 MONTHS
PATIENT FOLLOW-UP AT 6 MONTHS
PATHWAY COMPLETE
RELAPSE
COACH & COUNSEL
RESET GOALS
FOLLOW-UP APPOINTMENT

Questionnaire Round 2

ROUND 2
Investigating the feasibility of a physical activity (PA) clinical pathway for use by primary care Physiotherapy services

INSTRUCTIONS

Thank you very much for the information you provided in Round 1. Consensus was reached on many items of the pathway and these have been removed from this questionnaire.

In this questionnaire you are asked to examine again the items that failed to reach consensus in round 1. You have been given the collective response of all participants, as well as your own original answer. You will be asked to consider these statements again. You may then choose to;

a. answer the same as you did previously
or
b. change your answer as you see fit.

This questionnaire also includes some new statements based on the information that you provided in the open ended questions. You will be asked to indicate your agreement or disagreement with these statements.

PLEASE REFER TO THE PHYSICAL ACTIVITY (PA) PATHWAY AT THE END OF THIS DOCUMENT WHEN COMPLETING THIS QUESTIONNAIRE

If you have any questions please do not hesitate to contact me.
Emer Barrett, School of Medicine, Trinity Centre for Health Sciences, St James Hospital, Dublin 8
barrete@tcd.ie Tel: 01 896 2120 / 087 6383871

Thank you again for taking the time to participate

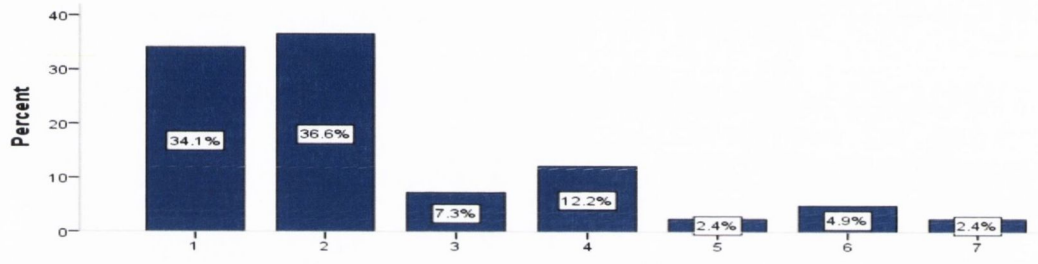
Section 1 of the pathway: RECRUITMENT Round 1: Consensus reached on 3/6 Qs

The graphs show the collective scoring of participants for that question in Round 1. Your previous answer is indicated by the circled number.

The following 3 questions failed to reach consensus in Round 1 therefore you have been asked to consider your response again.

Please indicate your agreement with the following statements by circling the appropriate number.

1. It is appropriate that ONLY higher risk patients (e.g. pts with CV risk factors) attending Physiotherapy should be eligible for entry onto the pathway?

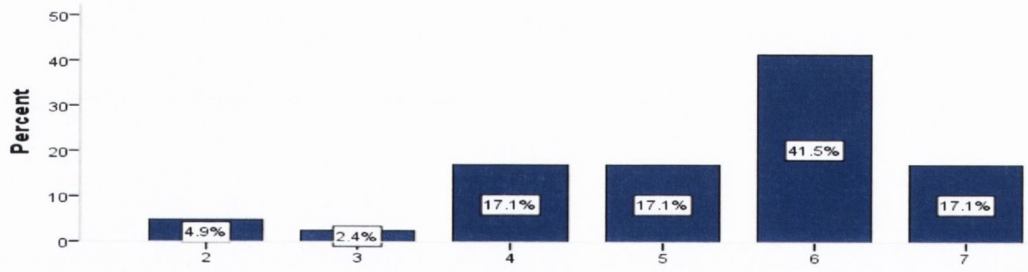


1.....2.....3.....4.....5.....6.....7

Do not agree Somewhat agree Highly agree

If you changed your score can you tell us why? _____

2. It is appropriate to recruit the general public onto the pathway by offering dedicated PA appointments

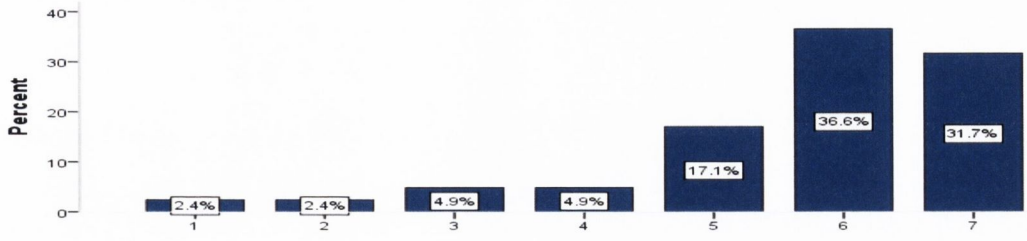


1.....2.....3.....4.....5.....6.....7

Do not agree Somewhat agree Highly agree

If you changed your score can you tell us why? _____

3. It is appropriate to allow patients to self refer to Physiotherapy for PA promotion



1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

If you changed your score can you tell us why? _____

Four new statements were generated as a result of feedback provided in Section 1.

Please indicate your agreement with the following statements by circling the appropriate number.

4. It is important that the PA pathway is integrated into other preventative programmes for e.g. obesity or diabetes programme

1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

5. It is appropriate to exclude patients who have unstable medical conditions from entry onto the pathway

1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

6. It is appropriate to exclude patients who have a disability or physical impairment (that prevents them from being physically active) from entry onto the pathway

1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

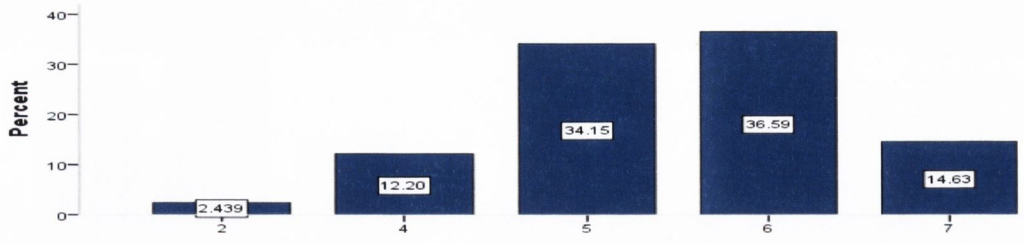
7. All patients should at least be eligible for entry onto the SCREENING part of the pathway

1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

Section 2 of the pathway: SCREENING Round 1: Consensus reached on 2/4 Qs

The following 2 questions failed to reach consensus in Round 1 therefore you have been asked to consider your response again.

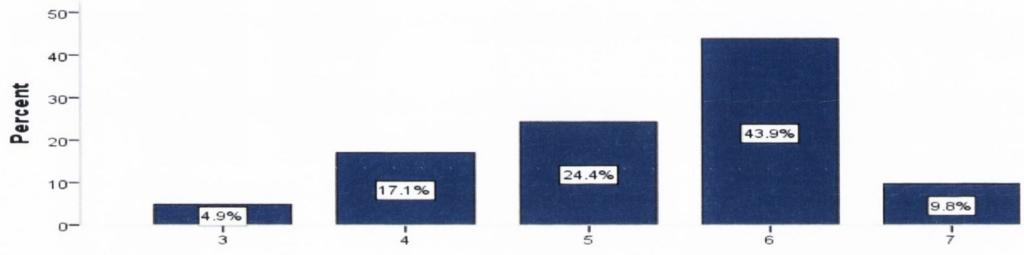
1. The GPPAQ (See Appendix 1) is the most appropriate PA screening tool for the Physiotherapist



1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

If you changed your score can you tell us why? _____

2. The questions used to assess walking are appropriate (See Appendix 2)



1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

If you changed your score can you tell us why? _____

Five new statements were generated as a result of feedback provided in Section 1.

3. Using a pedometer as well as the GPPAQ would be helpful in establishing an objective measure of PA

1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

4. It would be helpful if the screening part of the pathway was carried out by other health professionals (e.g.GP or AHP) before referring to physiotherapy for PA promotion

1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

5. The decision to deliver the brief intervention as part of a routine appointment or as a separate appointment is at the discretion of the physiotherapist dependant on the individual patients circumstance

1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

6. Assessment of the patient's readiness to change their PA behaviour (Appendix 3) should be carried out in the SCREENING part of the pathway (The pathway suggests this should occur later, in the INTERVENTION stage)

1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

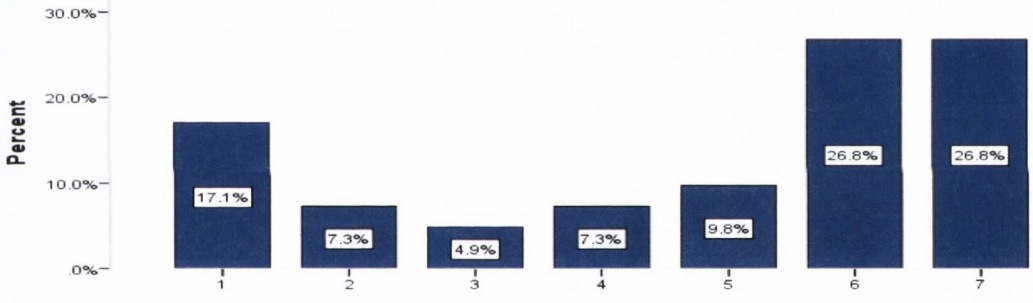
7. It may be appropriate to carry out a health risk questionnaire such as the PAR Q to determine if people are safe to exercise

1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

Section 3 of the pathway: Intervention Round 1: Consensus reached on 9/11 Qs

The following 2 questions failed to reach consensus in Round 1 therefore you have been asked to consider your response again.

1. Patients not ready to change their behaviour should be offered a follow up appointment

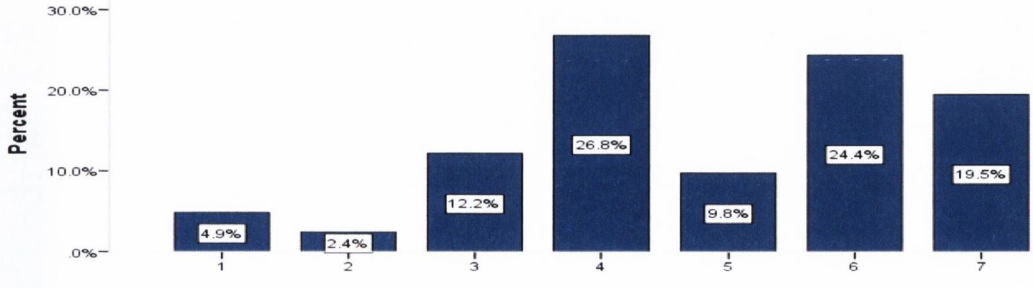


1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

If you changed your score can you tell us why?

_____

2. Physiotherapists are appropriately trained to carry out the brief intervention



1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

If you changed your score can you tell us why? _____

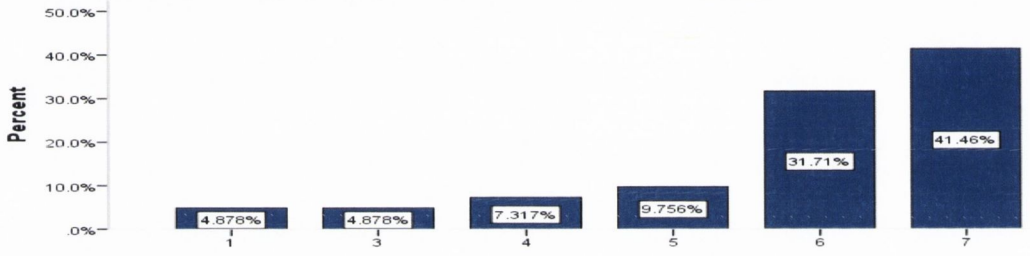
No new statements were generated as a result of feedback provided in Section 3.

Section 4 of the pathway: Delivery **Round 1: Consensus reached on 12/15 Qs**

The following 3 questions failed to reach consensus in Round 1 therefore you have been asked to consider your response again.

All of the following low to medium risk activities should remain part of the pathway

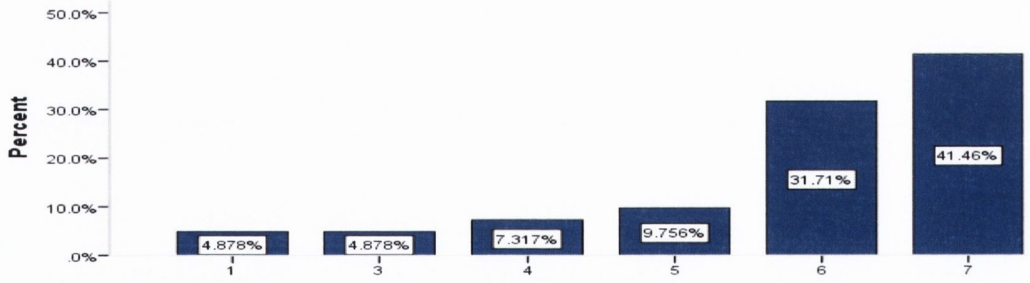
1. Active travel (e.g. walking or cycling to work)



1.....2.....3.....4.....5.....6.....7
Do not agree **Somewhat agree** **Highly agree**

If you changed your score can you tell us why? _____

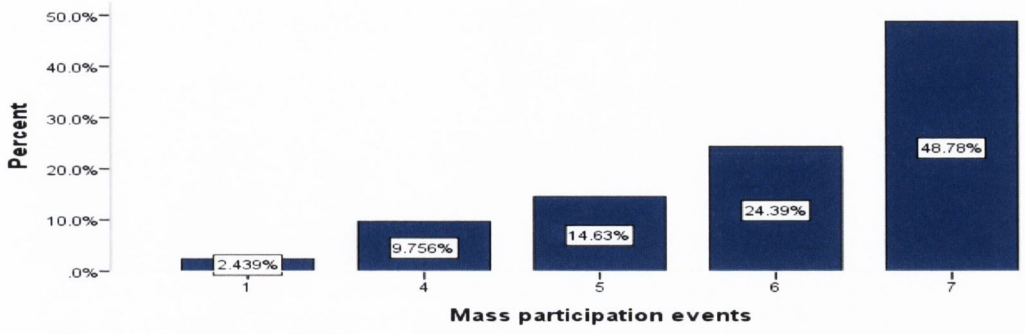
2. Active workplace (e.g. work sports teams, yoga classes, ensuring the provision of bike racks and showers)



1.....2.....3.....4.....5.....6.....7
Do not agree **Somewhat agree** **Highly agree**

If you changed your score can you tell us why? _____

3. Mass participation events (e.g. mini marathon, organised 5 or 10 Km runs)



1.....2.....3.....4.....5.....6.....7

Do not agree **Somewhat agree** **Highly agree**

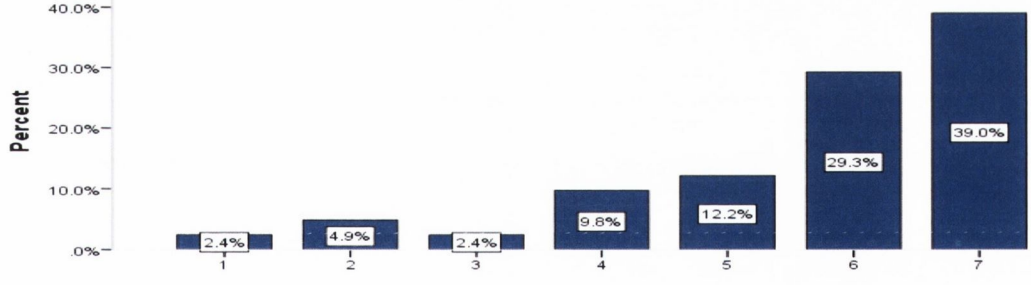
If you changed your score can you tell us why? _____

No new statements were generated as a result of feedback provided in Section 4.

Section 5 of the pathway: Completion Round 1: Consensus reached on 1/4 Qs

The following 3 questions failed to reach consensus in Round 1 therefore you have been asked to reconsider your response again.

1. The patient should be given a follow up appointment for 6 months after the brief intervention



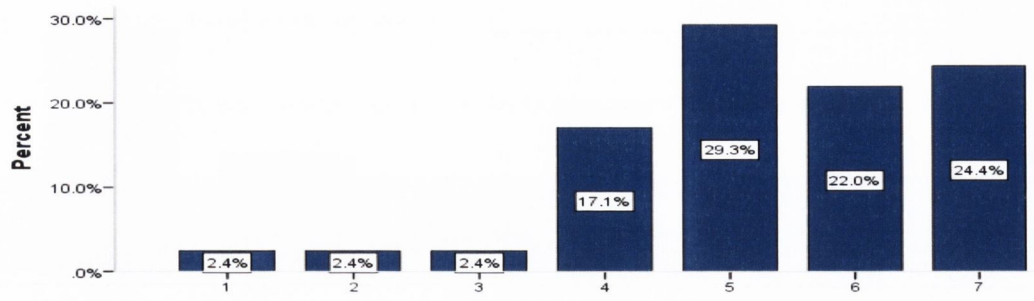
1.....2.....3.....4.....5.....6.....7

Do not agree **Somewhat agree** **Highly agree**

If you changed your score can you tell us why?

_____

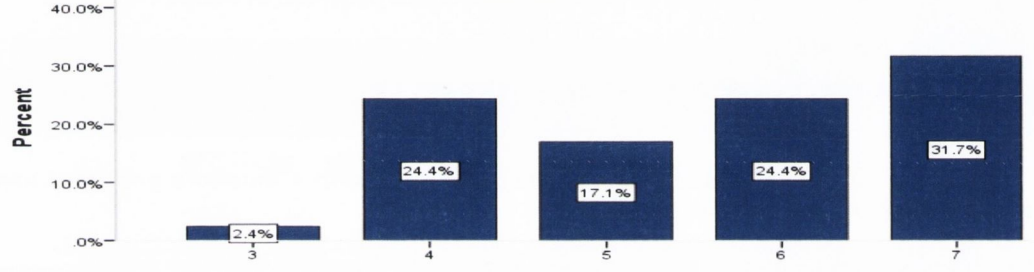
2. Patients who have relapsed should be coached again



1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

If you changed your score can you tell us why? _____

3. Patients who have relapsed should be <u>offered</u> further follow up appointments



1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

If you changed your score can you tell us why? _____

Three new statements were generated as a result of feedback provided in Section 5.

4. It may be appropriate to follow up <u>SOME</u> patients more frequently than 3 and 6 months

1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

5. It may be appropriate to contact patients requiring more regular follow up by phone

1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

6. The coaching of patients who have relapsed should be dependent on their motivation to change

1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

Section 6: Clinical feasibility — Round 1: Consensus reached on 1/2 Qs

The order of this section has been changed. You are asked to consider the feasibility of introducing the pathway to your service after consideration of the training needs and resources identified in Round 1.

Eight new statements were generated as a result of feedback provided in Section 6.

1. Training in methods to screen PA levels in the population would be beneficial

1.....2.....3.....4.....5.....6.....7
Do not agree — Somewhat agree — Highly agree

2. Further training in the use of the Lets get Moving pathway would be beneficial

1.....2.....3.....4.....5.....6.....7
Do not agree — Somewhat agree — Highly agree

3. It is appropriate for ALL primary care Physiotherapists to receive training about the pathway

1.....2.....3.....4.....5.....6.....7
Do not agree — Somewhat agree — Highly agree

4. It is appropriate for SOME primary care Physiotherapists to receive training about the pathway

1.....2.....3.....4.....5.....6.....7
Do not agree — Somewhat agree — Highly agree

5. Additional Physiotherapy staff are required to deliver the pathway

1.....2.....3.....4.....5.....6.....7
Do not agree — Somewhat agree — Highly agree

6. Additional administration staff are required to support the pathway

1.....2.....3.....4.....5.....6.....7
Do not agree — Somewhat agree — Highly agree

7. Printed promotional and educational materials are needed to support the pathway

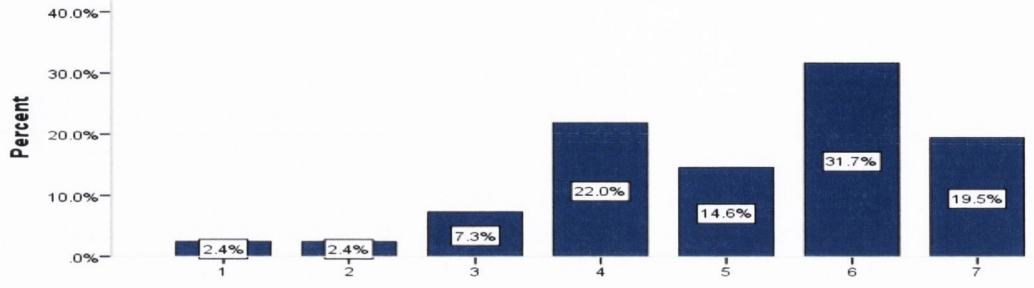
1.....2.....3.....4.....5.....6.....7
Do not agree — Somewhat agree — Highly agree

8. Details of locally available opportunities to be active are required to support the pathway

1.....2.....3.....4.....5.....6.....7
Do not agree — Somewhat agree — Highly agree

The following question failed to reach consensus in Round 1 therefore you have been asked to consider your response again.

9. It would be feasible to introduce this PA pathway to my practice



1.....2.....3.....4.....5.....6.....7

Do not agree **Somewhat agree** **Highly agree**

If you changed your score can you tell us why? _____

THANK YOU VERY MUCH FOR TAKING THE TIME TO COMPLETE THIS QUESTIONNAIRE

PLEASE CAN YOU RETURN IT IN THE SAE THAT WAS PROVIDED AT THE EDUCATION SESSION BY

FRIDAY the 24TH MAY

Appendix 1 GPPAQ Screening Tool

General Practice Physical Activity Questionnaire

Date.....

Name.....

1. Please tell us the type and amount of physical activity involved in your work.

		Please mark one box only
a	I am not in employment (e.g. retired, retired for health reasons, unemployed, full-time carer etc.)	
b	I spend most of my time at work sitting (such as in an office)	
c	I spend most of my time at work standing or walking. However, my work does not require much intense physical effort (e.g. shop assistant, hairdresser, security guard, childminder, etc.)	
d	My work involves definite physical effort including handling of heavy objects and use of tools (e.g. plumber, electrician, carpenter, cleaner, hospital nurse, gardener, postal delivery workers etc.)	
e	My work involves vigorous physical activity including handling of very heavy objects (e.g. scaffolder, construction worker, refuse collector, etc.)	

2. During the *last week*, how many hours did you spend on each of the following activities? *Please answer whether you are in employment or not*

Please mark one box only on each row

		None	Some but less than 1 hour	1 hour but less than 3 hours	3 hours or more
a	Physical exercise such as swimming, jogging, aerobics, football, tennis, gym workout etc.				
b	Cycling, including cycling to work and during leisure time				
c	Walking, including walking to work, shopping, for pleasure etc.				
d	Housework/Childcare				
e	Gardening/DIY				

3. How would you describe your usual walking pace? Please mark one box only.

Slow pace (i.e. less than 3 mph)		Steady average pace	
Brisk pace		Fast pace (i.e. over 4mph)	

Appendix 2 Assessment of walking

ASSESSING INACTIVE PATIENTS WHO SELF REPORT 3 HOURS OR MORE PER WEEK OF WALKING

"You say you do three hours or more of walking per week. So that I might better understand how walking fits into your day, perhaps you could talk me through a typical day for you, starting from when you get up in the morning right through to when you go to bed telling me where walking fits in. How about yesterday, could you talk me through yesterday?"

Ensure you assess the level of intensity of walking; you can use the following tool to assess intensity:

- **0 breathing easily, conversation is easy**
- **1 breathing lightly and talking easily but heart rate increases**
- **2 still talking comfortably but breathing more quickly body warming up**
- **3 breathing more deeply and harder, talking with a little more difficulty**
- **4 breathing very hard and short of breath, cannot carry on a conversation**

Light Activity 0-1 Moderate Activity 2-3 Vigorous Activity 4

People would need to be walking at an intensity of at least 2 – 3 for walking to count towards their weekly physical activity.

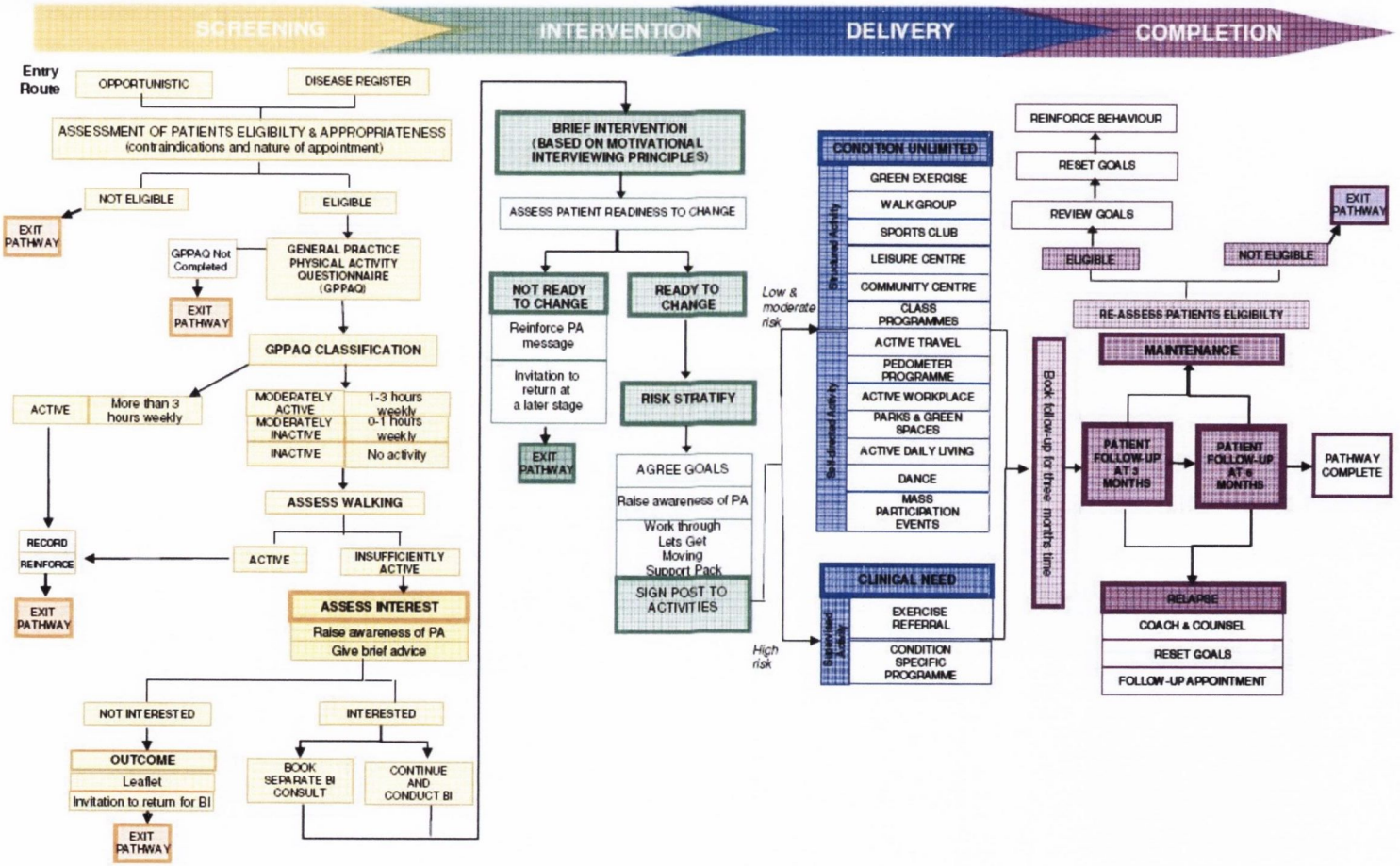
Appendix 3 Readiness to change

"Thinking now about regular physical activity, by that I mean taking part in vigorous exercise or sport 3 times per week for a minimum of 20 minutes at a time or more general activities like walking, cycling or dancing 5 times per week for at least 30 minutes a day"

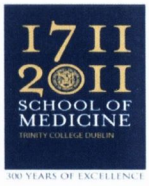
With that in mind please read the following five statements and indicate which ONE best describes how physically active you have been over the last 6 months.

1. I am regularly physically active and have been so for more than six months
2. I am regularly physically active and have been so for six months
3. I am not regularly physically active but I have plans of becoming active in the near future; within one month
4. I am not regularly physically active but I have plans of becoming active within the next six months
5. I am not regularly physically active and I do not intend to be so in the next six months

Appendix 4 PA pathway



Questionnaire Round 3



FINAL ROUND

Investigating the feasibility of a physical activity (PA) clinical pathway for use by primary care Physiotherapy services

INSTRUCTIONS

Please read these carefully before starting the questionnaire.

1. This Round 3 questionnaire includes only the statements that failed to reach consensus in the first two rounds.

2. Where appropriate I have tried to give you extra information or include relevant participant feedback to help inform your final decision.

3. It is important to note that some questions will have appeared in all 3 questionnaires meaning that you may find some questions repetitive. However the Delphi methodology looks at the consistency or change in your responses over subsequent rounds so it is very important that you still answer these questions.

4. As in the Round 2, the collective responses of all participants are presented in the graphs.

5. The answer you gave in Round 2 is indicated by the circled number.

6. Please consider your agreement with these statements for the final time. You may choose to change your answer in response to the information provided OR you may leave your answer the same as round 2.

7. Your comments have been analysed and will be included in the write up of the study.

PLEASE REFER TO THE PHYSICAL ACTIVITY (PA) PATHWAY AT THE END OF THIS DOCUMENT WHEN COMPLETING THIS QUESTIONNAIRE

If you have any questions please do not hesitate to contact me.
Emer Barrett, School of Medicine, Trinity Centre for Health Sciences, St James Hospital, Dublin 8
barrete@tcd.ie Tel: 01 896 2120 / 087 6383871

Thank you again for taking the time to participate

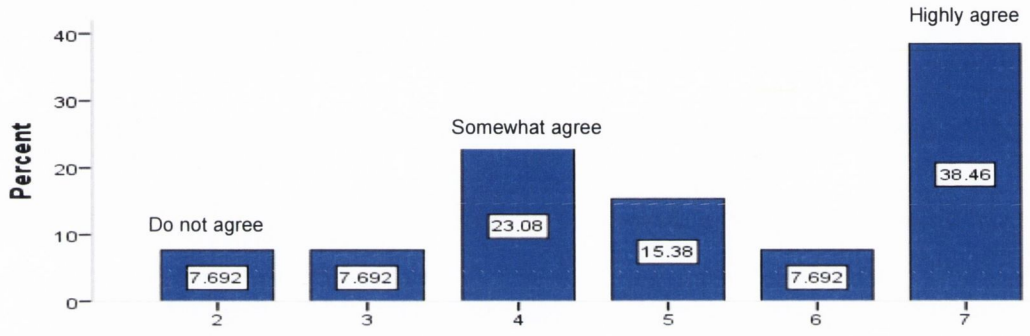
The graphs show the scoring of participants for that question in Round 2.

YOUR previous answer is indicated by the circled number.

Section 1 of the pathway: RECRUITMENT Round 2: Consensus reached on 5/7 Qs

TWO STATEMENTS FAILED TO REACH CONSENSUS IN ROUND 2

1. It is appropriate to exclude patients who have unstable medical conditions from entry onto the pathway



The following are the contraindications used to exclude people from participating in a pilot study investigating the feasibility of the pathway in the UK.

If patients are diagnosed with any of the following contraindications they are not eligible to participate in the physical activity care pathway.

A. Resting SBP >= 180mm Hg / DBP > 100
B. Febrile illness
C. Uncontrolled / unstable angina
D. Acute uncontrolled psychiatric illness
E. Osteoporosis (T score >= 2.5)
F. Significant drop in BP during exercise
G. Uncontrolled tachycardia
H. Unstable or acute heart failure
I. Uncontrolled diabetes

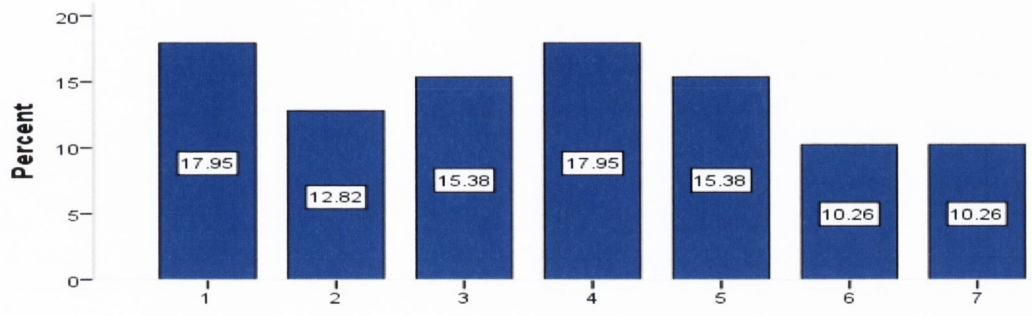
Having read the extra information provided above please indicate your agreement with the following statement by circling the appropriate number

1. It is appropriate to exclude patients who have the unstable medical conditions (listed above) from entry onto the pathway

1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

If you scored 5 or below can you tell us why?

2. It is appropriate to exclude patients who have a disability or physical impairment (that prevents them from being physically active) from entry onto the pathway



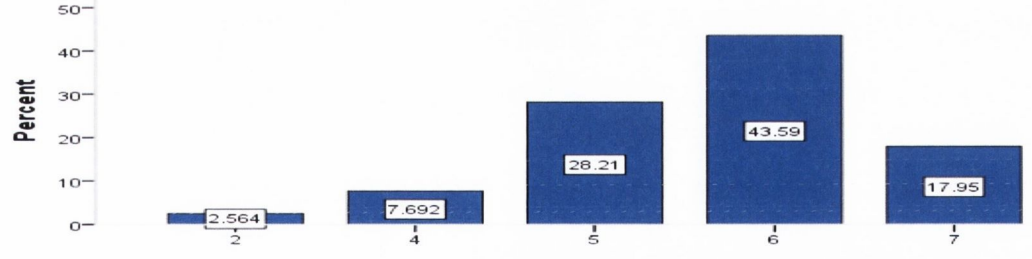
Please indicate your agreement with statement 2 by circling the appropriate number

1.....2.....3.....4.....5.....6.....7
Do not agree **Somewhat agree** **Highly agree**

Section 2 of the pathway: SCREENING **Round 2: Consensus reached on 3/7 Qs**

FOUR STATEMENTS FAILED TO REACH CONSENSUS IN ROUND 2

1. The GPPAQ (See Appendix 1) is the most appropriate PA screening tool for the Physiotherapist



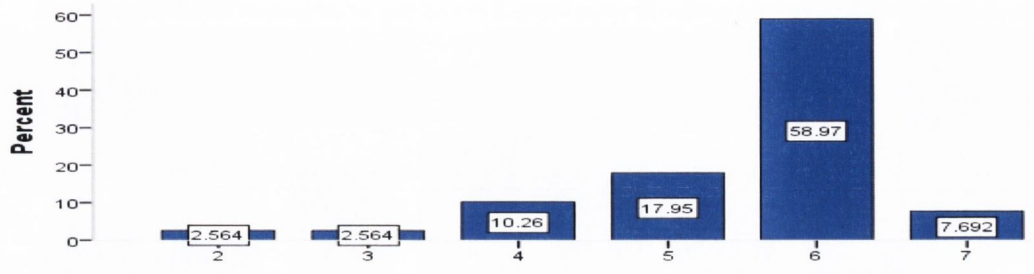
Whilst the majority of participants agreed with this statement, most of the scores fell between 5 and 6 on the Likert scale. It has therefore been necessary to include this statement in round 3. Some participants commented that they were unaware of another suitable scale.

Please indicate your agreement with statement 1 by circling the appropriate number

1.....2.....3.....4.....5.....6.....7
Do not agree **Somewhat agree** **Highly agree**

If you scored 5 or below can you tell us why?

2. The questions used to assess walking are appropriate (See Appendix 2)



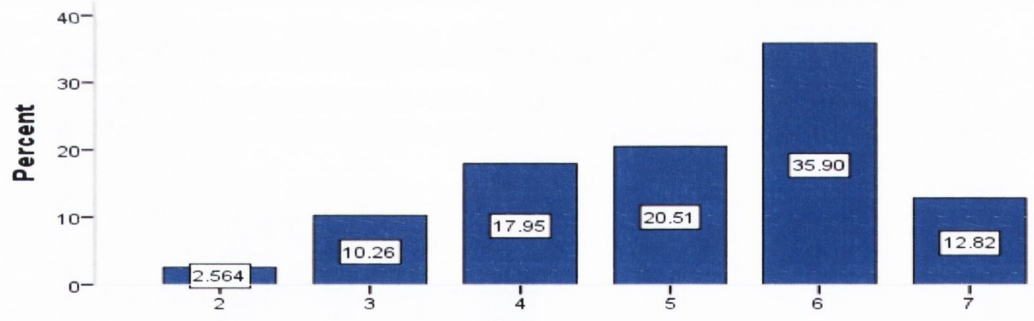
Whilst the majority of participants agreed with this statement, most of the scores fell between 5 and 6 on the Likert scale. It has therefore been necessary to include this statement in round 3.

Please indicate your agreement with statement 2 by circling the appropriate number

1.....2.....3.....4.....5.....6.....7
Do not agree **Somewhat agree** **Highly agree**

If you scored 5 or below can you tell us why? _____

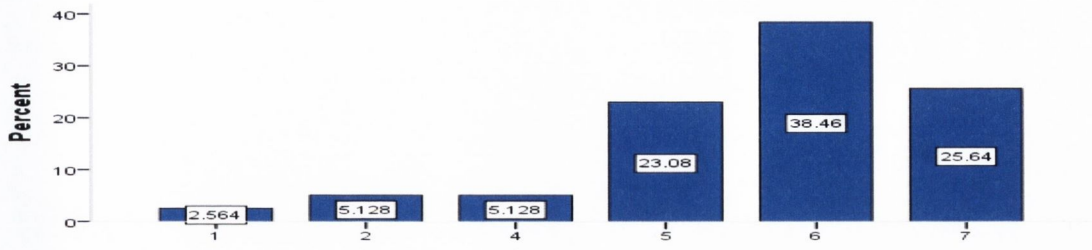
3. It would be helpful if the screening part of the pathway was carried out by other health professionals (e.g.GP or AHP) before referring to physiotherapy for PA promotion



Please indicate your agreement with statement 3 by circling the appropriate number

1.....2.....3.....4.....5.....6.....7
Do not agree **Somewhat agree** **Highly agree**

4. Assessment of the patient's readiness to change their PA behaviour (Appendix 3) should be carried out in the SCREENING part of the pathway (The pathway suggests this should occur later, in the INTERVENTION stage)



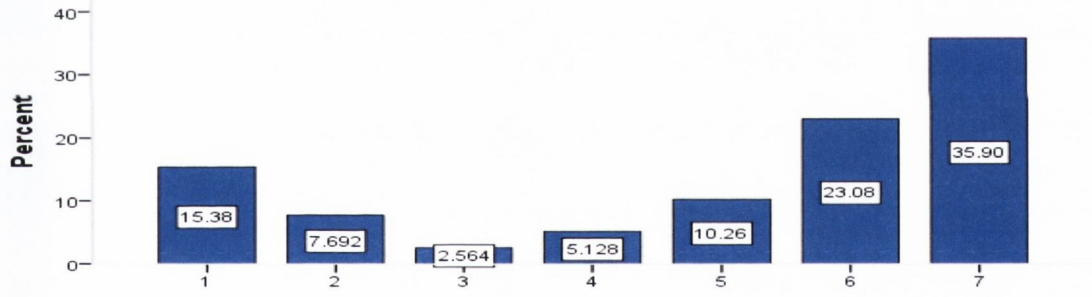
Please indicate your agreement with statement 4 by circling the appropriate number

1.....2.....3.....4.....5.....6.....7
Do not agree **Somewhat agree** **Highly agree**

Section 3 of the pathway: Intervention **Round 2: Consensus reached on 0/2 Qs**

TWO STATEMENTS FAILED TO REACH CONSENSUS IN ROUND 2

1. Patients not ready to change their behaviour should be <u>offered</u> a follow up appointment



The pathway suggests that patients who are not ready to change their behaviour at that time are verbally invited to contact the practitioner in the future to make an appointment. It does not suggest that the patient is given an appointment at that time.

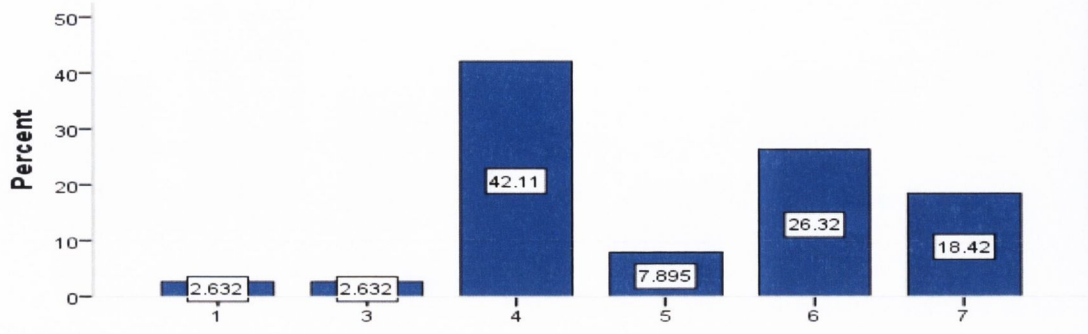
Please indicate your agreement with statement 1 by circling the appropriate number

1.....2.....3.....4.....5.....6.....7
Do not agree **Somewhat agree** **Highly agree**

If you scored 5 or below can you tell us why?

_____

2. Physiotherapists are appropriately trained to carry out the brief intervention



The majority of participants felt that further training; particularly in motivational interviewing was required.

Please indicate your agreement with statement 2 by circling the appropriate number

1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

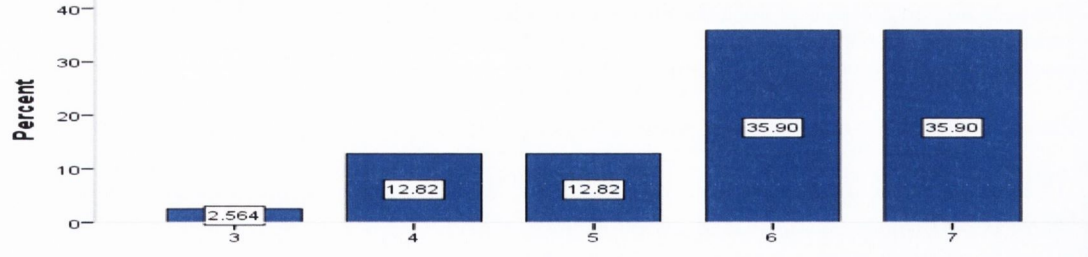
Section 4 of the pathway: Delivery — Round 2: Consensus reached on 3/3 Qs

NO FURTHER INPUT REQUIRED, CONSENSUS REACHED ON ALL COMPONENTS

Section 5 of the pathway: Completion — Round 2: Consensus reached on 2/6 Qs

FOUR STATEMENTS FAILED TO REACH CONSENSUS IN ROUND 2

1. Patients who have relapsed should be <u>offered</u> further follow up appointments



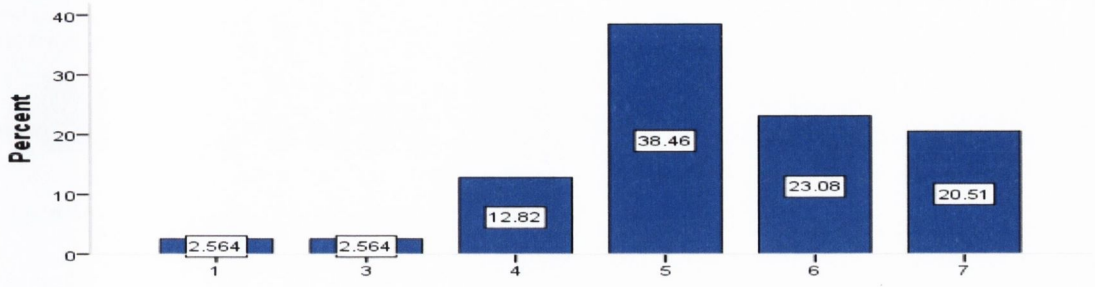
The percentages of participants agreeing with this statement increased from round 1 to 2. However it is marginally outside the criteria for consensus and therefore has been included in round 3.

Please indicate your agreement with statement 1 by circling the appropriate number

1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

If you scored 5 or below can you tell us why?_____

2. Patients who have relapsed should be coached again



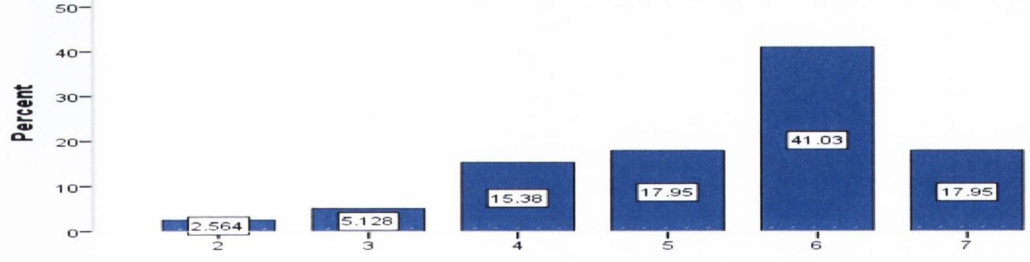
The pathway would suggest it is important to offer coaching to patients whose physical activity may have reduced or ceased. Some participants commented that this should be dependent on a patient's readiness to change or motivation.

Please indicate your agreement with statement 2 by circling the appropriate number

1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

If you scored 5 or below can you tell us why?_____

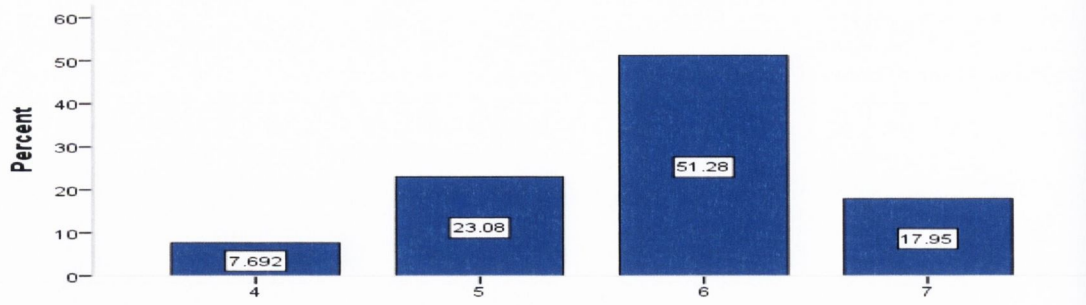
3. It may be appropriate to follow up SOME patients more frequently than 3 and 6 months



Please indicate your agreement with statement 3 by circling the appropriate number

1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

4. It may be appropriate to contact patients requiring more regular follow up by phone



Please indicate your agreement with statement 4 by circling the appropriate number

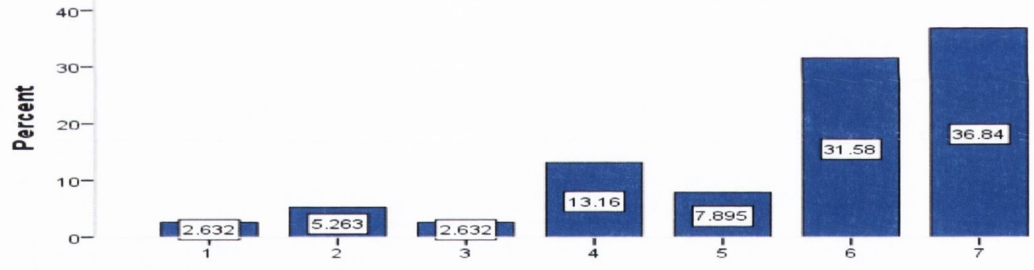
1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

Section 6: Clinical feasibility

Round 2: Consensus reached on 6/8 Qs

TWO STATEMENTS FAILED TO REACH CONSENSUS IN ROUND 2

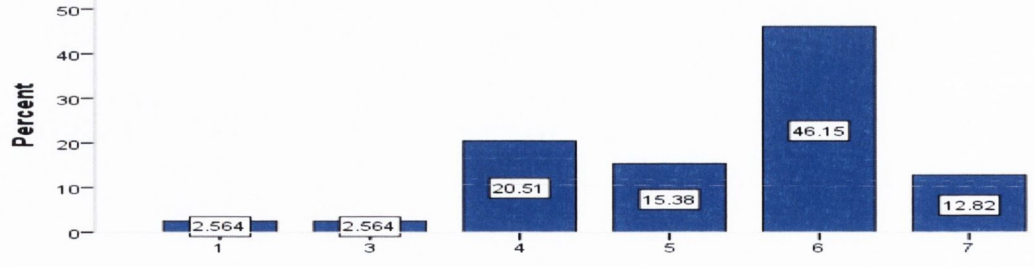
1. Additional Physiotherapy staff are required to deliver the pathway



Please indicate your agreement with statement 1 by circling the appropriate number

1.....2.....3.....4.....5.....6.....7
Do not agree Somewhat agree Highly agree

2. It would be feasible to introduce this PA pathway to my practice



Round 2 established consensus on the need for additional administration staff and written resources to support the pathway. It also established consensus in additional training requirements in motivational interviewing and the Lets Get Moving pathway.

Please consider your agreement with this statement on the basis of the additional resources and training requirements identified.

1.....2.....3.....4.....5.....6.....7
Do not agree **Somewhat agree** **Highly agree**

If you scored 5 or below can you tell us why?_____

YOU HAVE NOW FULLY COMPLEPTED THIS RESEARCH

THANK YOU VERY MUCH FOR TAKING THE TIME TO PARTICIPATE

PLEASE CAN YOU RETURN THE QUESTIONNAIRE IN THE SAE THAT WAS PROVIDED AT THE EDUCATION SESSION BY

MONDAY the 17TH June

Appendix 1 GPPAQ Screening Tool

General Practice Physical Activity Questionnaire

Date.....

Name.....

1. Please tell us the type and amount of physical activity involved in your work.

		Please mark one box only
a	I am not in employment (e.g. retired, retired for health reasons, unemployed, full-time carer etc.)	
b	I spend most of my time at work sitting (such as in an office)	
c	I spend most of my time at work standing or walking. However, my work does not require much intense physical effort (e.g. shop assistant, hairdresser, security guard, childminder, etc.)	
d	My work involves definite physical effort including handling of heavy objects and use of tools (e.g. plumber, electrician, carpenter, cleaner, hospital nurse, gardener, postal delivery workers etc.)	
e	My work involves vigorous physical activity including handling of very heavy objects (e.g. scaffolder, construction worker, refuse collector, etc.)	

2. During the *last week*, how many hours did you spend on each of the following activities? *Please answer whether you are in employment or not*

Please mark one box only on each row

		None	Some but less than 1 hour	1 hour but less than 3 hours	3 hours or more
a	Physical exercise such as swimming, jogging, aerobics, football, tennis, gym workout etc.				
b	Cycling, including cycling to work and during leisure time				
c	Walking, including walking to work, shopping, for pleasure etc.				
d	Housework/Childcare				
e	Gardening/DIY				

3. How would you describe your usual walking pace? Please mark one box only.

Slow pace (i.e. less than 3 mph)		Steady average pace	
Brisk pace		Fast pace (i.e. over 4mph)	

Appendix 2 Assessment of walking

ASSESSING INACTIVE PATIENTS WHO SELF REPORT 3 HOURS OR MORE PER WEEK OF WALKING

"You say you do three hours or more of walking per week. So that I might better understand how walking fits into your day, perhaps you could talk me through a typical day for you, starting from when you get up in the morning right through to when you go to bed telling me where walking fits in. How about yesterday, could you talk me through yesterday?"

Ensure you assess the level of intensity of walking; you can use the following tool to assess intensity:

- **0 breathing easily, conversation is easy**
- **1 breathing lightly and talking easily but heart rate increases**
- **2 still talking comfortably but breathing more quickly body warming up**
- **3 breathing more deeply and harder, talking with a little more difficulty**
- **4 breathing very hard and short of breath, cannot carry on a conversation**

Light Activity 0-1 Moderate Activity 2-3 Vigorous Activity 4

People would need to be walking at an intensity of at least 2 – 3 for walking to count towards their weekly physical activity.

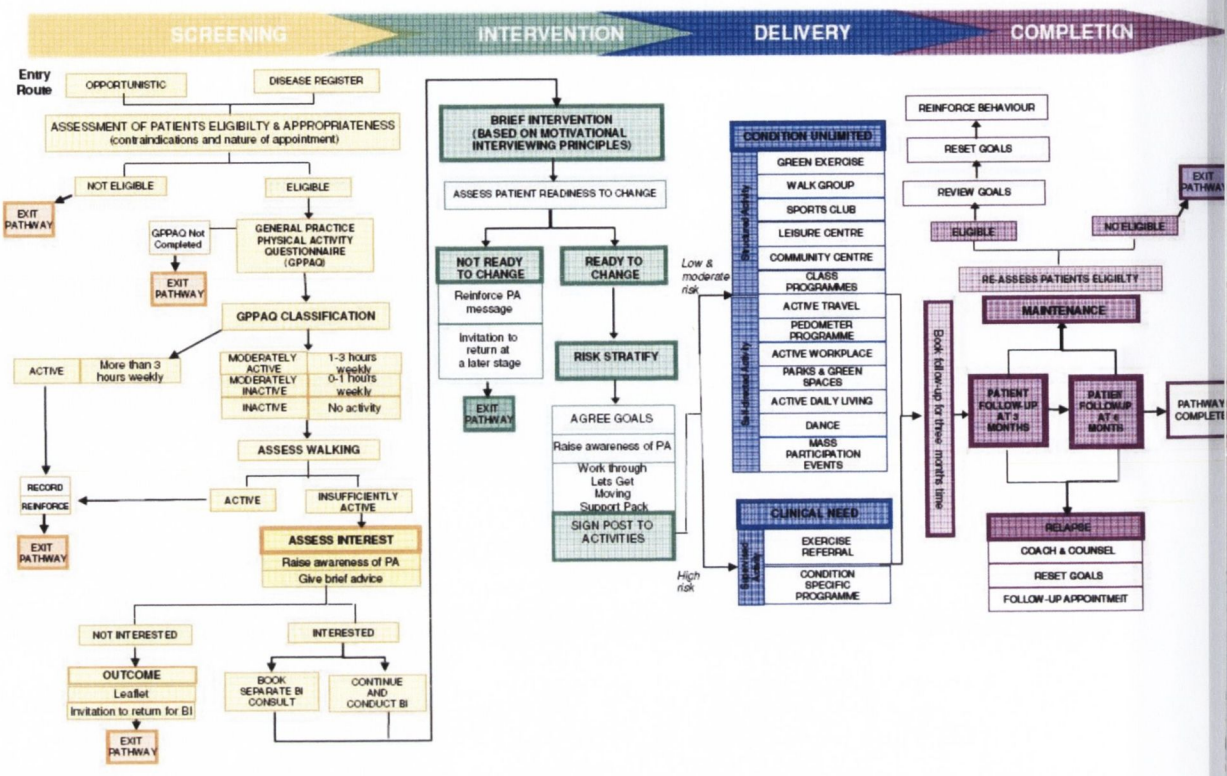
Appendix 3 Readiness to change

"Thinking now about regular physical activity, by that I mean taking part in vigorous exercise or sport 3 times per week for a minimum of 20 minutes at a time or more general activities like walking, cycling or dancing 5 times per week for at least 30 minutes a day"

With that in mind please read the following five statements and indicate which ONE best describes how physically active you have been over the last 6 months.

1. I am regularly physically active and have been so for more than six months
2. I am regularly physically active and have been so for six months
3. I am not regularly physically active but I have plans of becoming active in the near future; within one month
4. I am not regularly physically active but I have plans of becoming active within the next six months
5. I am not regularly physically active and I do not intend to be so in the next six months

Appendix 4



SCREENING
INTERVENTION
DELIVERY
COMPLETION
Entry Route
OPPORTUNISTIC
DISEASE REGISTER
ASSESSMENT OF PATIENTS ELIGIBILTY & APPROPRIATENESS (contraindications and nature of appointment)
NOT ELIGIBLE
ELIGIBLE
EXIT PATHWAY
GPPAQ Not Completed
GENERAL PRACTICE PHYSICAL ACTIVITY QUESTIONNAIRE (GPPAQ)
EXIT PATHWAY
GPPAQ CLASSIFICATION
ACTIVE
More than 3 hours weekly
MODERATELY ACTIVE
1-3 hours weekly
MODERATELY INACTIVE
0-1 hours weekly
INACTIVE
No activity
ASSESS WALKING
RECORD
REINFORCE
EXIT PATHWAY
ACTIVE
INSUFFICIENTLY ACTIVE
ASSESS INTEREST
Raise awareness of PA
Give brief advice
NOT INTERESTED
INTERESTED
OUTCOME
Leaflet
Invitation to return for BI
EXIT PATHWAY
BOOK SEPARATE BI CONSULT
CONTINUE AND CONDUCT BI
BRIEF INTERVENTION (BASED ON MOTIVATIONAL INTERVIEWING PRINCIPLES)
ASSESS PATIENT READINESS TO CHANGE
NOT READY TO CHANGE
Reinforce PA message
Invitation to return at a later stage
EXIT PATHWAY
READY TO CHANGE
RISK STRATIFY
AGREE GOALS
Raise awareness of PA
Work through Lets Get Moving Support Pack
SIGN POST TO ACTIVITIES
Low & moderate risk
High risk
CONDITION UNLIMITED
Structured Activity
Self-directed Activity
GREEN EXERCISE
WALK GROUP
SPORTS CLUB
LEISURE CENTRE
COMMUNITY CENTRE
CLASS PROGRAMMES
ACTIVE TRAVEL
PEDOMETER PROGRAMME
ACTIVE WORKPLACE
PARKS & GREEN SPACES
ACTIVE DAILY LIVING
DANCE
MASS PARTICIPATION EVENTS
CLINICAL NEED
Supervised Activity
EXERCISE REFERRAL
CONDITION SPECIFIC PROGRAMME
Book follow-up for three months time
REINFORCE BEHAVIOUR
RESET GOALS
REVIEW GOALS
ELIGIBLE
NOT ELIGIBLE
EXIT PATHWAY
RE-ASSESS PATIENTS ELIGIBLTY
MAINTENANCE
PATIENT FOLLOW-UP AT 3 MONTHS
PATIENT FOLLOWUP AT 6 MONTHS
PATHWAY COMPLETE
RELAPSE
COACH & COUNSEL
RESET GOALS
FOLLOW-UP APPOINTMENT

Appendix VII: Participant Letters Study I

Pre-notice Letter

Dr

Address

20/06/2010

Dear Dr ,

I am writing in advance to inform you of a research study that is being conducted by the Departments of Public Health and Physiotherapy in Trinity College Dublin. It concerns the screening and promotion of physical activity in Primary Care, as a means of preventing cardiovascular disease.

As part of this project we are contacting General Practitioners and Primary Care Physiotherapists to ask about their normal practice in the promotion of physical activity to their patients.

In a few days you will receive a request to fill out a short questionnaire asking about your practice.

We would very much value your input and would like to thank you in advance for your assistance with this research.

Yours sincerely,

Emer Barrett MISCP

BSc (Hons) Physiotherapy

Introductory Letter

30/06/2010

Dear Ms ,

Re: Physical activity for the management of cardiovascular disease in the primary care setting

This letter is being forwarded to you by Ms. Lucy Alpine MISCP on my behalf.

I am writing to request your assistance in a research study. We wish to determine the current practice of Irish Primary Care Physiotherapists in the screening and promotion of physical activity as a means to prevent and manage cardiovascular disease.

There is strong scientific evidence supporting the cardiovascular health benefits of regular physical activity and primary care is acknowledged as the key setting in which to deliver this message. To date however, most of the research investigating the role of physical activity promotion in primary care has concerned professionals other than physiotherapists such as GPs and practice nurses.

We would therefore be very grateful if you could complete the enclosed questionnaire and return it in the SAE by 14/07/2010. We estimate that it should take **4 to 7 minutes** to complete. All information will be treated anonymously and in the strictest of confidence. The Trinity College Ethics committee has granted approval for this research

If you have any queries regarding the study or the questionnaire please do not hesitate to contact me: Tel 01 896 2120, barrete@tcd.ie (email). I have included a participant information leaflet which gives more details of the study.

Thank you for your time and your valuable contribution.

Yours sincerely,

Emer Barrett MISCP, BSc (Hons) Physiotherapy

Principle Investigator: Ms. Emer Barrett, School of Medicine, Trinity College Dublin.
Study supervisors: Dr Juliette Hussey, Discipline of Physiotherapy, School of Medicine, TCD
Dr Catherine Darker, Dept of Public Health and Primary Care, School of Medicine, TCD

Follow up Letter Non Respondents

23/04/2010

Dear Dr ,

Re: Physical activity for the management of cardiovascular disease in the primary care setting

We have recently sent you a questionnaire asking about your practice in the promotion of physical activity as a means to prevent and manage cardiovascular disease. To the best of our knowledge, this questionnaire has not yet been returned.

To date, the results have indicated that GPs use a variety of informal assessment and promotional practices (dependent on results).We know that there is strong scientific evidence supporting the cardiovascular health benefits of regular physical activity however there is very little information on how Irish GPs promote this message to their patients.

This study is therefore important as we have yet to determine the most effective and acceptable way of encouraging health professionals to promote exercise as a proven means of preventing and managing cardiovascular disease.

We know that you are extremely busy but would be very grateful if you could complete the questionnaire and return it in the SAE by (insert date). It has been estimated to take **5 minutes** to complete. All information will be treated anonymously, and in the strictest confidence. The Trinity College Ethics Committee has granted approval for this research.

If you have any queries regarding the study or the questionnaire please do not hesitate to contact me: Tel 01 896 2120, barrete@tcd.ie (email).

Thank you again for your time and your valuable contribution.

Yours sincerely,

Emer Barrett MISCP, BSc (Hons) Physiotherapy

Principle Investigator: Ms. Emer Barrett, School of Medicine, Trinity College Dublin.
Study supervisors: Dr Juliette Hussey, Discipline of Physiotherapy, School of Medicine, TCD
Dr Catherine Darker, Dept of Public Health and Primary Care, School of Medicine, TCD

Final Follow up Letter Non Respondents

Final Invitation

09/08/2010

Dear Ms ,

Re: Physical activity for the management of cardiovascular disease in the primary care setting

During the past two months we have been gathering valuable information on how Physiotherapists and GPs assess and promote physical activity in their patients.

This study is now drawing to a close and our records indicate that we have yet to receive your response. We understand and respect that you may have chosen to opt out of this study. However, should you wish to still participate we have enclosed another copy of the questionnaire for your convenience. This is the final correspondence you will receive regarding this study and therefore we would be most grateful if you would consider our request. The questionnaire should take between 5 to 7 minutes of your time.

Thank you very much for your valuable contribution.

If you have any queries regarding the study or the questionnaire please do not hesitate to contact me: Tel 01 896 2120, barrete@tcd.ie (email).

The Trinity College Ethics Committee has granted approval for this research.

Yours sincerely,

Emer Barrett MISCP, BSc (Hons) Physiotherapy

Principle Investigator: Ms. Emer Barrett, School of Medicine, Trinity College Dublin.
Study supervisor: Dr Juliette Hussey, Discipline of Physiotherapy, School of Medicine, TCD
Dr Catherine Darker, Dept of Public Health and Primary Care, School of Medicine, TCD

Appendix VIII: Participant Information Leaflets

Study I Participant Information Leaflet

Participant Information Leaflet

1. Title of study

Physical activity in the management of cardiovascular disease in the primary care setting

2. Main Researcher

Emer Barrett, Discipline of Physiotherapy, School of Medicine, Trinity Centre for Health Sciences, St James Hospital, Dublin 8.

Tel: 01 896 2120 (W) Email: barrete@tcd.ie

Study Supervisors

Dr Juliette Hussey, Discipline of Physiotherapy, School of Medicine, Trinity Centre for Health Sciences, St James Hospital, Dublin 8.

Dr Catherine Darker, Dept of Public Health and Primary Care, School of Medicine, Trinity Centre for Health Sciences, St James Hospital, Dublin 8.

3. Introduction

Cardiovascular disease accounts for 36% of deaths in Ireland each year. It is responsible for 22% of deaths in those aged under 65. There is strong scientific evidence supporting the cardiovascular health benefits of regular physical activity. Adults who are more physically active have a lower incidence of all cause-mortality, coronary heart disease, stroke, high blood pressure and diabetes.

Primary care is considered the most appropriate environment in which to manage the majority of a populations' health care needs including the prevention of chronic diseases such as cardiovascular disease. Primary care staff, as first contact clinicians can play a key role in the promotion of physical activity amongst their patients.

The aim of this study is to capture the current practice of primary care staff in the promotion of physical activity amongst their patient. The professions of interest are Physiotherapists and GPs.

3. Procedure

This study is being carried out on all GPs and Primary Care Physiotherapists based in the HSE region of Dublin mid Leinster. Participation involves the completion of a short questionnaire asking about your normal practice in the assessment/promotion of physical activity amongst your patients.

The questionnaire should take between 5 to 8 minutes to fill in and most of the questions ask you to place a tick ✔ in the box next to your answer. All questionnaires will be treated in a strictly confidential manner.

4. Benefits

There is no personal compensation for participation in this study.

However this research will provide valuable insight into the current practice of physical activity promotion in Ireland and may help guide future educational developments in the area of exercise management in primary care.

5. Risks

There are no perceived risks expected with this study.

6. Exclusion from participation

None

7. Alternative treatment

No treatment is offered in this study.

8. Confidentiality

All information provided will be strictly confidential. Questionnaires are coded with an identification number to allow us to contact non responders. The researchers will at no time disclose the identity of any study participant to another. This study will be written up as a Masters Thesis by the principal researcher and may appear in publication. Your identity will always remain strictly confidential and no individual professional, GP practice or Physiotherapy Service will be identified in any report of this research.

9. Compensation

This study is covered by standard indemnity insurance. Nothing in this document restricts or curtails your rights.

10. Voluntary Participation

Participation in this study is entirely voluntary. Should you be unable to participate for any reason the questionnaire includes the option of an opt out box which you may mark and return. This will allow us to remove your details from our study list and ensure that you receive no further communication regarding this study.

11. Ceasing the study

You are entitled to cease participation in the study at any time.

12. Permission

This study has received Trinity College Ethics Committee approval.

13. Further information

Further information regarding the study is available from:

Emer Barrett, Discipline of Physiotherapy, School of Medicine, Trinity Centre for Health Sciences, St James Hospital, Dublin 8. Tel: 01 896 2120, Email: barrete@tcd.ie

Study II Participant Information Leaflet



Patient Information Leaflet

1. Title of study: "Determining the physical activity profile of patients attending primary care"

2. Introduction: ***What is this study about?***

Being physically active has many health benefits and can help to prevent many common diseases like diabetes and stroke. It is therefore important for everyone to be as active as possible.

You have been asked to take part in a research study which is specifically interested in finding out about the physical activity levels of people attending primary care services. It is being carried out by the Departments of Physiotherapy and Public Health & Primary Care in Trinity College Dublin.

If you decide to participate you would be required to complete a questionnaire asking about your normal levels of physical activity during a week. You would also be asked to record some details about any health problems that might limit your ability to be more physically active. These questionnaires should take about 10 minutes to complete and there will be a physiotherapist available to help you with any queries you may have.

3. Procedures: ***Who is being asked to participate?***

All patients between the ages of 18 to 69 are being asked to participate whatever their activity levels or medical condition. However if you are currently attending a structured exercise class run by health professionals you would not be eligible for inclusion. Examples of this would be cardiac or pulmonary rehab classes or exercise classes for back pain.

What do I have to do?

If you choose to participate you will be requested to complete a questionnaire asking about your physical activity levels during the past seven days. You will also be asked to answer some questions about your general health and any medical conditions that may prevent you from being active.

The questionnaire is called **The International Physical Activity Questionnaire** and contains questions about the type of activity you do and for how long you do each activity every day for 7 days. There will be a research physiotherapist available in the centre to answer any questions you may have. She can also help you fill out the questionnaire if you would prefer.

All your answers will be confidential and your primary care health professional will have no access to the information recorded. Participation in this study will therefore not affect your treatment options in any way.

4. Benefits: ***What are the benefits to me?***

There are no direct benefits to you for participating in this study, but the results may benefit future patients.

5. Risks: ***Are there any risks to me?***

There is no risk to you that we can think of, in participating in this study. The practitioners involved in this study have current medical indemnity cover..

6. Exclusion from participation: ***Who can not participate in this study*****?**

If you are currently attending a structured exercise class run by health professionals you would not be eligible for inclusion. Examples would be cardiac or pulmonary rehab classes or exercise classes for back pain. If you are under 18 or over 69 you are not eligible for this study.

7. Alternative treatment:

You do not have to be a part of this study to be treated and your participation will not affect your normal treatment in any way.

8. Confidentiality: ***Will my information be confidential?***

Your identity will remain confidential. Your name will not be published and will not be disclosed to anyone outside the hospital.

9. Compensation:

Your medical practitioners are covered by standard medical malpractice insurance. Nothing in this document restricts or curtails your rights.

10. Voluntary Participation:

You have volunteered to participate in this study. You may quit at any time. If you decide not to participate, or if you quit, you will not be penalised and will not give up any benefits which you had before entering the study.

11. Stopping the study:

You understand that your doctor or investigator may stop your participation in the study at any time without your consent.

What if I change my mind?

If you volunteer to participate in this study, you may quit at any time. If you decide not to participate, or if you quit, you will not be penalised and will not give up any benefits which you had before entering the study.

12. Permission:

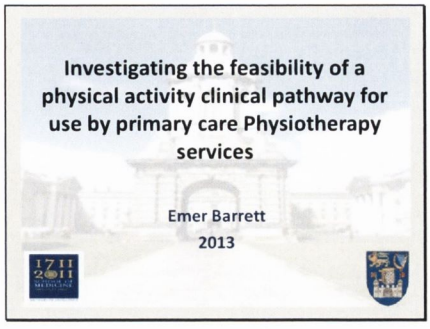
This study has received Hospital Research Ethics committee approval.

13. Further information: ***I have more questions, who will I ask?***

You can get more information or answers to your questions about the study, your participation n the study, and your rights, from **Emer Barrett**, Discipline of Physiotherapy, School of Medicin, Trinity Centre for Health Sciences, St James's Hospital. Dublin 8 who can be telephoned at **01 896 2120/2110.**

Appendix IX: Introductory Session Study III

Slide 1



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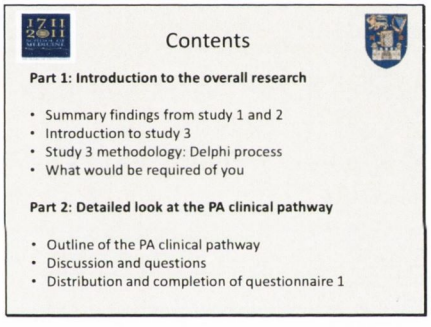

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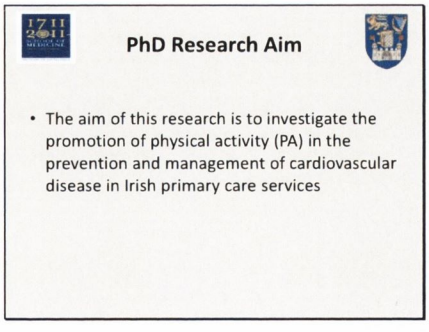


Slide 4

Introduction

- In Ireland the number of adults living with chronic diseases is forecasted to increase by around 40% by 2020 (Balanda et al. 2010)
- In 2008 the Dept of Health released "The National Guidelines on Physical Activity for Ireland"
- Sufficient evidence to recommend the use of brief interventions designed to promote physical activity (PA) in primary care (NICE, 2006)

Slide 5

Research Overview

Study 1
- Promotion of physical activity in primary care: knowledge and practice of general practitioners and physiotherapists
- Study completed 2011, published Journal of Public Health 2012

Study 2
- Determining the physical activity profile of patients attending primary care
- Data collection and primary analysis completed

Study 3
- Investigating the content and clinical feasibility of a physical activity pathway in primary care physiotherapy services by means of the delphi process
- Ethical approval granted, data collection phase

Slide 6

Study 1

Aim
- Establish the current practice of health professionals in the screening and promotion of PA for the prevention and management of cardiovascular disease in primary care

Study design
- Cross sectional postal questionnaire survey
- General Practitioners (GPs) (N=543) registered with the Irish General Medical Scheme
- Primary Care Physiotherapists (PTs) (N=101)

Results
- 65% (342) of GPs and 88% (89) of PTs responded to survey
- 28% of GPs and 50.5% of PTs got minimal PA guidelines correct
- A third of PTs reported that they screened PA levels in all of their patients
- 8% of GPs screened PA in all of their patients
- Significantly more GPs than PTs reported that they were very likely to counsel patients with hypertension, raised cholesterol and with diabetes
- 38% of GPs and 20% of PTs reported that they were unlikely to counsel healthy patients

Slide 7

Study 2

Aims

- Describe the PA levels of adult patients attending Irish primary care services

Study design

- Cross sectional population study of 885 patients attending primary care aged between 18 and 69
- IPAQ & questionnaire used to collect data

- Overall 47% (n=418) of participants failed to meet the recommended minimal levels of PA
- Significant association between age, gender, education and primary care location and PA category
- Overall 86% of participants had at least 1 CVRF & 64.5% had 2 CVRF

Slide 8

Study 3

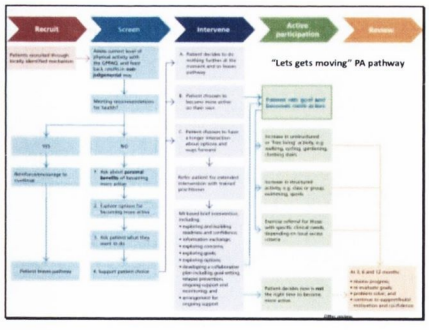
Aims

- The aim of study 3 is to establish consensus on a PA clinical pathway suitable for use by Physiotherapists in Irish primary care services

Objectives

- Agree criteria for entry onto the pathway
- Agree criteria that would exclude entry onto the pathway
- Determine if the GPPAQ screening tool is the most appropriate means of PA assessment for the Physiotherapist
- Agree follow up criteria
- Identify potential training needs and resources required to support implementation of the pathway

Slide 9



Slide 10

Study Population

- Purposive sample of 40 senior PTs working in primary care will be sought

Inclusion criteria

- Senior PTs* working in an urban primary care location
- Senior PTs working in a rural primary care location
- Senior PTs working in private practice
- PT Managers

Exclusion criteria

- PTs working in a clinical environment other than that outlined above
- PTs with less than 3 years post qualification experience
- PTs who are unable to commit to follow up rounds of the Delphi process

Slide 11

Study Design

- Delphi process which uses multiple contacts to reach consensus
- Following the introduction session a series of questionnaires will be distributed
- You will be asked to indicate your agreement or disagreement with each item of the PA pathway using a seven point Likert scale

1	2	3	4	5	6	7
Do not agree at all						Strongly agree

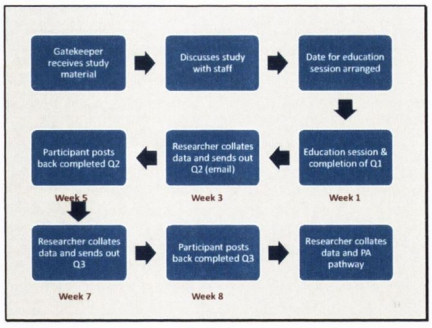
- Open ended questions will gather data on specific study objectives
- The researcher will collate and edit the second round questionnaire based on your responses
- Open ended responses will be used to generate statements that will tested for agreement/disagreement in subsequent rounds

Slide 12

Study design

- Consensus criteria based on agreement as defined by a score of 6 or 7 on the Likert scale from 70 – 75% of participants
- After round one, you will receive a second round questionnaire showing the overall anonymised rankings complete with feedback, together with a copy of your initial responses
- You will be asked to reconsider your initial responses based on the revised statements following round one analysis and rescore your agreement/disagreement as appropriate
- Three rounds of questionnaires will be required

Slide 13



Slide 14

What you would be committing to

- Completion of all 3 rounds of the delphi questionnaire
- Post back Q within the allotted timeframe (SAE)
- Complete Qs confidentially and without discussion
- **The rigour and validity of the technique is dependant on the response rate throughout the Delphi process**

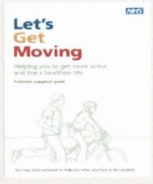
Slide 15

My responsibilities

- Available for further information during each stage of process
- The contents of the questionnaires will remain confidential
- Questionnaires will be coded to protect participants' identity
- Q 2 and 3 will be distributed in the agreed timeframe
- Results of final outcome will be reported back to gatekeeper after final questionnaire
- Provide in-service on research or PA promotion
- Potential for piloting and testing of the final version, looking for clinical partners

Slide 16

Part 2
"Lets get moving"
Physical activity clinical pathway





Slide 17

Introducing 'Lets Get Moving'

- First launched by the NHS in 2009 (Dept of Health UK)
- Let's Get Moving (LGM) is an evidence-based behaviour change intervention
- LGM is designed to systematically identifying sedentary adults by assessing PA and appropriately supporting them to become more active through a brief intervention
- Intended to create flexibility to establish the best model locally and identify the most appropriate service providers to deliver the intervention
- Has proven feasible for delivery by practitioners working in primary care settings

Slide 18

Further information on programme

- A range of existing materials to support the implementation of Let's Get Moving, including training resources
- For further information about Let's Get Moving, visit: www.dh.gov.uk and search for **Let's Get Moving**

- You will find details of:
- LGM commissioning guidance
- LGM patient support pack
- GPPAQ
- LGM feasibility study
- LGM training information
- NHS choices physical activity search tool for local opportunities
- Email queries to: **letsgetmoving@dh.gsi.gov.uk**

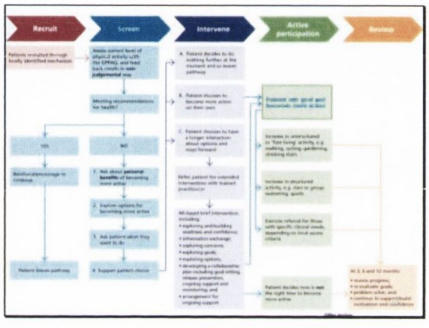
Slide 19

Pathway based on evidence from NICE

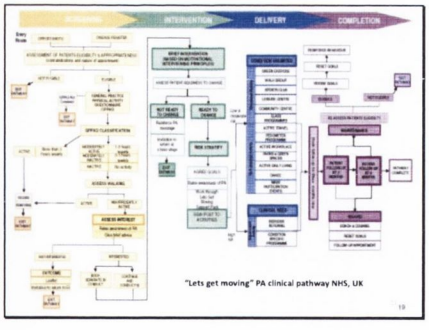
According to NICE public health guidelines, primary care practitioners should:

- Use a validated tool (GPPAQ) to identify inactive adults
- Advise all patients to aim for the recommended minimum amount of PA as outlined in the guidelines
- Consider the individual's needs, preferences and circumstances
- Agree goals
- Provide written information about the benefits of activity and the local opportunities to be active
- Deliver a brief intervention that help people to understand the likely impact of PA on their health and put in place simple steps that can guide them to change their behaviour

Slide 20



Slide 21



"Lets get moving" PA clinical pathway NHS, UK

Slide 22

Step 1. Recruit

1. **Recruitment methodology decided at a local level**

2. **Flexible entry route:**
   Patients already attending Physiotherapy
   - All new patients presenting to Physiotherapy
   - Only patients at higher risk (e.g. CVRFs)

   Offer pathway to people not already attending Physiotherapy
   - Advertise service offering dedicated PA appointments
   - Links with local clinics or services e.g. diabetes, obesity clinics, preventative health
   - Disease Registers
   - Accept referrals from local GPs/Nurses/AHP
   - Patient self refers

Question:
Consider entry route most appropriate to your service, what are exclusion criteria?

Slide 23

Step 2. Screen

- **Assess physical activity levels using the GPPAQ**

  This classifies people into one of four categories:
  - Inactive
  - Moderately inactive
  - Moderately active
  - Active

Question:
Is the GPPAQ the most appropriate screening tool for physiotherapists?

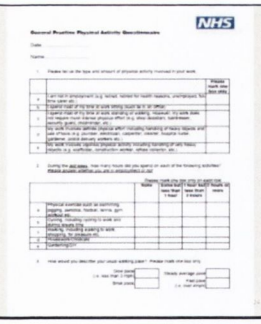
Slide 24

GPPAQ PA
Screening Tool

Although the questionnaire includes walking, DIY, green exercise and housework, these are not reflected in the final score due to significant over reporting.

Need to probe on walking further

LGM\UK NHS Literature\GPAQ\GPAQ Calculation tool.xlsx


NHS

General Practice Physical Activity Questionnaire

Date:

Name:

1. Please tell us the type and amount of physical activity involved in your work.

		Please mark one box only
1	I am not in employment (e.g. retired, retired for health reasons, unemployed, full time carer etc.)	
2	I spend most of my time at work sitting (such as in an office)	
3	I spend most of my time at work standing or walking. However, my work does not require much intense physical effort (e.g. shop assistant, hairdresser, security guard, mechanic etc.)	
4	My work involves vigorous physical effort including handling of heavy objects and use of tools (e.g. plumber, electrician, carpenter, cleaner, hospital nurse, gardener, postal delivery workers etc.)	
5	My work involves vigorous physical activity including handling of very heavy objects (e.g. scaffolder, construction worker, refuse collector, etc.)	

2. During the last week, how many hours did you spend on each of the following activities? Please answer whether you are in employment or not

		Hours	Hours and Mins Next Week Next Week	Hours and Mins Next Week Next Week	Hours and Mins Next Week Next Week	Hours and Mins Next Week Next Week
1	Physical exercise such as swimming, jogging, aerobics, football, tennis, gym, football etc.					
2	Cycling, including cycling to work and during leisure time					
3	Walking, including walking to work, shopping, for pleasure etc.					
4	Housework/Chores					
5	Gardening/DIY					

3. How would you describe your usual walking pace? Please mark one box only

Slow pace (i.e. less than 1 mph)		Steady average pace (i.e. 1 mph)	
Brisk pace		Fast pace (i.e. 1 mph)	

Slide 25

ASSESSING INACTIVE PATIENTS WHO SELF REPORT 3 HOURS OR MORE PER WEEK OF WALKING

- "You say you do three hours or more of walking per week. So that I might better understand how walking fits into your day, perhaps you could talk me through a typical day for you, starting from when you get up in the morning right through to when you go to bed telling me where walking fits in. How about yesterday, could you talk me through yesterday?"
- Ensure you assess the level of intensity of walking, you can use the following tool to assess intensity:

- 0 breathing easily, conversation is easy
- 1 breathing lightly and talking easily but heart rate increases
- 2 still talking comfortably but breathing more quickly body warming up
- 3 breathing more deeply and harder, talking with a little more difficulty
- 4 breathing very hard and short of breath, cannot carry on a conversation

Light Activity 0-1 Moderate Activity 2-3 Vigorous Activity 4

Slide 26

Step 3. Intervention

- Assess the persons readiness to change their behaviour

The spirit of the approach

- Evidence suggests that adopting a "guiding style" can be more effective and helpful in motivating people to think about, start and persist with lifestyle change
- **Lets Get Moving** takes a motivational interviewing approach
- "Motivational interviewing (MI) is a collaborative, person centered form of **guiding** to elicit and strengthen **motivation for change**."

Question: Do you think physiotherapists need to receive specialist training in MI before delivering this part of the intervention? Do you think that MI is the best approach to adopt?

Slide 27

Readiness to change

1. I am regularly physically active and have been so for more than six months
2. I am regularly physically active and have been so for six months
3. I am not regularly physically active but I have plans of becoming PA in the near future; within one month
4. I am not regularly physically active but I intend to change my physically inactive behaviour in the next six months
5. I am not regularly physically active and do not intend to be so in the next six months

NB Define " physically active for the patient"

Slide 28

Step 3. Intervention cont'd

- The practitioner, skilled in the use of motivational interviewing principles follow initial steps to guide the patient towards a decision
- LGM patient support pack, exercise diaries, goal setting, inserts about local PA opportunities e.g. Classes, walking routes etc

Question: What are the condition specific programmes that may be included in the pathway?

Slide 29

Step 4. Active participation

- Following a brief intervention there is about a 12 week period where the patient gradually becomes active on their own
- Patients may need to be followed up more regularly than this
- Some patients may benefit from extra support during this time, for example by a health trainer

Slide 30

Step 5. Review

- It is recommended that the patient is followed up at regular intervals, for example 3,6 and 12 months
  - The NICE guidance says patients should be followed up at regular intervals over 3 and 6 months
  - The GPPAQ requires annual completion

Question: What do you feel the follow up criteria should be?

Question: Are their extra resources and training required to support delivery of the pathway?

Slide 31

To participate

- Sign the consent form
- Put your details into the participant sheet (email)
- Fill in the questionnaire, please no blanks in Likert Q's and ask for clarification if needed
- Return consent form and Q to me
- Keep the two SAEs for follow-up Qs

Thank you!!

Slide 32

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Slide 33

ASSESSING INACTIVE PATIENTS WHO SELF REPORT 3 HOURS OR MORE PER WEEK OF WALKING

- "You say you do three hours or more of walking per week. So that I might better understand how walking fits into your day, perhaps you could talk me through a typical day for you, starting from when you get up in the morning right through to when you go to bed telling me where walking fits in. How about yesterday, could you talk me through yesterday?"
- Ensure you assess the level of intensity of walking, you can use the following tool to assess intensity:
- 0 breathing easily, conversation is easy
- 1 breathing lightly and talking easily but heart rate increases
- 2 still talking comfortably but breathing more quickly body warming up
- 3 breathing more deeply and harder, talking with a little more difficulty
- 4 breathing very hard and short of breath, cannot carry on a conversation

Light Activity 0-1 Moderate Activity 2-3 Vigorous Activity 4

Slide 34

ACSM Risk Stratification (ACSM 2000)

- 1. Family history
- 2. Cigarette smoking
- 3. Hypertension
- 4. Hypercholesteraemia
- 5. Obesity
- 6. Physical inactivity
- 7. Impaired fasting glucose

ACSM Risk Stratification (ACSM 2000)

Low risk

- M<45 & F< 55 who are asymptomatic and have <= 1RF

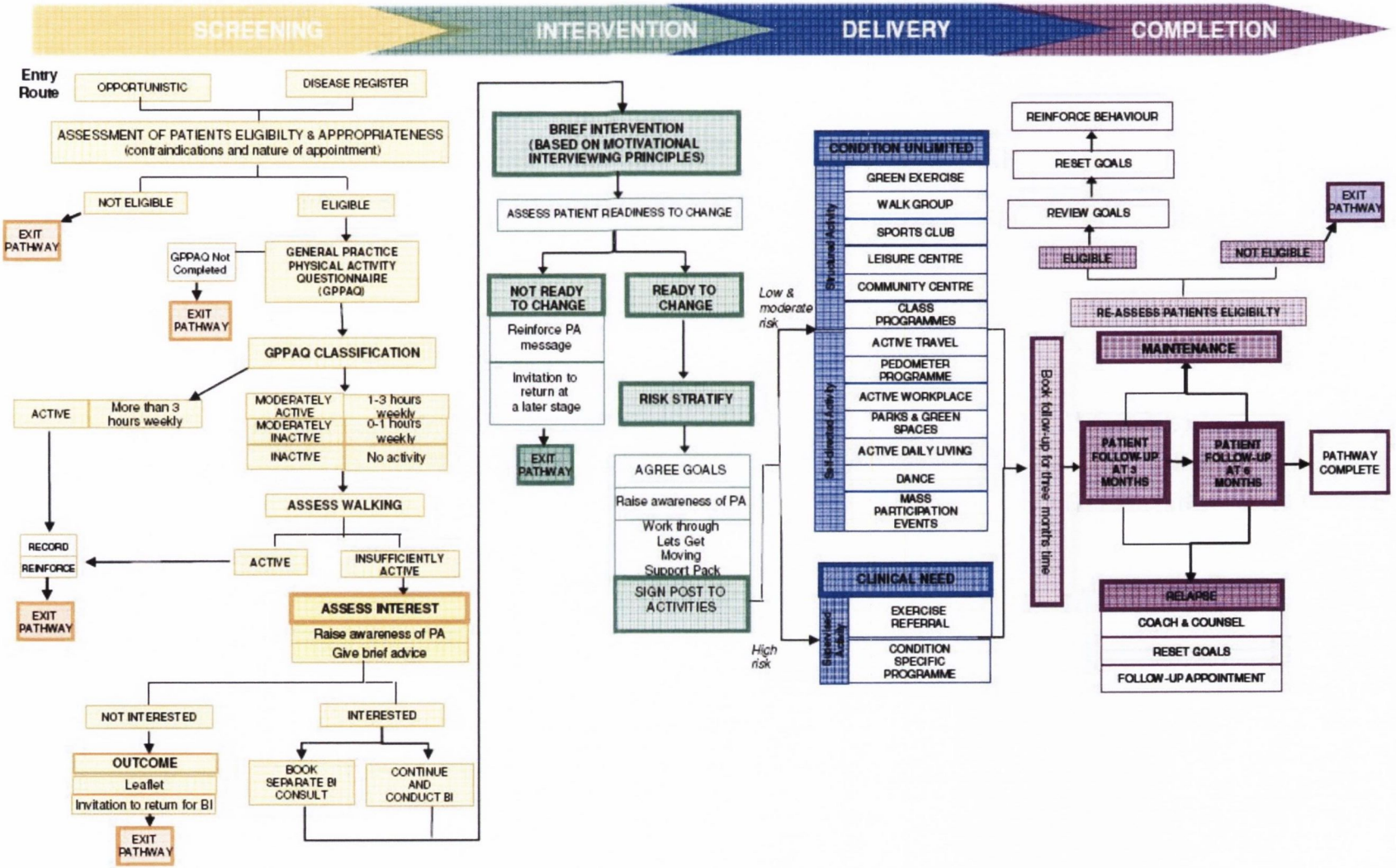
Moderate risk

- M>= 45 & F>= 55 with >= 2 RF

High risk

- Individuals with >= I S&S of CV or pulmonary disease or with known CV, pulmonary or metabolic disease

Appendix X: Physical Activity Clinical Pathway Study III



Appendix XI: Study Publications

Study 1 Publication

J Public Health (2013) 21:63–69
DOI 10.1007/s10389-012-0512-0

ORIGINAL ARTICLE

Promotion of physical activity in primary care: knowledge and practice of general practitioners and physiotherapists

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Abstract
Aim Being physically active has many proven health benefits and promoting physical activity to patients in primary care is an important component of public health programmes. This study examined the knowledge and practices of general practitioners and physiotherapists in the promotion of physical activity in primary care.
Subject and methods A cross-sectional population survey was conducted in Ireland to establish participants' knowledge of physical activity guidelines and current practice in the promotion of physical activity. A total of 342 general practitioners (response rate 65 %; $n=543$) and 89 physiotherapists (response rate 88 %; $n=101$) responded to the survey.
Results More physiotherapists (50.5 %; $n=45$) than general practitioners (28 %; $n=97$) correctly reported the minimal physical activity guidelines ($X^2=16.56$, $p<.005$, df=1). General practitioners reported screening physical activity opportunistically (41 %; $n=139$) and when related to a patient's presenting complaint (37 %; $n=126$). Physiotherapists reported screening physical activity routinely (34 %; $n=30$) and when related to the presenting complaint (28 %; $n=25$). With the exception of overweight patients, general practitioners were more likely than physiotherapists to promote physical activity to patients with known cardiovascular risk factors such as hypertension ($X^2=49.65$, $p<.001$, df=2) and hypercholesterolemia ($X^2=32.58$, $p<.001$, df=2). Physiotherapists, however, were more likely to promote physical activity to healthy populations ($X^2=9.91$; $p<.01$, df=2). Education and advice was the intervention most frequently used (general practitioners 76 %; $n=258$, physiotherapists 97 %; $n=86$).
Conclusion Despite high levels of awareness of physical activity promotion amongst general practitioners and physiotherapists, there is scope to improve physical activity promotion particularly to healthy populations and ongoing challenges to incorporate evidence based interventions into routine care.

Keywords Physical activity · Physical activity promotion · Primary care · Cardiovascular disease · Health promotion

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Introduction

Cardiovascular disease remains a major cause of premature death and disability throughout the world, and accounts for an estimated 17.1 million deaths globally (World Health Organisation 2011). Each year, 36 % of deaths in the Republic of Ireland are attributable to cardiovascular disease, and 22 % of these deaths occur in persons under the age of 65 (Central Statistics Office 2006). Cardiovascular disease also contributes substantially to the economic burden of a country through increasing demands on healthcare provision and reducing productivity through lost work days (European Heart Network 2008).

There is strong scientific evidence supporting the cardiovascular health benefits of regular physical activity (PA) in preventing the onset of coronary artery disease (Blair and

Jackson 2001) and in modifying risk factors such as hypertension (Fagard 2001), type 2 diabetes (Thompson et al. 2001), obesity (Wing and Hill 2001), and altered blood lipid profile (Leon et al. 2000). Despite this, levels of physical inactivity remain high with one in five Irish adults being classified as physically inactive and a further 24 % failing to meet the volume of activity recommended for health by the American College of Sports Medicine (ACSM; Morgan et al. 2007). The ACSM guidelines recommend that healthy adults should undertake moderate-intensity aerobic PA, for a minimum of 30-min duration, on 5 days of the week (Pate et al. 1995; Haskell et al. 2007). The guidelines may also be met by undertaking vigorous exercise three times a week for 20 min or combinations of vigorous and moderate activities. Many countries, including Ireland, have released their own national PA guidelines (Department of Health and Children, Ireland 2009), and urge healthcare workers to use all available opportunities to communicate and support the benefits of PA to their patients. This call is echoed by the European Society of Cardiology who considers "the assessment, counselling, and support of PA as core tasks for physicians and other health professionals engaged in the prevention of cardiovascular disease" (Graham et al. 2007).

Whilst the importance of promoting PA is widely acknowledged (Haskell et al. 2007; Graham et al. 2007), the most effective way of supporting a patient's behaviour is still unclear and thus presents a challenge to those charged with this task. An evidence briefing paper, based on a synthesis of systematic reviews investigating the effectiveness of public health interventions, reports an increase in short-term PA levels among healthy adults following brief advice from a doctor (National Institute for Health and Clinical Excellence 2006). Exercise prescription schemes, where health professionals refer patients for supervised follow up in structured exercise programs, are now widely available in some countries, but results are disappointing with many trials reporting poor rates of uptake and large attrition rates (Gidlow et al. 2005; Isaacs et al. 2007). Providing patients with individually tailored advice, supported by written materials, which include details of local facilities, may be as effective as referral to supervised exercise classes as well as being a more cost-effective option (Isaacs et al. 2007).

There is a growing body of literature investigating the effectiveness of specific PA interventions in primary care with most of these interventions being introduced to practice as part of the investigating trial (Isaacs et al. 2007; Bull and Milton 2010; Foster et al. 2005). There are however, fewer studies which describe the PA interventions health professionals actually choose to use as part of routine practice. This is an important consideration, as health professionals participating in PA trials may be more motivated to deliver PA interventions, may be in receipt of financial incentives, and often have additional material or staffing resources available to them as part of the investigating trial.

Within primary care, the role of the general practitioner (GP) in PA promotion has been widely reported (Ribeiro et al. 2007; Lawlor et al. 1999; van der Ploeg at al. 2007). Large sections of the general population will consult with a GP at least once a year (Morgan et al. 2007), and consider them to be a credible source of information (Booth et al. 1997). This suggests that as a professional group, GPs have a unique opportunity to promote PA to large sections of the general population. Another profession of interest is the primary care physiotherapist (PT). Although unlikely to experience the same level of access as a GP, specialist knowledge in exercise combined with appointments of a more prolonged nature offer another opportunity to support positive PA behaviour in primary care.

The aim of this study was to establish GPs and PTs practice in the screening and promotion of PA in primary care. The study objectives included: determining knowledge of current PA guidelines, establishing the likelihood of counselling patients with and without cardiovascular risk factors, describing the interventions most frequently used and identifying potential barriers limiting practice.

Methods

Participants

The study population included all GPs (n=543) registered with the state run General Medical Services programme and all primary care PTs (n=101) employed by the National Health Service Executive in the region of Dublin Mid Leinster. This geographical region is the largest of the four operational areas of the Health Service Executive in the Republic of Ireland and was chosen for its good mix of rural and urban locations. Up-to-date mailing lists were generated by contacting each of the relevant primary care managers in the region.

Eligible participants were limited to those registered or working with the Health Service Executive as there is no central register of GPs and PTs available. However, a report into the structure of general practice in Ireland found that only 4 % of their sample were not registered with the General Medical Services Programme (O' Dowd et al. 2006), so it is likely that this is a representative sample of all GPs working in this region. There are no similar data available for PTs. The PT sample therefore was limited to those working within the primary-care services of the Health Service Executive to ensure accuracy of mailing lists and minimise the risk of coverage and sampling error. Ethical approval was granted by the Research Ethics Committee, Faculty of Health Sciences, Trinity College Dublin.

Design

Following completion of a pilot study, a self-report postal questionnaire was developed to collect the data. Data collection occurred over a 2-month period in summer 2010 and consisted of a maximum of four phased contacts. Participants initially received a pre notice letter informing them of the study, the study aims and requesting their participation. In the second contact, participants received a copy of the questionnaire and a stamped addressed envelope for its return. Non respondents were followed up by post on a further two occasions, at two-week intervals. Several methods were used to maximise response rates including; personally addressed letters to participants, multiple contacts for non respondents, prepaid envelopes for questionnaire return, and careful design of the study tool through pilot testing and focus group follow up.

Measures

The questionnaire consisted of four sections. The first section examined knowledge of the current minimal PA guidelines. Sections two and three questioned subjects about their normal practice in screening and promotion of PA to patients and requested details of the types of promotional activities used and barriers to practice. The final section recorded professional and demographic information and details about postgraduate training in PA or exercise promotion.

Analyses

Data were analysed using PASW version 18.0 and descriptive statistics were used to describe the data. Chi- squared tests were used to test for significant associations between categorical variables and Mann-Whitney U tests were used to test for significant differences between groups.

Results

Response rate and professional details

Sixty five percent (342/523) of GPs and 88 % (89/101) of PTs completed the questionnaire. Of the GPs who did not participate, 15 returned the questionnaire having opted out of the study, ten were returned due to incorrect addressing or recipients being on extended leave and 156 did not respond. Of the non participating PTs, one opted out of the study, two questionnaires were returned as PTs were not based in primary care and eight failed to respond.

Details of gender, years working in primary care and the numbers with postgraduate (PG) training in exercise prescription are given in Table 1. Whilst the gender distribution was different amongst the two groups, comparison with national data (O' Dowd et al. 2006) found that there were no differences in gender distribution between the study population and that of the general population of the professions surveyed (Physiotherapy data accessed by personal communication with the Irish Society of Chartered physiotherapists). GPs had worked in primary care for a significantly longer time than PTs but there were no significant differences in the proportion of participants reporting postgraduate education in exercise prescription.

Knowledge of PA guidelines

Participants were asked to state the current minimal PA guidelines for healthy adults. Significantly fewer GPs than PTs (28 %; $n=97$ vs. 50.5 %; $n=45$, $\chi^2=16.56$, $p<.005$, df=1) accurately recalled the guidelines with 45 % ($n=153$) of GPs and 35 % ($n=31$) of PTs reporting PA levels that were below the recommended minimum.

When looking at the individual parameters of frequency, intensity and duration the largest discrepancies were seen when reporting the frequency of physical activity required to meet the guidelines with 58 % ($n=197$) of GPs and 37 % ($n=33$) of PTs being incorrect or unsure. Participants used a variety of resources to source information on PA including; international guidelines (GP 20 %; $n=69$, PT 37.1 %; $n=33$), national Department of Health guidelines (GP 13 %; $n=43$, PT 35 %; $n=31$), short course attendances (PT 65 %; $n=58$) and their professional body's website (GP 29 %; $n=100$).

PA screening practices

Ninety five percent of both groups (GP=325, PT=85) felt that PA screening and promotion was part of their professional role. To determine screening and counselling practices subjects were asked to read a series of statements (outlined in Fig. 1) and indicate which one most closely related to their routine practice. The results for PA screening practices are presented in Fig. 1. The largest proportion of GPs (41 %; $n=139$) reported opportunistic or ad hoc screening practices with a further 37 % ($n=126$) screening PA levels if relevant to a patient's presenting complaint. Eight percent ($n=28$) of GPs reported routine screening of PA in all of their patients. Conversely the largest proportion of PTs (34 %; $n=30$) reported screening PA in all of their patients. Twenty eight percent ($n=25$) of PTs screened PA levels if related to a patient's complaint and 24 % ($n=21$) reported opportunistic screening.

PA counselling practices

Participants were asked to indicate how likely or unlikely they were to counsel healthy patients and those with known

Table 1 Demographic and professional details of general practitioners (GPs) and physiotherapists (PTs)

	GPs	(*n*=342)	PTs	(*n*=89)	*p* value
Gender % (n)	M	67 (229)	M	17 (15)	$p<.001$
	F	33 (113)	F	83 (74)	$\chi^2=72.18$
Mean yrs in primary care (SD)	22.15	(9.77)	3.99	(3.628)	$p<.001$[b]
PG training in exercise prescription % (*n*)[a]	Yes	14.5 (49)	Yes	18 (16)	Ns
	No	85 (290)	No	82 (73)	$\chi^2=.679$

[a]Data missing for three participants

[b]Mann-Whitney test

CV risk factors and results are presented in Table 2. Overweight patients were most likely to be counselled by both professions but significantly more GPs than PTs reported counselling patients with hypertension, raised cholesterol and diabetes. The promotion of PA to healthy populations was much lower with 37 % (*n*=128) of GPs and 20 % (*n*=18) of PTs reporting that they were unlikely to counsel these patients.

PA interventions and barriers

A number of different interventions were used to promote PA, those reported most frequently are presented in Fig. 2. Overall education and advice was the intervention most frequently used by both professions (GP 76 %; *n*=258, PT 97 %; *n*=86). GPs utilised onward referrals to other services more often than PTs, reporting referrals to the practice nurse (16 %; *n*=56), exercise specialist (14 %; *n*=49) and exercise prescription schemes (11 %; *n*=37). PTs utilised written materials (73 %; *n*=65), exercise diaries (57 %; *n*=51) and follow up appointments (53 %; *n*=47) more frequently than GPs. Behavior modification (GP 50 %; *n*=172, PT 53 %; *n*=47) and gym referrals (GP 44 %; *n*=150, PT 45 %; *n*=40) were used similarly by both groups.

Barriers to PA promotion included time constraints (GP 51 %; *n*=175, PT 50.5 %; *n*=45), poor patient compliance with advice (GP 34 %; *n*=115, PT 66 %; *n*=59), lack of educational resources (GP 25 %; *n*=86, PT 31.5 %; *n*=28) and uncertainty regarding local services (GP 24 %; *n*=83, PT 18 %; *n*=16).

The majority of both professional groups (GP 72 %; *n*=247, PT 92 %; *n*=82) indicated that they felt confident providing PA advice to their patients. Further analysis found that there was no association between respondents who correctly described PA recommendations and reported confidence to promote PA ($\chi^2=5.386$, $p=.068$, df=2).

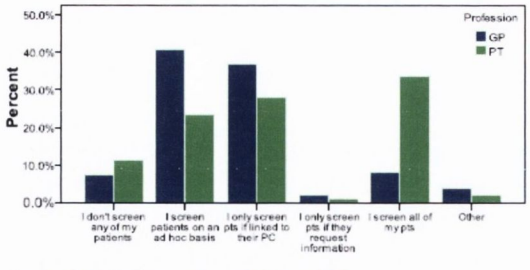

Fig. 1 PA Screening practices of GPs and PTs

Discussion

Response rate

Response rates to GP surveys are traditionally very low raising concern about the validity of the findings (VanGeest et al. 2007). The GP response rate of 65 % achieved in this study was therefore satisfactory and compares favourably to similar studies, which reported rates ranging from 40 to 64 % (Buffart et al. 2009). The response rate of 88 % from the PTs was excellent and much higher than a study of Australian PTs (54 %), suggesting that our sample is representative of PTs working in government-run primary-care services (Shirley et al. 2010). The generally high response rates achieved in this study may reflect the importance accorded to physical activity by the study population and its relevance to general practice. However, we cannot rule out non-response bias particularly amongst the GP population. In the absence of a central register of PTs, we chose only to survey PTs employed in the Health Service Executive, meaning that the results cannot be generalised to PTs employed solely in private practice.

Knowledge of the guidelines

Physical activity needs to be of sufficient duration, frequency and intensity in order to incur health benefits (Haskell et al. 2007), so it is important that patients receive the correct information from health professionals. Less than a third of GPs and half of PTs reported the correct PA guidelines. Where guidelines described were incorrect, respondents were more likely to report levels below the recommended minimum. Recalling the correct frequency of PA was the component with which participants were most unsure accounting for the largest number of incorrect answers both in this study and in previous work (Daley et al. 2008).

Despite this disparity in knowledge, the majority of participants reported feeling confident providing patients with advice. Although far from optimal, knowledge of guidelines

Table 2 Likelihood of GPs and PTs to counsel healthy and cardiovascular risk patients

		Very likely	Likely	Unlikely/V unlikely	*p* value
Hypertension	GP %(*n*)[a]	63 (216)	33 (114)	3 (11)	$p<.001$
	PT %(*n*)[a]	22.5 (20)	65 (58)	11 (10)	$\chi^2=49.65$
Hypercholesterolemia	GP %(*n*)[a]	70.5 (241)	28 (95)	1.5 (5)	$p<.001$
	PT %(*n*)	38 (34)	56 (50)	6 (5)	$\chi^2=32.58$
Diabetes	GP %(*n*)[b]	74 (254)	23 (78)	2 (7)	$p<.001$
	PT %(*n*)	50 (44)	47 (42)	3 (3)	$\chi^2=21.42$
Overweight	GP %(*n*)[c]	86 (293)	12 (41)	2 (6)	Ns
	PT %(*n*)	77 (68)	21 (19)	2 (2)	$\chi^2=5.17$
Healthy	GP %(*n*)[a]	21.5 (73)	41 (140)	37.5 (128)	$p<.01$
	PT %(*n*)	25 (22)	55 (49)	20 (18)	$\chi^2=9.91$

[a]Data missing for one participant
[b]Data missing for three participants
[c]Data missing for two participants

by Irish health professionals is better than that reported in two previous studies, in which 13 % of Scottish GP's (Douglas et al. 2006) and a third of Australian PTs (Shirley et al 2010) stated the correct guidelines. There is of course the possibility that interested participants may have accessed the guidelines after receipt of the questionnaire and the true level of knowledge is actually lower than that reported.

Physical activity has recently been receiving more widespread promotion with the release of population targeted guidelines, evidence based statements and the inclusion of PA recommendations in many health policy documents at national and international level. It is likely that PA guidelines need to be more specifically tailored to their target audience and their distribution and promotion co-ordinated more formally to improve knowledge and acceptance. Increasing the numbers of professionals who undertake postgraduate training in this area may also be required as less than a fifth of participants reported postgraduate training in exercise prescription.

PA screening practices

There was a high level of awareness of PA amongst professionals with almost all participants considering PA promotion as part of their professional role. The screening practices of participants were quite varied. In addition to those who do not screen any patients, large numbers reported ad hoc practices suggesting that a number of inactive or insufficiently active patients are not being correctly identified. Another frequent practice was screening patients PA levels when it was relevant to their presenting complaint. While this may be understandable in busy practice, physical inactivity is in itself an independent risk factor for cardiovascular disease and several other non-communicable diseases and thus should be screened for as such. An Australian study reported similar findings with little change in the percentage of patients screened over a 10-year period (Buffart et al. 2009).

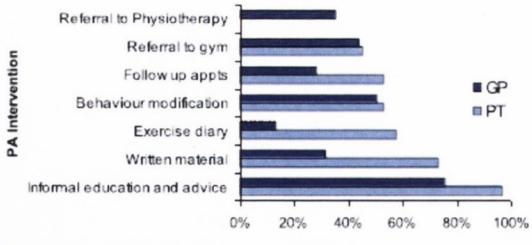

Fig. 2 Use of PA interventions by GPs and PTs

Given the potential public health benefits of increasing physical activity levels, all primary care assessments should at least include a simple screening process to identify patients who are not meeting recommendations. This could be administered quickly in the form of a one question screening tool (Rose et al. 2008), a self-report questionnaire (Department of Health, London 2006) or by specific questioning of the patient, none of which add much to the time burden of professionals.

PA counselling practices

In view of the evidence supporting the use of PA in the prevention and treatment of cardiovascular disease (Blair and Jackson 2001; Fagard 2001; Thompson et al. 2001; Wing and Hill 2001; Leon et al. 2000), it is reassuring to see that high numbers of health professionals are likely/very likely to counsel patients with known cardiovascular risk factors. However, despite the overall high counselling rates, GPs are more likely than PTs to counsel patients with hypertension, raised cholesterol and diabetes, suggesting that as a profession they have better awareness of these risk factors. PTs may be less alert to these components of cardiovascular health or consider it less of a priority when treating patients for an unrelated condition such as an orthopaedic or musculoskeletal disorder. However the prolonged

nature of many PT appointments and specialist skills in exercise prescription offers a further opportunity to promote PA in this high-risk population. Similar to previous reports (Kreuter et al. 1997), the current study found that overweight patients are most likely to receive PA counselling. This may be as a result of the increased focus on obesity both in the medical literature and general media or may reflect the external visual cue a health professional receives when assessing an overweight patient reminding them to promote PA.

Despite the call for PA promotion to be included in all primary care consultations (WHO 2009), participants were less likely to counsel healthy patients. The infrequent use of PA promotion as a primary preventative strategy is an important finding, which warrants further investigation. Half of all participants in this study identified time constraints as a barrier to practice and thus may choose to limit counselling to more high-risk populations. Other factors such as such as a lack of financial remuneration, personal interest in PA, personal PA behaviour and perceived effectiveness in influencing change have all been suggested to influence health professional practice and need further research (Ampt et al. 2009). To effect large-scale improvements in public health, promotion of PA by medical professionals must be delivered alongside policy reform, community engagement, media campaigns and widespread targeted education programmes.

Use of PA interventions

Informal advice and education was the intervention most frequently used by health professionals and when supported by written materials has been found to be effective in producing at least short-term changes in PA behaviour (NICE 2006). A quarter of the GPs and just under a third of PTs identified a lack of patient educational material as limiting their practice. Improving the availability and dissemination of printed educational materials particularly amongst GPs may reinforce the advice a patient receives. The 10,000 Steps Rockhampton study, a community-based PA counselling intervention showed a 31 % increase in the numbers of patients recalling GP advice on PA following practice-based instruction to GPs and distribution of promotional materials (Eakin et al. 2004).

About half of the participants reported using behavioural counselling to influence patients PA. This approach tailors advice given to a patient relative to their goals and stage of behaviour change and when delivered over a number of appointments have been shown to produce more promising and long-term results (Lawton et al 2008). It was not within the scope of this study to describe the actual content of each intervention but the numbers of participants providing follow up appointments ranged from 30 % (GP) to 60 % (PT), suggesting that at least in some cases the intensity of the intervention may not have been high enough to support change.

It is likely that the different professions working in primary care have different roles to play in PA promotion. Undoubtedly GPs are the cornerstone of public health and must play a vital role in terms of screening and assessment of activity levels. They are also best placed to offer brief advice such as the promotion of PA guidelines to the large sections of the population they come into contact with. However patients requiring more supportive measures may benefit from onward referral to more specialised services. There is still no consensus as to what is the best form of supervised PA intervention and the role that the PT may play in the provision of such programmes has to date received very little formal evaluation.

In conclusion, we found high levels of awareness of PA promotion amongst GPs and PTs in primary care especially for patients with cardiovascular risk factors. PA promotion to healthy populations was less established. There are ongoing challenges to ensure that evidence-based guidelines and interventions supporting long-term behaviour change are incorporated into routine practice.

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Conflicts of interests The authors declare that they have no conflict of interest.

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