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ENVIRONMENTAL PHILOSOPHY, THREAT AND WELL-BEING

By

Anne Walsh Dáneshmandi

A thesis submitted for the degree of Doctor of Philosophy

Department of Psychology,
University of Dublin,
Trinity College

May 2002
DECLARATION

(a) The work contained in this thesis has not been submitted as an exercise for a degree at this or at any other university.

(b) This thesis is the result of my own investigations. The contributions of others are duly acknowledged in the text wherever included.

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Anne Walsh-Daneshmandi
You must be the change you wish to see in the world.'

-Mahatma Gandhi

ACKNOWLEDGEMENTS

The genesis for this thesis was my personal experience of attempting to effect change in my own lifestyle. But this partial journey toward 'being' that change could not have been undertaken without the help and support of many old friends. The route map has also been oriented by the interventions of many new friends and colleagues. I have had so many fascinating exchanges of ideas that I really relished, and have learned the benefit of enduring less palatable ones. Reading for this thesis led me down various paths and has been the impetus for connecting with many fine people along the way. It has also been a vehicle for those near and dear to me to, once again shine through offering levels of support and generosity of spirit that have been overwhelming at times.

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I dedicate this thesis to my husband, Pirooz Daneshmandi.

**Dialogue in Fading Light**

The moon sits in the chilled zenith.  
Emptied of everything but your grace,  
night long, I stare at its mask of light.

I recall ice dripping into a drain.  
The drain is deep and the sound faint;  
the measure of the drip is ominous.

Our sun is many times the size of the earth,  
and red giants like Beltegeuse dwarf the sun,  
and for all I know Beltegeuse is a mote  
in the scale of creation. Yet we belong.

The eye craves rhythm and colour.  
There's no healing or ease  
in a vista where nothing coheres.

You renewed me by losing yourself  
to our deepening dialogue in fading light.  
To stardust we shall return.

A pink moon rose as we parted,  
its presence over the rooftops a focus,  
a celestial light through the dust of pollution,  
composing all that had been in isolation.

Philip Casey  
(Published by Southern Review, USA, & The Whoseday Book; cf.  
www.philipcasey.com)
ABSTRACT

This thesis represents a comprehensive attempt to address the dearth of research on relationships between environment and mental health. The aim is to present a novel theoretical and empirical investigation of the links between environmental values, perceived environmental quality and psychological well-being. Across seven chapters we have endeavoured to tell this story, by weaving together strands from the pertinent literature and unravelling meaning from responses to more than one thousand questionnaires.

Multiple levels of design and analysis were employed to examine existing and new theoretical propositions. Survey methods were employed, in three separate studies, to collect cross-sectional and longitudinal data from young people attending academic institutions in Dublin. Sampling included convenience and matched group methods. Aspects of the third study involved field research on an experiential education program for ecology and enterprise. Following schematic representation of the constructs, factorial, and path modelling were employed to examine the nature of eco-wellness: the relationships between eco-philosophy, threat, and well-being.

The eclectic perspective of the thesis is reflected in the review of literature presented in the first chapter. The philosophical underpinnings of the thesis are strongly influenced by ecosophy, however the methodology is more closely related to health psychology. In this regard the approach to the thesis has been essentially trans-disciplinary.

Chapters 2 through 6 uncover the layers of complexity in the dynamic of eco-wellness by systematically testing and refining theoretically derived models, employing factorial and path analysis. An integral part of this process was detailed scrutiny of the operational measures, and chapters two and five explore aspects pertinent to methodology.
The impact of the educational program, designed for second level schools in the European Union, was measured and discussed in chapter six.

An additional aspect of the methodology was to include an evaluation of technologies, designed to facilitate collection of data from large samples.

In the final chapter the results were summarised and evaluated. These findings were discussed and positioned in relief against the backdrop of a theoretical tapestry woven in the first chapter. Each of the threads together form a picture of distinct networks connecting what have been traditionally seen as separate aspects of environmental and health psychology. The limitations of the project were also discussed in chapter seven, before recommendations for future research were proposed.

The empirical approach in the thesis goes some way toward closing the unnecessary gap between empirical psychology and eco-psychology, essentially defined by methodological difficulties, that has restricted research progress in the area.

This thesis illustrates the importance of the holistic approach in an area that will continue to be a fascinating garden for research, where ‘exotic’ and ‘native’ varieties can thrive together and provide a rich ecology, rich enough to support the web-of-life.
SUMMARY

This thesis represents a comprehensive attempt to address the dearth of research into the relationship between environment and mental health. The desire to pursue an empirical approach was the guiding principle of the project. Within this context the goal of maximizing internal validity was paramount. This required the use of multiple levels of design. There were both cross-sectional and longitudinal aspects to the project, which capitalised on field research in environmental education. Data included quantitative and qualitative aspects, but the focus of this thesis is on the quantitative data. Sampling included convenience and matched group designs. Statistical analyses incorporated both univariate and multivariate procedures, as appropriate. Following an initial schematic representation of the constructs, factorial, and path modelling were employed to examine the nature of the relationships between eco-philosophy, threat, and well-being.

In the first of seven chapters, we presented a theoretical exposition of these relationships. The philosophical underpinnings of the thesis are essentially based in the literature of eco-philosophy and eco-psychology, recently being referred to as ecosophy, however the methodology is more closely related to that employed within the discipline of health psychology to explore psycho-social impacts on health. In this regard the approach to the thesis has been essentially trans-disciplinary. This multiplicity of perspectives is reflected in the literature review, which reaches across distinct areas of academic endeavour with the view to craft an enhanced understanding of the underlying processes of the dynamic between environmentalism and well-being.

In Chapter 2 we attend to some of the methodological difficulties that have been highlighted in the literature on eco-philosophy and threat. This was an attempt to close the unnecessary gap that exists between empirical psychology and eco-psychology. The
focus of the chapter was on psychometric aspects of the research instrument for the study reported in Chapter 3.

Chapter 3 discussed the necessary elements required in theoretical models wherein the relationships between environmental consciousness and well-being can be explored. The notion of ecological well-being was introduced and the links between environmental degradation and perceived threats to health discussed, within the context of the state of the environment in Ireland. The literature on stress and health was reviewed and a factorial model of environmental consciousness and well-being described. The utility of this model, the Individual Psycho-Ecological Carrying-Capacity (IPECC), was demonstrated with data from college students.

In Chapter 4 the IPECC model was successfully applied to data collected from teenagers. Expanded definitions of the concepts of 'environmentalism' and 'well-being' were discussed and the constructs were further refined. In addition, the utility of Optical Mark Recognition (OMR) computer software, as an aid to data collection was evaluated.

Chapter 5 examined issues regarding methodological confounds extant in the research model thus far and the psychometric properties of the research instrument were evaluated here with data was collected from a larger teenage sample. The research model was further refined and strengthened.

Chapter 6 explored the IPECC model within the context of recent refinements. Structural Equation Modelling was used to depict paths between elements of Eco-Wellness. This chapter also discussed an experiential education intervention, fielded as a pilot study for an Eco-Friendly Enterprise project designed for second level schools in the European Union. The impact of the educational program was measured and discussed within the context of increases in environmental attitudes, beliefs, knowledge, and behaviour. The effect of the intervention on aspects of psychological well-being including distress, self-esteem, emotional happiness, and psycho-social functioning were also examined.
In the final chapter the results of the empirical studies presented in chapters two to six are summarised and evaluated. These findings were discussed and positioned in relief against the backdrop of the theoretical tapestry woven in the first chapter. Each of the threads together form a picture of distinct networks connecting what have been traditionally seen as separate aspects of environmental and health psychology. The limitations of the project were also discussed before recommendations for future research were proposed.

These limitations are viewed in a way consistent with the image portrayed by the Persian idiom, related to me by my late mother-in-law Parvindokht Arasteh, which translates to “A flower has no back.” The ‘back-side’ of these limitations is thus transformed into a vista of potential in an area that will continue to be a fascinating garden for research where ‘exotic’ and ‘native’ varieties can thrive together, each contributing to a rich ecology, rich enough to support the web-of-life.
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CHAPTER ONE: Theoretical Overview of The Project

1.1 INTRODUCTION

In this first chapter we introduce the theoretical foundation of the thesis with emphasis on the constructs of environment and well-being. In doing so, we endeavour to weave a tapestry from disparate threads within the literature on constructs, which have not often been juxtaposed in the past. By tracing the history of human development and enterprise we illustrate the reciprocity of the well-being of the individual and the well-being of the planet. We show how in spite of a shift in fundamental values regarding ecology, earth-friendly behaviours are practiced by few. As part of the process of changing attitudes and behaviour there has been a reliance on the behaviourist paradigm for shaping behaviour, and a practice of heightening the sense of threat from environmental hazards. We argue that this policy may be ill-founded, both in terms of being ineffectual and on the grounds that it may be harmful. Presenting research to demonstrate how individuals realise that ecological problems are diffuse and the degradation of the environment has measurable effects on personal well-being, we argue the need for a phenomenological approach to the links between environment and well-being. By formulating a conceptual model and an empirical mechanism for demonstrating the links between the ecological well-being of the person and the planet we address the gap in research on the topic. Towards the end of the chapter we outline the contents of rest of the thesis.

Almost half a century has passed since the first government funded research project in the field of environment and behaviour examined the environment of a mental hospital and its effect on patient behaviour\(^1\) (Ittelson, 1961). This focus on the effect of environment on behaviour dominated the field and in the intervening years the study of the dangerous impacts of human actions on the environment was relatively

\(^1\) William Ittelson received the first government funding for research in the area (1958-1961). Published in 1961 the report from this research was titled ‘Some factors Influencing the Design and Function of Psychiatric Facilities’ (Ittelson, 1961).
slow to develop (Darley & Gilbert, 1985). The impact of behaviour on environment now forms part of the social science research on environmental problems. Part of this re-orientation has been a move away from viewing behaviour and environment as end-states and toward a realization that the two concepts are processes, each affecting the operation of the other. From this position one can acknowledge that humans are thinking feeling beings, and this implies a necessary consideration of mental health. Yet, in spite of its pioneering position in the history of environment and behaviour research, the relationship between the environment and mental health remains largely unexplored territory.

The relationship between mental health and the environment is a surprisingly neglected subject in spite of the greatly increased importance of the environment as a political and scientific issue in recent years. As a result, it is a scientific area that still lacks both adequate data and rigorously defined concepts (Freeman, 1998; p. 124).

This thesis goes some way toward the gap in research identified by Professor Freeman. Here we examine the relationship between eco-philosophy, threat, and well-being, paying particular attention to the definition of concepts and validation of data used to define the complexity of such relationships.

The third edition of Collins English Dictionary defines ‘environment’, as the state of being environed or encircled. This is consistent with William Ittelson’s2 (1973) assertion that “the environment surrounds, enfolds, engulfs” us, and that we are all “exploring” the environment (p.13). Research on experiences relating to environment must be concerned with the essence of this exploration process (Rivlin, 2000). Therefore, an appropriate starting point for this research is to define the backdrop of this human exploration.

---

2 William Ittelson, with Harold Proshansky, founded the first, and still remaining, environmental psychology program at (what is now) City University of New York in 1958. He co-authored the first textbook in the field (Proshansky, Ittelson, & Rivlin, 1970) and received the first government funding for research in the area.
Human activity on the earth

While it is known that humans have inhabited the earth for about half a million years, agriculture, the foundation of fixed settlements, was developed only twelve thousand years ago, and civilizations only date back to six thousand years or so. To apply the popular analogy of a 24 hour day to describe the span of human existence, agriculture would have come into existence at 11.56 p.m. and civilizations at 11.57. The development of modern societies would begin at 11.59 and 30 seconds, and all of the change that has formed the world, as we know it, has occurred in the last 30 seconds of this day of human existence (Giddens, 1997). This rate of change is readily demonstrated by the technological developments that have taken place. Giddens illustrates the point by recounting the observations of economic historian David Landes based on a celebrated study:

Modern technology produces not only more and faster; it turns out objects that could not have been produced under any circumstances by the craft methods of yesterday. The best Indian handspinner could not turn out yarn so fine and regular as that of the mule; all the forges in eighteenth-century Christendom could not have produced steel sheets so large, smooth and homogenous as those of a modern strip mill. Most important, modern technology has created things that could scarcely have been conceived in the pre-industrial era; the camera, the motor car, the aeroplane, the whole array of electronic devices from the radio to the high-speed computer, the nuclear power plant, and so on almost ad infinitum . . . The result has been an enormous increase in the output and variety of goods and services and this alone has changed man’s way of life more than anything since the discovery of fire: the Englishman [and, we might add, the Englishwoman] of 1750 was closer in material things to Caesar’s legionnaires than to his own great-grandchildren (Landes, 1969; cited by Giddens, 1997; p. 519).

The radical development in social and technological lifestyles that has evolved over the last two centuries is symptomatic of the ever-increasing speed at which change occurs, beyond the imagination of most and beyond control in the view of many.

This development has brought many benefits across a wide range of areas, but the cost has been enormous on many fronts, not least in terms of damage to the biosphere. The full realization of this cost is something that is beyond the reach of most people. Indeed there is a growing awareness that the extent and complexity of the damage
caused by human enterprise is so enormous that in most cases people refrain from examining it. It is overwhelming and can be depressing!

To contemplate the full range of problems would require a shift from a singular perspective to a more holistic view of the biosphere considering how each constituent part can affect the other. Such an adjustment would be worthwhile however, it could afford a theoretical position from where a gestalt of ideas could develop, a vision that might gain insight from the developing science of complexity. Peter Coveney and Roger Highfield (1996) described the science of complexity eloquently:

When viewed in profound close-up, the universe is an overwhelming and unimaginable number of particles dancing to a melody of fundamental forces. All about us and within us, molecules and atoms collide, vibrate, and spin. Gusts of nitrogen and oxygen molecules are drawn into our lungs with each breath we take. Lattices of atoms shake and jostle within the grains of sand between our toes. Armies of enzymes labor to turn chemicals into living energy for our cells. Yet we think of the universe as a single harmonious system or cosmos, as the Greeks called it. Now a new branch of science is attempting to demonstrate why the whole universe is greater than the sum of its many parts, and how all its components come together to produce overarching patterns. This effort to divine order in a chaotic cosmos is the new science of complexity. It is weaving remarkable connections between the many and varied efforts of researchers working at its frontiers, across an astonishingly wide range of disciplines (Coveney & Highfield, 1996; p. 5).

One step toward a more complex model of the chaotic state of human-environmental interaction is the notion of sustainability.

**Sustainability**

At the turn of the new millennium there is a general consensus that the notion of sustainability must become a key consideration in the development of all nations of the world. Sustainable Development, defined as *development which meets the needs of the present without compromising the ability of future generations to meet their own needs* (World Commission on Environment and Development, 1987), acknowledges the existence of limits to resources on the planet. In the face of the uncertain future of humanity, within the traditional modus operandi, sustainable
development is an increasingly common theme. As part of the current zeitgeist it has become a currency whereby ideas pertaining to ecological behavioural repertoires are exchanged.

Inherent in this is a view of preservation of resources for future generations and the notion that sustainable yields (the highest rate at which a renewable resource can be used without impairing or damaging its ability to be fully renewed) must become the overarching philosophy in all cost-gain analyses.

Eminent economist Herman Daly (1991; cited in Bechtel 1997) has stated three necessary conditions for sustainable development:

a) The use of renewable natural resources cannot exceed the rate at which renewable resources are developed.

b) The use of non-renewable resources also cannot exceed the rate at which they are developed.

c) Rates of pollution cannot exceed the assimilative capacity of the environment.

It would appear that traces of such ideas have begun to permeate western economic policy agendas. The nature of the global concern with economic development, personified in the OECD\(^3\), has begun to expand to include concepts such as 'human capital'\(^4\) into models of analysis. Integral to this notion of human capital is the link between personal well-being and the well-being of a nation. Even within the strict framework of economic analysis crude indicators like GDP\(^5\) have been judged insufficient and have now been enhanced by concepts such as subjective well-being and environmental quality in the analysis of overall well-being.

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\(^3\) OECD: Organisation for Economic Co-operation and Development, established in 1961 to promote economic development in its member countries. Ireland is among the 30 member countries, which include most of Europe, the United States, Japan, Korea, Australia and New Zealand (OECD, 2001).

\(^4\) Human capital represents the knowledge, skills and health of the individual, which together with 'social capital' (i.e. norms and networks facilitating co-operation within or between groups) impact on well-being. See Chapter 2 of The Well-being of Nations for more expansive definitions of these terms (OECD, 2001).

\(^5\) GDP: Gross Domestic Product, a standard economic measure of national prosperity.
Economic Growth and Well-Being

When considering the question ‘What is the relationship between economic growth and well-being?’ one might suggest a direct positive correlation, and indeed this appeared to be the case up until the 1980’s. However evidence from more recent surveys of public attitudes and quality of life, in particular the World Values Study, now refutes such an association. Beyond a certain threshold of income per capita, increases in subjective well-being diminish for higher income (Inglehart, 1977). Overall well-being\(^6\) is increasingly lagging behind growth in GDP in various OECD countries. Indeed, in the developed world economic growth is now yielding diminishing returns (Inglehart, 2000; Eckersley, 1998). A resulting view is that “…more attention needs to be paid to the quality of economic growth, taking account of any other changes in the physical or social environment which are linked to economic growth, and affect well-being” (OECD 2001, p.73). Among the main reasons for this divergence from earlier trends is environmental degradation\(^7\).

Shifting Paradigms

To understand how humans partake in this process of degradation requires consideration of their sense of connectivity with the environment. Paul Hawken (1993) suggests that we are living in the ‘latter days of industrialism and the beginning of an ecological age’. The zeitgeist of this ecological age facilitates a web-of-life analysis, making room for the notion of delicate but definite links between elements of the web, however not everybody has moved on to take this conceptual step. Outside the issue of overpopulation, the separation of modern societies from the

\(^6\) Overall well-being includes economic well-being but also extends to the enjoyment of civil liberties, relative freedom from crime, enjoyment of a clean environment and individual states of mental and physical health. However, difficulties exist in standardising operational measures. Measures referred to here pertain to both economic measures and other measures based on a wider range of social indicators (e.g. the Index of Sustainable Economic Welfare and the Fordham Index of Social Health). Subjective well-being appears to be synonymous with happiness, as the two terms are interchanged in the OECD (2001) report.

\(^7\) The other reasons mentioned in the report are increased relative poverty and income inequality in some OECD countries.
natural world is seen as a significant source of environmental problems. This separation has resulted in a society ignorant to the natural life cycles and secure in their belief that environmental problems are the concern of experts and scientists. In general, people do not see themselves as part of the natural world. Across recent generations, there has been a shift away from the earth. That the current process of production and distribution of food acts as a barrier to understanding the natural world is illustrated by this quote: “My grandfather had a farm, my father had a garden, all I’ve got is a tin opener” (Eco-friendly Enterprise, 1997; p.6). Many children living in our cities today have never seen vegetables growing and do not realise that a carrot has ‘leafy bits’ at the top (Madden, 2002). Their carrots come ‘sanitised’, pre-packed or frozen from a supermarket.

On the other hand, indigenous peoples’ belief systems and lifestyles are much closer to the earth (Burger 1990), a phenomenon reflected in their folklore. One such example comes from India: “Treat the Earth well: it was not given to you by your parents, it was loaned to you by your children. We do not inherit the Earth from our ancestors, we borrow it from our children” (Kemf, 1993). A variation of the same proverb has been attributed to East Africa, in Kenyan folklore “Care for the earth. It was loaned to you by your children” (Clinebell, 1996).

This latter perspective is consistent with the realisation of the fragility of the human relationship with the earth. Exemplified by the observation that “The whole of human endeavour rests on six inches of topsoil and the fact that it rains” (Eco-friendly Enterprise, 1997; p.8). Leading us to the sobering reflection that the collapse of many early civilisations, including those of ancient Greece and Rome, was due in large part to soil erosion (Lowdermilk, 1989). The current relevance of this observation, however, is pertinent to more than distant countries and other climates where vast tracts of virgin forests have been ripped up leaving the topsoil vulnerable to erosion. Soil erosion is also a reality in Ireland, for example where overgrazing of sheep can lead to bare unstable peat (Raferty, 1994).

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8 Mr. Patrick Madden is a primary school teacher in Dublin currently on secondment from the department of education he is expanding the school garden project that he initiated some years ago in his own school in the south inner city. During an interview with him on the subject he recounted the novelty of seeing vegetables fresh from the earth displayed by the children in his school. He also recalled how on a trip to the countryside some of these children did not recognise sheep as being distinct from dogs.
Yet, the dominant social paradigm in the majority of the world, including Ireland, continues to be one of environmental resource use rather than conservation. In Ireland although we enjoy a relatively clean environment, in the sense that heavy industrialisation has not featured in the economic development of the country, we see evidence of pollution emanating from various forms of human activity. According to the Environmental Protection Agency (EPA) the main environmental issues for concern in Ireland, as we embark on a new millennium, are:

- Eutrophication of inland waters
- Increasing amounts of waste being generated
- Deterioration of the urban environment and allied transport problems
- Our need to reduce emissions of greenhouse gases
- Depletion of natural resources

The authors of the Millennium Report assert that these problems are a product of increased economic activity of the last thirty years and mirror similar though earlier changes in other countries. However, the scale of the problems here is still considered moderate and, in general, the quality of the Irish environment remains relatively good and compares favourably with that of other European Union States (EPA, 2000).

From an alternative perspective however one might assert that we are performing very well in a game of ‘catch-up’. Air pollution is a definite issue of concern, particularly in the major cities. Landfill sites have become over used and the debate on disposal of rubbish and its effect on human health is a particularly hot topic, in the all types of popular media and the scientific, psychological (Gale, 1996) and medical literature (Fielder, Poon-King, Palmer, & Moss, 2000). That the ‘3-r’ national policy for reduction, re-use and recycling lacks cohesion is quite clear by the slight improvements observed in this area over the past decade or so (EPA, 1996, 2000). Evidence from the EPA indicates that water pollution in Ireland, like other European countries, is a growing problem, particularly in rural areas mainly as a result of intensive agricultural practice (EPA 1996, 2000). From such an alternative perspective Ireland does not enjoy a relatively clean environment.
This begs the question of the true nature of relativity. In a quote attributed to Albert Einstein\(^9\) we get one answer:

> Put your hand on a hot stove for a minute, and it seems like an hour. Sit with a pretty girl for an hour, and it seems like a minute. That's relativity.

This reflection tends to clarify the distinction between how a citizen might perceive the extent of environmental problems, as they cycle through the streets of the capital city during rush hour for example, and the view formulated by a state funded body, regarding the degree of pollution in Ireland.

Whichever perspective one might take, there is a growing awareness that these problems have reached a stage that critical thinking needs to be applied to their amelioration if not their solution. It is becoming clear that some of the fruits of economic development need to be diverted to this endeavour.

*Problems created by solutions*

Sometimes, however, solutions to environmental problems can be applied without consideration of the environmental health effects on individuals and populations (Pershagen, 1999). For example – the adjustments made to homes in Sweden to seal houses in order to increase energy efficiency has resulted in an increase in dust mites, this has health repercussions for individuals, in particular children. The same phenomenon has occurred with the increase in asthma as a consequence of particular ambient emissions from diesel and bio-mass (wood-burning) fuel consumption. One of the original visions for nuclear power plants was to reduce the drain on fossil fuel consumption, although some might say that this was a particularly naive view to take. Yet the predicted and actual implications for air pollution from nuclear power plants are well documented.

Such conflicts of interest are also apparent at a systemic level where the Kyoto Principle\textsuperscript{10} has come under severe criticism and there is a growing uneasiness among the larger players about the implications of meeting sustainable development targets.

So whose problem is it and what is the best approach to finding solutions?

\textit{Environmental Psychology}

Beneath the umbrella of sustainable development a multiplicity of interested parties have gathered to address the issues of concern. Traditionally the topic has rested within the realms of environmental sciences, including physics, chemistry, biology and agricultural science. However, given the social aspects of the problem it has also been a topic of interest in the social sciences. For example within the context of a discussion of Environmental Psychology, Veitch & Arkkelin (1995) had this to say:

> Recently there has been a renewed interest in human/environment relations. Worldwide concern regarding equitable management of natural resources, absolute increases in population and increases in population density, and changing technologies with their subsequent demands for additional energy (as well as the problems they create as a by-product) have coalesced to fuel this rejuvenated interest. Thinkers in these and related areas have laid the groundwork for the development of some rudimentary theories to account for human/environment relations (p.13).

Psychology as a discipline encompasses many different approaches, and has been described as "... a very large umbrella under which dramatically different theoretical assumptions and methodological practices co-exist ..." (Bonaiuto & Bonnes, 2000: p 67). From the 1960's writers within the discipline of Eco-philosophy and Eco-psychology have advocated the urgency with which intellectual energy needs to be applied to the area. The discipline of Environmental psychology has traditionally

\textsuperscript{10} Kyoto Principle: An international standard for sustainable development set by heads of state in Kyoto, Japan. Kyoto has human engineered aspects of the natural landscape (e.g. forest and dams) that stemmed the ecological crisis of the last century when deforestation resulted in flooding that stripped the topsoil with devastating consequences for the ecology of the area. A combination of Dutch engineering and Japanese practical and social knowledge reversed a potentially disastrous situation.
examined the issue within the context of behaviour-change models and Sociology has provided the basis for a broader perspective.

Bechtel (1997) classifies environment & behaviour (E&B) theories into four viewpoints:

- True E&B theories that see the connection as inseparable
- Person-in-environment theories that present the organism's responses as continuing across any environmental context
- Social psychological theories that focus on the social context of the individual
- Environment-on-the-person theories that examine the effect of the environment on a person

'Environmental determinism' encompasses one of the earliest concepts proposed, asserting that the environment causes all human behaviour. BF Skinner's behaviourism proposes this concept by asserting that all human behaviour is 'shaped' by the environment. Citing Lacey (1979) Bechtel reminds us that, contrary to common misconceptions regarding the consideration of psychological events within the behaviourist paradigm, "Skinner does not deny that there are inner events. Rather he maintains that they are fully functions of external forces" (p.6).

Often misclassified as deterministic, Ecological psychology, exemplified by Barker (1968), sees close links between behaviour and environment, and highlights the importance of ecological validity in experimental research (Behctel, 2000). This approach is more accurately classified as a transactional view, since the two elements are seen to interact each influencing the other. Ecological psychology emphasises the community context of behaviour.

Another essentially transactional view informs the systems of Post-occupancy Evaluation (POE’s) and Pre-design Research (PDR’s). These systems of quality

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11 POE: Post occupancy Evaluation. An evaluation of the design of a building in relation to the users' needs. Many of the early studies in Environment and Behaviour research were directed at changing architecture through the use of POE's. While the term POE has become universally accepted the
controls formulate a systematic approach whereby institutions or organisations become responsive to the environment. The POE’s and PDR systems - seen as a-theoretical - have a purpose. Their purpose is to enhance a behaviour-environment transaction.

More deeply rooted in the field of social psychology are theories about belief systems and their component beliefs, attitudes and values about the environment. Bechtel (1997), a proponent of ecological psychology, assert: “What has been found is that belief systems are largely inadequate for dealing with the environment or even most human situations. The goal here as well is to open the system up to more environmental inputs” (p. 543). The practice of de-contextualising behaviour from its social-political bedrock is just one problem resulting from this approach. Other problems lie within the methods used, for example, while presenting support for the utility of the theory of planned behaviour (Ajzen 1988, 1991), some writers would concur with Bechtel’s view, emphasizing the importance of reliable and compatible measures of attitude and behaviour (e.g. Stroebbe & Stroebe, 1995).

It remains however, that the sub-discipline Environmental psychology is multifaceted with applied and theoretical interests. The classic design comprised environmental conditions as independent variables, and individual responses as dependent variables, within the context of linear causal models. This paradigm however suffers from the same epistemological circularity of traditional psychology, elaborated on by Rom Harre (1989), and is open to further criticism because of its lack of systemic logic (Bronfenbrenner, 1979). More recently, social perspectives have permeated the discipline giving emphasis to the importance of the interface between the individual and the collective and social-cultural processes (Bonnes & Secchiaroli, 1995). The general view of embedding the individual in a social network has been increasingly advocated in cognitive and social psychology in recent years (e.g. Doise, 1982; Harre, 1980; Harre & Gillett, 1994; Moscovici, 1984; Still & Costall, 1991; cited in Bonnes

‘evaluation’ has also been called socio-physical technology, user needs, design research, and even human factors.

12 PDR: Pre-design Research. This research involves assimilation of POE reports on similar buildings with the aim of learning the profile of human needs so that the new building can be designed to take the findings into account. The actual practice of bringing PDR social science measures into building design remains as much an ideal as incorporating POE into routine architectural practice.
& Secchiaroli, 1995). This has implications for environment-behaviour studies, both in terms of theoretical argument and methods used to operationalise constructs and to gather and analyse data. For example, in a move away from the direct linear model Grob (1995) proposed and tested a structural model linking environmental awareness, emotions, personal-philosophical values, perceived control, and environmental behaviour. The strongest effect on environmental behaviour stemmed from personal-philosophical values and emotions, and 39% of the variance in environmental behaviour was explained by attitudinal components in the model.

In the area of environment-behaviour research theoretical expositions in favour of more socially, contextually, and culturally oriented approaches have also been numerous. While acknowledging this literature (e.g. Altman & Rogoff, 1987; Canter, Correia Jesuino, Soczka & Stephenson, 1988; Graumann & Kruse, 1990; Saegert & Winkel, 1990; Stokols, 1987; Wapner, 1987), Bonaiuto and Bonnes argue that there has been little transfer of the social psychology approaches that would “…offer a richer and more complex picture than that of the single individual reacting to a given environment on the basis of intra-individual cognitive processes.” (2000; p. 68). These authors contend, in particular, that the application of Identity Theories and Discourse Analysis are proving fertile new grounds for the mediating variables between people-environment relationships.

Together, these views represent healthy saplings, and indeed the recent focused attention on methodological difficulties in the discipline, including a questioning of the underlying assumptions of the discipline (Wapner & Demick et al., 2000) are certain to take root and eventually bear fruit. However, given the enormity of the research and the urgency with which solutions are needed, the question of generating research interest from outside the pale\textsuperscript{13} requires further consideration. One needs to identify the barriers that must be overcome before such a critical approach can be adopted in the mainstream of the environmental-behaviour research, and into the further reaches of more mainstream sub-disciplines within psychology and beyond.

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\textsuperscript{13} Formally defined as ‘Sphere of activity within which certain restrictions are applied’, in the present context we refer to the theoretical and methodological practices of the sub-discipline.
Barriers to Research

In general two potential barriers to research are low levels of funding and the presentation of the topic in such a way as to reduce its appeal to individual researchers.

In a recent comment on research priorities in environmental health, published in the British Medical Journal, Pershagen (1999) points out that while Environmental issues are often high up on the political agenda, environmental health aspects tend to receive a lower priority. In a foreboding tone he asserts that this amounts to a 'conflict of interest' and when this happens the result may have 'negative consequences for public health'. We must concur with the view that one way to prioritise environmental health issues is to increase research funding. When funding for basic research in a given area is limited the lions share will always flow toward those with vested interests, and the sum of collective energy will not reach the critical level required to make, what Thomas Kuhn (1970) calls, 'paradigm shifts'. The principles fundamental to environmental health are basic issues of sustainability and survival, and they have implications in all areas of academic and practical endeavour.

The fifth framework programme of the European Commission has recognised this, and placed more of a focus on environmental health research than earlier programmes. For example, the European Science Foundation, the World Health Organisation's European office, and the European Commission, submitted a collective document, outlining research needs in environment and health, to the intergovernmental Conference on Environment and Health in London, 1999. The aim of the document was to provide policymakers with scientific strategic elements for launching a European wide research effort in environment and health. Eleven research topics were identified and among these was 'Cognitive functions as mediators of environmental effects on health.' Evidence of the role of cognitive functions in risk perception is becoming more widespread, for example noticeably lower self-reported health scores were found in those who believed chromium to be harmful to health, and point to the potential importance of perception and possible anxiety (McCarron, 2000).
It is anticipated that prioritising these research topics will strengthen the scientific basis for decision making about environmental health effects in both the public and industrial sectors. The empirical study of risk perception and risk assessment has much ground to cover, a terrain with many paths requiring multidisciplinary and trans-disciplinary approaches and expertise in both basic and applied areas. Such collaboration between scientists in different disciplines offers a great potential for advancing risk assessment (Pershagen, 1999).

The relevance of psychology in this regard is suggested by one definition of environmental psychology as being a multidisciplinary behavioural science, both basic and applied in orientation, whose foci are the systematic interrelationships between the physical and social environments and individual human behaviour and experience (Veitch & Arkkelin 1995; p. 5). In the same volume, these authors note that there are limits arising from its multidisciplinary nature. It may be that such limitations have more to do with the traditional philosophy of reductionist methodologies however, and the multidisciplinary approach points the way to new territories, consistent with those being explored by the new science of complexity that we referred to earlier.

Exposition of a second possible barrier to research involves the relationship between 'fear appeals'\(^\text{14}\) and 'reactance'\(^\text{15}\). To begin with, it is fair to say that there has been considerable development in sociological aspects of environmental research. It is also apparent, however, that to a large degree the social sciences continue to struggle with the realization that environmental problems, which have been largely created by social beings, must be addressed by social scientific endeavour. This endeavour requires a thorough approach that will inspire confidence and engender research interest. However, there is a tendency to follow the approach apparent in the popular media, and to consider the issue of sustainable lifestyle creation only under the banner of crisis and sensationalism. This is inherent in the frequency with which terms like 'crisis', 'risk', 'disaster' is used in titles of book chapters and journal articles. For

\(^{14}\) 'Fear appeals' refer to the presentation of information in such a way as to heighten the sense of danger or threat associated with the content of the message.

\(^{15}\) Reactance is the rejection of over-forceful messages.
example, Anthony Giddens (1997), while urging his colleagues to focus attention on the topic in his book entitled *Sociology*, chose to discuss these issues under the chapter title ‘Global change and ecological crisis’, and Robert Bechtel (1997) penned a chapter entitled *The Environment will get you if you don’t watch out!* published as part of his volume *Environmental and Behaviour: An Introduction*. Another example is an article published in *Sociological Quarterly* entitled, *Captain Planet and the Planeteers: Kids, environmental crisis, and competing narratives of the new world order* (King, 1994). While it is understandable that the crisis analogy had utility when the general awareness was at low ebb, perhaps there is merit in the view that by couching the topic in such emotive terms a kind of reactance takes place.

*Crisis and Advocacy*

This use of threat orientations in mass communications has been widely used to engender compliant behaviour. Indeed religious leaders have been using fear appeals to achieve compliance with considerable success (Giddens, 1997), although some would argue that the rate of success is in decline. Fear or threat appeals are also the mainstay of most mass media health promotion campaigns (Stroebe & Stroebe, 1995). To a large extent fear-appeals have been the underlying philosophy of much of the earlier environmental advocacy material, and the traditional behaviourist paradigm has been the dominant backdrop against which behaviour change models have been designed. For example, a critical review of 54 reports of behavioural interventions designed to preserve the environment, published during the 1980’s (Dwyer, Leeming, Porter, Cobern & Jackson, 1993), points to the dominance of the behaviourist paradigm in the research, and the profusion of ‘consequence conditions’ (Geller & Berry et al., 1990) in the design of experiments. Yet, as far back as the early 1980’s questions were raised about the effectiveness of fear appeals as a vehicle for personal environmental advocacy.

In a wider arena, early studies provided broad support for the proposition that higher levels of threat lead to greater persuasion than lower levels (Sutton, 1987; Boster and Mongeau, 1984). The effect was even stronger for behavioural intentions than for actual behaviour, and links between intentions and behaviour have been found in a number of studies (e.g. Chu 1966; Rogers 1985). However, the lack of generalisability
outside laboratory settings has been noticed, and discussed within the context of dual-processing theories of attention. Within this theoretical framework Jepson and Chaiken (1990) demonstrated that with higher levels of fear the emotional tension disrupted people’s capacity for systematic processing (see Stroebe & Stroebe, 1995 and Stroebe, 2000; for a review of the topic in relation to health behaviours).

The effective use of stimulus-response design methods for environmental interventions was also variable. Indeed the conclusions of the Dwyer et al. 1995 review were that (a) antecedent conditions using commitment, demonstration, and goal-setting strategies were generally most effective in encouraging environmentally responsible behaviour, and (b) consequence conditions were effective in producing behaviour change only during the experiment's duration. In a similar vein, Clarke (1990, cited in Dwyer et al, 1995) observed, with respect to behaviour change interventions for injury control, that using extrinsic motivators only (i.e. rewards and penalties) can minimize long-term effectiveness because they impede the development of intrinsic controls (perhaps through some process like reactance).

However, some other important findings of the 1993 review were that (a) much of the research in this field during the 1980s did not directly compare interventions, (b) few meaningful follow-up measures were reported, and those evaluations that included follow-up assessment showed little maintenance of the behaviour changes, and (c) many potentially effective intervention strategies have been ignored (i.e., group interventions and penalties). Some practical progress has been made on foot of this type of research experience in terms of incorporating positive examples into public communications. For example, ‘10 Steps Toward a Better Environment’, is one of the current public information campaigns being fielded by the Department of the Environment in Ireland. The aim here is to use specific behaviour change as a vehicle to effect change in environmental consciousness.

**Environmental Consciousness**

Environmental consciousness is a topic that requires the benefit of a complex model for explanation and discussion. Definition of the term *environmental consciousness* has been the subject of scrutiny. Findings from cross-cultural research suggest the term should not to be understood in the same philosophical way as the single term
consciousness. It should be described as a natural tendency of human beings to behave and feel positively toward the environment (Kovac, Dockal & Matejik, 1993). This suggests that by engaging in lifestyles that deplete the resources of the biosphere beyond sustainable limits, humans are behaving against their natural tendency. Reflecting on the earlier remarks about relativity, not only is one’s notion of environmental degradation constructed within the direct experience of the environment, but also it appears that our psychological construction processes are also brought to bear on this very issue. In a study comparing the perceptions of people presented with the term ‘environmental’, the relative emphasis given to various facets of this cognitive structure was compared against subjects' scaled responses to a survey which measured commitment to dominant and emergent environmental beliefs. A series of correlations suggested that our responses to advocacy might be significantly grounded in the complexity of our thoughts about environmental terms and our allegiance to widespread cultural paradigms (Cantrill & Chimovitz, 1993). Together these studies suggest that environmental consciousness is constructed within a psycho-social context, that we have a natural tendency to feel positively toward the environment, and our perception of environmental degradation is therefore a very individual matter.
Stern and colleagues (Stern, Dietz & Guagnano, 1995) presented a socio-cultural model of environmental concern (see Figure 1.1).

![Schematic Causal Model of environmental concern](source: Stern et al., 1995; Figure 1)

The assumption was that the major flow of causation is from top to bottom, with adjacent variables having the strongest causal effects and nonadjacent variables also having the ability to directly influence each other. No provision for reciprocal relationships between variables or differential levels of influence has been included in the scheme however.

The approach taken by such socio-ecological models is that individuals are embedded in a social structure that influences psychological variables in two ways. Early experience is shaped by the social structure and thus an individual’s values and
general beliefs or worldview is influenced. A second mechanism is the provision of opportunities and constraints that shape behaviour and the perceived response to behaviour (Guagnano, Stern & Dietz, 1995). Stern and colleagues (1995) argue that values and worldview are causally antecedent to more specific beliefs, which in turn influence personally held norms, intentions, and other proximate causes of particular actions.

Threat Perception and Environmental Behaviour

One such specific belief, which may be incorporated into a socio-ecological model of environmental concern, relates to the potential harm to the person from hazards in the environment. Personal environmental threat perception is thought to be associated with increased participation in pro-ecological behaviours. The premise of the argument is that when one feels that environmental hazards pose a threat to health then one is motivated to act. Indeed there has been some empirical support for this view. When Californian adults were surveyed (Baldassare & Katz, 1992) on personal environmental threat (PET) associated with environmental problems, those who perceived that environmental problems pose a very serious threat to their health and well-being, were more likely to engage in environmental practices, specifically recycling, conserving water, buying environmentally safe products, and limiting their driving. While highest among younger participants, women, Liberals, and Democrats, PET was a better predictor of overall environmental practices than were demographic variables or political factors. While this finding is useful in expanding the vista of relevant variables required in a comprehensive model, it appears to contradict the findings regarding the in-effectiveness of fear appeals. The contradiction may lie at a theoretical level or it may lie at the level of measurement, further research is needed to clarify the issue. Another line of research regarding the relationship between cognition and environmental behaviour has addressed the influence of environmental education.
Two perspectives have addressed the issue of how education effects change in children’s thinking about the environment. The more recent approach has focused on children’s understanding of how the environment operates (Sheehy, Wylie, McGuinness & Orchard, 2000; Wylie, Sheehy, McGuinness & Orchard, 1998). This perspective addresses the lack of attention to the cognitive capabilities of children, proposing a systems theory approach when environmental education is being planned and delivered (Wylie et al., 1996). The second approach places more emphasis on what children know about the environment. Within this genre, many of the environmental education studies since 1974 designed to demonstrate changes in environmentally relevant knowledge, attitudes, or behaviours have suffered from methodological difficulties (Leeming & Dwyer et al., 1993). Particular weaknesses, in both ‘in-class’ and ‘out-of-class’ programs, have concerned designs that did not include meaningful control groups, control for expectancy effects, use reliable and valid dependent measures, or collect follow-up data. No study looked at strategies for getting children to encourage behaviour change in others (e.g. their parents). Horsley’s (1977) finding with college students suggests this is a potentially fruitful area for research. Bryant and Hungerford (1979) found positive results with kindergarten children, and Geller (1989) demonstrated in a study on safety belt use, that even very young children can act as agents of change. Very little work has been done however with young children and the effects of environmental education, notwithstanding the research of Wylie and her colleagues already mentioned. Addressing some of the methodological difficulties in the area, Leeming & Porter, et al., (1995) examined the effects of participation in class activities on children's environmental attitudes and knowledge, and their potential as agents of change. In North America, ‘The Caretaker Classroom Program’ was initiated by the major newspaper of a large, mid southern city, to encourage elementary school classes to engage in pro-environmental activities. The results indicated that the Caretaker program had a significant positive effect on attitude toward the environment, but did not influence knowledge of environmental issues. Additionally, children rated by their teachers as most interested in the activities, showed greater increases in pro-environmental attitudes than those rated least interested. The parents of the Caretaker children also displayed
significantly more pro-environmental behaviours after their children's activities than did parents of control children, indicating that the children influenced their parents.

Another fascinating intervention to increase earth-friendly behaviours, this time in south America, which has made a real difference to the lives of people living in the Favelas of Curitiba, Sao Paulo in Brazil where re-cycling is now common (Moore 1994; cited in Bechtel, 1997). Three quarters of the paper, one half of the metal, glass and plastics are recycled. There has been a 50% reduction in the volume of waste going to landfill as a result of the recycling scheme. There have also been positive changes in use of public transport and forestry practices. Part of the success in recycling may be attributed to the strategy of recruiting children in schools to instruct parents on how to recycle.

So, children have moved into the spotlight when it comes to environmental education. The belief is that given the greater plasticity of their attitudes children a worthwhile target group, and these young people are tomorrow's adults. While young children are an important group, so too are adolescents. During the adolescent years there is a particular emphasis on moral and social development that makes the school a particularly effective milieu for attitude change in respect to environmental issues. The propensity of this view is evidenced by the number of interventions designed for children – one such program, targeting adolescents, developed in Ireland, was the Eco-friendly Enterprise Project. Initiated in 1996 “...to promote linkages between the practical teaching of environmental literacy in educational and training programmes and the attempts within local and regional areas to develop new and more environmentally sustainable enterprises” (Eco-friendly Enterprise, 1997; p. iii). Sponsored by the Curriculum Development Unit of the City of Dublin Vocational Education Committee, and the National Resource Development Centre of Trinity College, Dublin, the project was co-funded by the EU. Other partners included: The Keelogue Institute, Wexford; The Colin Glen Trust, Belfast; and the Thessalonica Agricultural and Industrial Institute in Greece. The aims of the project were to produce and test the use of an educational manual that included practical projects concerned with environmental impacts of enterprise, and to establish a network of schools and centres, which could be used for environmental studies. The philosophy of this project represented an inclusive approach to environmental education and
advocacy that had a genesis in multiple disciplines and held potential for practical impacts across student and enterprise populations.

The generation and implementation of programs to increase environmental literacy is desirable, but the means by which this goal is achieved require careful consideration. As we have already illustrated, increasing threat-related knowledge may have negative effects on generation of earth-friendly behaviours. While the arguments against the 'fear-appeals' approach have generally been couched in terms of the behavioural context of reactance, resistance and repression. Implications of such methods for personal well-being have not received substantial empirical attention, and the consideration of personal well-being has generally been reserved for the study of impacts of the physical environment on the person (e.g. Clay, 2001). Yet, in terms of the conceptual space between sustainable lifestyles and healthy lifestyles there is a considerable wilderness. That wilderness has potential for the provision of an ecological space wherein all living species can experience mutual benefit from the homosapien species adopting a more pro-ecological worldview that acknowledges the inherent connectedness between species. Such a worldview has come to be known as a new ecological paradigm, NEP{superscript}{16} (Dunlap, Van Liere & Mertig et al., 1992).

Incorporating such a philosophy into one's lifestyle involves a change in personal levels of environmental concern.

_Evironmental Concern and Psychological Stress_

There are however apparent associations between environmental concern and psychological stress. Reports in the psychiatric literature illustrate how modern ecological threats may manifest themselves in paranoid developments. The mysterious and invisible nature, of such ecological influences, makes them likely to be adapted into delusional systems (Stark & Andresen, 1994), and hypochondriac beliefs (Barocka, Kalb, Triebig & Schiele, 1994). With increasing public interest in

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{superscript}{16} NEP: The new ecological paradigm is a development of the earlier ‘New Environmental Paradigm’ (Dunlap & Van Liere, 1987), which incorporates developments in ecological philosophy and avoids gender-biased language. The NEP incorporates a 'web-of-life' philosophy. Such perspectives contend that all species living on the planet are inter-related and the earth’s biosphere responds to the dynamics resulting from such interactions between the species.
environmental issues (Dunlap & Van Liere, 1978; Morrison, 1986, Freudenburg, 1991; cited in Davidson & Freudenburg, 1996), increasing perceptions of dangers from environmental pollution (Barocka et al., 1994), and a shift toward a more environmentalist ideology (Dunlap, 1993), the question of the impact of such awareness on psychological well-being in non-psychiatric populations arises. For example, over the past two decades growing public awareness of environmental change has been principally concerned with the impact of such change on human health and development and the quality of life enjoyed by inhabitants of planet earth (Stokols, 1992).

Personal Responses to Environmental Threats

The ways in which individuals respond to the perception of environmental hazards are as numerous as the hazards themselves. While some efforts toward classification of hazards have taken place (cf. Walsh-Daneshmandi & MacLachlan, 2000), less focus has been brought to bear on the reaction to such hazards. A notable exception has been in the work of Robert Bechtel. Remarking on the profusion of environmental threats he has set out a series of reactions asserting “...sooner or later, any individual must come to grips with the following personal responses” (Bechtel 1997; p.39):

- **Shock and dismay:** a sense of overwhelming problems with no escape; ‘a true response to a true condition’.
- **Anger and outrage:** asking questions about how problems arose and who is to blame.
- **Feeling trapped:** a feeling of being trapped within the polluted planet, sometimes contributed to by a paranoid fear of conspiracy or intentional pollution (e.g. politicians have done this to us).
- **Feeling stupid:** a realization of the short-sightedness of human beings when they use products that cause pollution.
- **Disbelief and denial:** an attempt to ease the discomfort caused by conscious awareness of the magnitude of environmental pollution threats.
- **Hopelessness:** a response that involves the “What can one person do?” reaction that is reinforced by both the weight of evidence and the inertia in public bodies to tackle the problems in any meaningful way.
- **Resolution to action:** engaging in positive action to save life is a mature response to a threat to your life.
Advocating pro-activity to be less stressful, in the long-term, than denial of the magnitude of the problem, Bechtel specifies examples of such pro-activity:

- Engage in every day energy conservation behaviours, (e.g. saving water while brushing teeth), which have low individual impact but significant cumulative impact.
- Vote for candidates that have a pro-environmental manifesto. Legislative action is effective in cleaning the environment.
- Join an environmental action group.
- Examine environmental philosophy by considering the basis of human survival on the planet.

This approach emphasises the transactional nature of behaviour, attitude change, and a shift in worldview. While this response process presents an attractive theoretical framework, for occupants of the western world at any rate, no empirical work has tested the utility of such taxonomy to describe the process involved in changing one's worldview.

**Worldviews**

The term *world-view* holds different meanings in different contexts. For example in a discussion of global politics, issues relating to human-environment relationships would receive little attention. Here, we define world-view in terms of how one perceives their environment and how they are related or connected to that environment. By environment, in this context, we mean the natural and built environments that constitute the biosphere. Perception of the world is a dynamic process with transactions between the human and the environment contributing to a world-view that evolves through experience. Such experience is interpreted at both cognitive and affective levels. Indeed current directions in neurobiology lend weight to the idea that we cannot reason without emotion “...emotion is an inextricable component of the nature of being rational ...” (Damasio, 1998; p. 69). A leading researcher in the neural basis of cognition, Antonio Damasio contends the role of emotion in situations that concern personal and social matters are “frequently linked to punishment and reward, and thus to pain, pleasure, and to the regulation of homeostatic states, including the part of the regulation that is expressed by emotion and feeling.” (ibid.).
Within such a theoretical framework it is possible that the justification of consistently exploiting natural resources for human use, exemplified by the Human Exemptionalist Paradigm (HEP\textsuperscript{17}), is consistent with an ethical value system that results from the avoidance of punishment principle predominant in our society (Piaget, 1932).

In such a world-view, one regales against the principles of thinking globally and acting locally because they still see humans as being outside nature's influence.

The same argument holds when a contrasting approach to 'shaping' behaviour is taken. For example while Jean Piaget (1932) described avoidance of punishment as the typical modus operandi in our 'Western' society, Maria Montessori (1964) emphasised that mistakes must not be noticed, let alone punished. This alternative approach is closer to practices observed in other cultural paradigms. One such example, recently recounted in the literature, were child-rearing practices in North American Shawnee society, described earlier by Eckert (1992). This society operated on the basis of praise for desired behaviour, and the accepted reaction to 'bad' behaviour was a statement of disappointment, and hope for the behaviour not to be repeated. "Oh, how sad I am that my child has done this bad thing. I truly hope he will never do it again" (Bechtel, 1997; p.53).

Once again, the pain-pleasure principle is directly associated with social rules set to educate the young people in their society. Perhaps this social etiquette is influential in formulating the traditional ecological worldview of indigenous peoples. Such a worldview is more consistent with the NEP in Western society, wherein interconnections between humans and other species in the biosphere are respected.

Within this context, to effect change in worldviews requires a shift at a fundamental level of environmental concern. Some theorists believe that the foundations of such concern begin in childhood, while others contend that we have an innate attraction to nature.

\textsuperscript{17} HEP: Human Exemptionalist Paradigm (Dunlap & Van Liere, 1978) incorporates the view that the planet essentially exists to be exploited by humans.
Biophilia Hypothesis

This latter view formulated as the *biophilia hypothesis*, coined by Wilson (1984), which asserts that humans have an inherent attraction toward the natural environment, has been subject to much scrutiny receiving criticism and support (Kahn, 1999). Indeed, Kahn argues that this evolutionary account is supported by the large body of research on environmental aesthetics, citing Rachel and Stephen Kaplan’s published between 1973 and 1992, showing a general human preference for natural environments over built environments both in terms of quality and quantity. Consistent with these findings, Brierley (1997) shows that natural places are high preference choices, across cultures, when it comes to specifying favourite places. Overall, 61% of the participants in her study; from Senegal, Ireland, and the United States, identified some part of the natural environment as a choice preference. As Kahn concludes from a related research review (Ulrich, 1993), this cross-cultural similarity is well established.

Notwithstanding the preference for the ‘actual environment’, in many different cultures it seems, exposure to natural environments need not be in terms of direct psycho-physical experience. The conclusion of a review of the aesthetics of environment literature was the finding that natural environments reduce stress and foster better health (Bechtel, 1997). A similar conclusion was reached by Kahn, (1999), when he reviewed the research, of Ulrich and various colleagues, spanning a decade. Demonstrating, by reference, how patients exposed to a view of trees, recovered from surgery faster than patients, with the same condition in the same hospital, exposed to a view of a brick wall (Ulrich, 1984). Drawing on a review by the same author (Ulrich, 1993) Kahn draws the implication that exposure to things natural has psychological benefits also. Focusing our attention on an interesting study, on environmental aesthetics. That retrospective review of hospital records, over a 15-year period, of complaints from patients in a psychiatric hospital, regarding ‘art work’ displayed there. On seven different occasions patients physically attacked the pictures and in each case these were substantially abstract compositions. No instances of damage to nature compositions were observed This lack of aversion to nature-art was
consistent with Ulrich’s report that short-term psychiatric patients responded well to art depicting rural landscapes or a vase of flowers, but showed a tendency towards negative reaction to abstract pictures with ambiguous or unintelligible content. No mention is made of possible confounding factors in this single case study. Yet Kahn presents a compelling argument.

Another interesting parallel proposition, is the notion of predisposed selection for landscape, in terms of human survival and reproductive success, is augmented by the suggestion that such a selection would nurture the human physiology and promote a sense of emotional well-being. Findings from more than 100 studies, employing various research techniques, have shown that stress reduction is a key perceived benefit of spending time in a wilderness area, especially in settings that resemble the savannah (Ulrich, 1993; cited in Kahn, 1999). Thus, Ulrich (1993) has “… extended the [biophilia] hypothesis from merely a preference for natural environments to a restorative response” (Bechtel, 1997; p. 419). Bechtel shows how this restorative effect has also been observed within a controlled setting. After watching a stressful movie, viewing video footage of natural settings has been shown to be more restorative than exposure to footage of urban settings (Ulrich et al., 1991). Further, the ‘room with a view’ type studies, already described, that showed the positive effects in hospitals (Ulrich, 1984), were found also in studies conducted in prisons (Ulrich, 1993), and indicating shorter post-operative recovery times, and potential protective health benefits, respectively, of exposure to actual natural views and even pictures of natural view (Ulrich & Lunden, 1990).

Perhaps Bechtel’s quote from the Kaplan and Kaplan (1989) review most eloquently states the generality of findings:

“… immediate outcomes of contacts with nearby nature include enjoyment, relaxation, and lowered stress levels. In addition, the research results indicated that physical well-being is affected by such contacts. People with access to nearby natural settings have been found to be healthier than other individuals. The longer-term indirect impacts also include increased levels of satisfaction with one’s home, one’s job, and with life in general” (p.173; cited in Bechtel, 1997).
The restorative effect of 'nature' has also been observed with children, in both disadvantaged and middle class settings. Research on Attention Deficit Hyperactivity Disorder symptoms, conducted at the University of Illinois, has demonstrated positive effects for children in middle class areas. Increased capacity for paying attention, and greater ability to delay gratification and inhibit impulses was also found, in children living closer to a green spot (i.e. a tree or small patch of grass), when compared to other children in the same housing complex, living in buildings that were surrounded by barren concrete (Clay, 2001).

While such findings are impressive, there is a further body of research that suggests a complexity in the eco-phenomenon eschewed by this work. Drawing on examples of observation research, conducted in playground settings, suggested that children display a preference for paved versus natural areas (Aiello, Gordon & Farrell, 1974; Marcus, 1974), Bechtel points out that at first glance, this seems to contradict the biophilia hypothesis. But paved areas facilitate the use of bicycles, skates etc., and parents are afraid of natural areas (Bechtel, 1997). However this fear of natural areas may be gender based. Work, from a Doctoral thesis examining the understanding of person-environment relationships in contemporary Australians, would suggest that women were not portrayed as being associated with nature, but as being afraid of it. Also of interest, in terms of gender difference, the same participants' memories of their childhood experiences in nature, and of who had influenced them in their relationship with nature, were focused around their fathers and other significant male figures (Bragg, 1997). Given the socialization influence that women have on children, one might suggest a poor outcome for efforts at increasing communion with nature, if children are discouraged from engaging with nature. This also runs counter to the eco-philosophy view that females are more aligned with nature than males, reflected in feminine depictions of nature literature. But as any good gardener will tell you, there is balance in nature.

Indeed, an additional finding from the data was that women were not more likely to experience their 'ecological selves' (being part of nature) than men. This justifies retaining the ecofeminist position, that caring about nature is an essential motivator of environmental action, and makes room for the proposition that men are the protagonists when it comes to developing ecological beliefs.
This simplistic approach fails to resonate until the 'parental role', positing influence of economic aspects in gendered environmental concern (Davidson & Freudenburg, 1996), reminds us of the need for a more holistic approach to the question. Thus, it appears that the issue of gender in determining environmental risk perception is rather complex. We will delve a little deeper into the broader aspects of environmental risk perception in Chapter 2. But let us return to this introduction to the complexity of eco-philosophy.

**Gender Difference in Environmental Concern**

Based on the general environmental attitude literature, a more environmentalist worldview should be inversely related to age, and directly associated with education, income, living in more urban areas, and being male (Arcury & Christianson, 1990). A contemporary review, of the literature on Gender and Environmental Risk Concerns, suggests however that, in some situations women report higher levels of concern toward technology and the environment than do men (Davidson & Freudenburg, 1996). The gender gap is most apparent when risk of contamination from local or nuclear facilities is an issue, while broader perspectives on environmental concern are less diverse. The proposition that increasing knowledge can decrease concern has been consistently refuted. On the other hand, the tendency for women to express greater concern about health and safety aspects of technological risk has been consistently supported. Similar to gender difference research in the broader psychological literature, findings represent a confusing picture at times with general weaknesses apparent at the level of theory and method.

According to Davidson & Freudenburg (1996) the growing body of research on gender differences in environmental risk concern has three principal limitations. Firstly, there has been a separation between the empirical or case study literature, and the theoretical literature, in particular the literature involving gender and feminist scholarship. This schism between the empirical and theoretical perspectives of gender difference reflects a more general situation in the area of environmental risk perception (Cantrill, 1995). Secondly, there has been little research to examine the underlying reasons behind the tendency for women to express greater levels of
concern than do men. Thirdly, there has been a consistent lack of cohesiveness within the research area, and a failure by authors to draw systematic comparisons with other findings. “Research needs to examine hypotheses across a wide range of social and economic groups, devoting much greater attention both to analytic specificity and to the multivariate testing of hypotheses” (Davidson & Freudenburg, 1996; p.329).

In their contemporary review, Bord & O'Connor (1997) conclude that the driving force behind gender differences in environmental concern, observed in most surveys, is differences in perceived vulnerability to risks from the environment, rather than differences in ecological sensibilities. This takes us back to perception of environmental risk. Citing examples from a range of potential hazards: including perception of health-risk from AIDS and more general health topics, fear of crime and violence, and risk from environmental hazards; they claim that methodological confounds might explain the gender difference. In surveys, which include items triggering risk perceptions, including environmental risk, women express more concern than men. The responses are more homogenous for females showing less variation (lower SD). They conclude, that survey results, from national surveys, which show gender differences on specific risk issues, can ‘be construed as communication events’ in which respondents who feel vulnerable answer in ways that send messages to policymakers. As Bord & O'Connor remind us, survey situations are ‘fundamentally interactive events’. Accordingly, there is an assumption or hope among respondents that their answers will affect policy. From this position respondents who feel more vulnerable to risk (women) will indicate higher levels of concern, in the hope that policymakers will take action to reduce the risk alluded to in the survey items.

Once again, this indicates the complexity associated with defining determinants of ecological concern. As we have already remarked, the importance of gender in determining concern, and subsequent environmental behaviour, is however undermined when isolated from the social context.
Determinants of Environmentally Responsible Behaviours

Berger (1997) indicates that socio-economic and demographic variables play an important role as antecedents to environmentally responsible behaviours such as recycling. Size of residential area, type of dwelling, education, and income are significant determinants of whether recycling facilities are available and used. Furthermore, having convenient access to a recycling program mediates the relationship between socio-economic factors and recycling practice. Analyses also show that environmental behaviours are structured around specific environmental issues such as water, energy, or waste disposal and suggest that recycling may operate as a first step toward the adoption of other behaviours. The implications of these results for activists and policy makers are important, in the context of empowerment.

Stress and Control

Environmental factors play a substantial role in the experience of stress also. Langer (1983) in her classic experiment in a nursing home for elderly people demonstrated how the experimental group, having control over their environment, lived longer, were healthier and happier. Karasek & Theorell (1990) found that workers with least control over their environments were least healthy. Environmental factors however, require a broad definition, extending to include perceptions of the environment at a larger scale. In this respect, the mediating effect of control has also been examined within the research on Hardiness. One of the three constituents of the hardness construct, proposed by Kobasa (1979), in this representation control refers to people’s belief that they can influence events in their lives. Having a ‘coherent view’ of the universe is one of the ways people exercise control over their lives (Antonovsky, 1979). We all operate within belief systems that are socially reinforced, and often independent of environmental influence (Bechtel, 1997). Those who espouse the HEP, are suspicious of any attempt to conserve natural resources, and such a belief system is very difficult to penetrate. Part of the social reinforcement strategy is to align oneself with complimentary views. For example, HEP supporters tend to hold more conservative political views. Yet adherence to such a worldview does not preclude earth-friendly behaviour. However, this may be somewhat unsophisticated
view, for example Bragg (1997) found that much environmental action was motivated by ‘stewardship’, a dualistic philosophy wherein humans are morally responsible to care for the non-human world. Increases in environmental action were not affected by experiences of the ‘ecological self’. Such constructs had much less association with actual behaviour than with pure feelings.

One implication from these findings is that belief systems can include seemingly contradictory elements and the effect of such beliefs operates at an emotional level rather than influencing behaviour. If this is the case then our question of the psychological impact of evidence that challenges one’s belief system, that is the increase in environmental consciousness and concern about environmental degradation, at both individual and societal levels, becomes all the more relevant.

Measuring ‘Health’

If there are tangible links between stress evoked from environmental consciousness and health, then the issue of a definition of health is a necessary consideration. Health and well being are, in the first instance, generally conceptualised in terms of biological functioning. For example, Veenhoven draws a comparison between humans and plants and other animals when he claims that “… the flourishing of humans can be judged by their bio-physiological functioning, in other words by their ‘health’ ” (2000; p117). The interpretation of such constructs as ‘health’ and ‘illness’ has been variable over time and can depend on the viewpoint of the perceiver. In general however, health is seen to be a composite of physical and psychological elements.

Physical Health

Physical health is generally defined in two ways, the absence of disease or impairment, and the presence of signs of good functioning, such as energy or resilience. Early theoretical models of disease, grounded in biomedical perspectives and dominant in the literature for several centuries (Engell 1977), were defined by objective identifiable biological causes being the only possible considerations. Developments in theory have now lead to a broader representation, which
incorporates psychosocial factors. In contrast to the earlier linear approaches in the behavioural medical model (Lovallo, 1997), interaction between variables facilitated a shift toward a view of health and illness as a recursive process, as opposed to a cause-effect, end state representation. Such ecological models maintain that biological, psychological and social factors are all important determinants of health and illness. The impact of behaviour on health, for example, has received considerable attention (Stroebe & Stroebe, 1995). One result has been the refinement of early, purely physical, prescriptions for health promoting behaviours (Belloc & Breslow, 1965; cited in Stroebe & Stroebe, 1995), to include psychosocial perspectives (e.g. developing an optimistic outlook and supportive friendships) alongside the more traditional physical domains focusing on areas such as diet and exercise (e.g. MacLachlan, 1997; Zimbardo et al, 1995).

Mental Health

Another perspective on health comes from consideration of ‘socio-psychological’ functioning, commonly referred to as ‘mental health’. This term has been historically associated with a medical model, in particular with the absence of psychiatric symptoms that impede the ‘normal’ functioning of an individual in society. Groups like the Mental Health Association of Ireland have grown largely from the direct experience of attempts to redress the manifold problems associated with ‘mental illness’ and their aims include education programs to reduce the social stigmatisation of people using the psychiatric services. While it is not appropriate to expand further on this topic in the present context, it is important to remark that the route by which people become users of these services has many twists and turns, but in the main, the issue is one of mental-illness rather than mental health. The operationalisation of this construct has been problematic however, and the shifting sands of psychiatric diagnostic parameters have been amply addressed in the volume of literature on the topic, not least by the several revisions of diagnostic criteria specified for use in the US (DSM IV \(^\text{18}\)) and Europe (ICD 10 \(^\text{19}\)).

Even within the context of studies on mental health the data tends to focus on ‘negative’ mental health and is predominantly concerned with ‘cures’ rather than adjusting to disturbance (Veenhoven, 2000). Further, the vague manner in which the global term ‘mental health’ has been used, the tendency to treat it as a single variable, and the generalisation between categories of illness is conceptually flawed (Freeman, 1998). One possible way to address some of these issues is to employ the notion of Psychological distress, which may be a more appropriate term to describe mental health in the general population. Several measures have been developed for survey research in the area. One such measure is the General Health Questionnaire. The approach taken in the development of this measure was to provide a means of enquiry into many facets of the psychological functioning of the person, based on self-reports.

*Life Appraisal*

Another approach to assessment of how well humans are ‘thriving’ is to make inferences from their appraisals of life. Appraisal can be assessed either directly by asking how they feel about their lives or indirectly by inferring from their behaviours. Social scientists have generally preferred the former method but the latter approach has been used widely and one could say that the two together provide an enhanced view (Veenhoven, 2000). Direct appraisal of satisfaction with life involves information from two sources, cognitive comparison between ‘life as it is’ and ‘how life should be’ (contentment) and an estimate of our general affective experience of life (hedonic level of affect). Such affective appraisals are highly indicative of quality-of-life, with positive affect being synonymous with good adaptation. Enjoying increasing support, this affective approach assumes that we infer happiness from how we feel in general; feeling fine is interpreted as being satisfied with life. Unlike conscious comparisons between ideal and actual life situations, affects are “… largely unreasoned experiences, that probably signal the degree to which basic needs are met” (Veenhoven 2000, p 125).

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19 ICD 10: Tenth edition of the International Classification of Diseases. Psychological problems are classified in Chapter 5 of this system (World Health Organization, 1992; ibid) and a multi-axial version is available for the classification of child and adolescent psychological problems (World Health Organization, 1996; ibid). The ICD-10 is not exclusively European, it is the measure used for statistical data on all diseases in the United Nations countries (Carr, 1999).
Self-reported Appraisal of Happiness

Unlike higher animals humans can, on reflection of experiences in their lives, make cognitive judgements and communicate these views to others. While self-reports are open to distortion in various ways the most commonly used measures have inbuilt checks and balances to afford reasonably valid and reliable estimates. A range of questions has been developed for the measurement of self-reports of happiness. The most common item has been the single question; *Taking all together, how happy would you say you are?*; with responses for the options of ‘very happy’, ‘fairly happy’, ‘not too happy’ or ‘not at all happy’; and another variation of the question focuses on how satisfied one is with one’s life-as-a-whole (Veenhoven, 2000). However, the principles of psychometrics indicate that the more robust measures of constructs contain more than one item. According to Veenhoven, in contrast to the single item measure, the ten-item Affect Balance Scale (Bradburn 1969) has also been used successfully to measure happiness at the hedonic level. Beyond this direct approach, happiness can also be inferred from behaviour.

*Behavioural Manifestations of Malaise*

Behavioural responses to environmental stressors are common to plants, animals and humans. In humans such responses can be affect-driven or subconscious. In the presence of such stressors plants show visible signs of malaise by lack of growth or susceptibility to infestation by insects, and if the situation becomes sufficiently severe the plant will die. In animals migration can be sometimes seen as discomfort in an earlier habitat, and aggression and self-infliction are used as indicators of despair in captive animals. Despair in humans can manifest in various maladaptive behaviours such as drug abuse, aggression and excessive risk-taking, but also in non-offensive behaviours such as social withdrawal. The most extreme indicator of personal despair is suicide and, in a tradition dating back to Durkheim (1897; cited in Veenhoven, 2000), suicide rates have often been used as an indicator of quality-of-life in nations. Indeed the continuous rise of suicide in Western nations in the 20th century has been interpreted as a marker of reduced quality-of-life since the onset of modernisation (ibid). While there is certainly some merit in connecting increased suicide rates and reduction in quality-of-life, the approach is, of course, open to many criticisms.
including issues of cultural differences in morality, the effects of modern medical technology, and variations in recording procedures. Less severe indications of the psychological health impacts of environmental stress can be seen in anti-social behaviours. One time in life when this is particularly important is adolescence, and in adolescents such indicators can be linked to self-esteem.

*Self-Esteem as an Indicator of Health*

Self-esteem is a complex construct, which assessed within a clinical setting has sometimes been used as a predictor of psychological distress, however several important criticisms have been proffered against the use of self-esteem to interpret mental-health problems (Damon & Hart, 1991). The problems with this approach are discussed in more detail in Chapter 4 of this volume. Nonetheless, certain approaches to the use of self-concept, particularly in children and adolescents, have employed what Wylie (1974) calls a phenomenological view of self-attitudes reflecting both description and evaluation of one’s own behaviour and attributes. Within such a definition reductions in self-esteem can be detected in behavioural manifestations. This conceptualisation of self-concept as an outcome measure has been widely used, in particular within educational settings where behavioural manifestations can impede social function within the milieu of the school. It may well be fruitful then to explore the relationship between elements of self-concept and views regarding environmental degradation.

*Eco-systems*

Any consideration of these phenomena, however, requires an ecological approach and one such framework is Urie Bronfenbrenner’s (1979) systems approach. This framework can also be applied to the development of environmental consciousness. For example, to examine environmental concern in adolescents, within such a schema, the macrosystem would represent national and international patterns of culture, politics and economic considerations of environmental consciousness. The exosystem
would represent neighbourhood eco-practices (participation in neighbourhood schemes like ‘tidy towns’, tolerance of eco-destruction behaviours such as littering, graffiti etc.), eco-facilities (recycling facilities, car pooling etc.), and media representations (e.g. tone of environmental coverage in television and radio communications). The mesosystem would represent the level of communication between the individual and the family (e.g. waste separation roles within the family, family members being involved with school based environmental projects). The microsystem constitutes the family (eco-consciousness within the family), class (at both economic and political levels), and peer group. Consideration of such levels help anchor both the design of empirical studies and the discussion of findings from empirical examination of the detail within links between environmental considerations and well-being.

1.2 AIMS OF THE PROJECT

Motivating factors:

One conclusion of the literature reviewed above is the predominance of crisis analogies within the genre of environmental awareness research. What is also clear is the contingency for reactance and resistance that such approaches may engender. The research also indicates that the context of environmental advocacy is best depicted within an ecological framework, and socio-ecological models of the association between environmental concern and earth friendly behaviour offer a suitable foundation for research in the area. The growing association between environmental concern and concerns for health is another strand in the literature that offers new insight into the topic of determinants of ecological behaviour. Therefore the impact of environmental concern on the psychological well-being of the individual becomes an interesting issue worthy of investigation. Although subjected to theoretical exposition, this is an area that has not received empirical attention so far. We know from the social psychology of health that lifestyle factors and psychosocial stress contribute substantially to morbidity and mortality across a range of disease. We also know that
since the late 1970's the discipline of health psychology has integrated the psychological aspects of health-maintenance and illness-prevention with adjustment to illness. Just as lifestyles are determined by health attitudes and health beliefs, perhaps a bridge between the notions of earth friendly lifestyles and eco-health attitudes and beliefs would serve us well. While it is important to examine these concepts across the lifespan, a particularly relevant group are adolescents and young adults. Poised on the brink of active engagement with societies systems, as participants with newly acquired power and control over economic and political decisions, this cohort are the decision makers of tomorrow.

Consequently, this thesis was designed to examine how eco-philosophy (one’s orientation on human-environment relationships i.e. one’s sense of connectedness with the biosphere); eco-threat perception (threat to the self from environmental hazards); and well-being, are related in young people. Using an empirical approach throughout, we initially formulated a schema to describe these concepts.

General Model of environmental concern and well-being

The central tenet of the thesis is that ‘environmentalism’ and ‘well-being’ are associated in a complex way. People are being made aware of information regarding environmental degradation, at many levels of input, and environmental concern is formulated within the ecological system. In addition to the influence of ‘push’ and ‘pull’ factors in the social context, demographic characteristics, values and beliefs act as mediating factors between environmental consciousness and earth friendly behaviours.
The interplay of these essentially socio-psychological constructs in addressing the issue of well-being of the planet has an impact on the psychological well-being of the individual. Psychological well-being incorporates self-concept, emotional health and psychological distress. A schematic representation of this formulation is presented in Figure 1.2. The model is presented in a broadly circular depiction to emphasise the reciprocal nature of the constituent elements.

Figure 1.2: Schematic Causal Model of environmental concern and well-being

We hypothesise that a straightforward causal model, such as that inferred by Bechtel's (1997) theoretical exposition, can be specified to establish directional relationships between variables in the model. In general the flow of such influence would descend
from the variables placed at the top of the scheme toward those at the bottom of the scheme. However, it is likely that this representation is somewhat simple and it is more likely that the level of complexity in the interplay between aspects of the model requires elucidation at distinct levels within and between constructs. Therefore we also predict that factorial models of analysis would provide a more detailed explanation of the interplay between variables in the model.

1.3 OUTLINE OF THE THESIS

Chapter structure and content:

Following the empirical issues highlighted throughout this chapter, Chapter 2 will attend to some of the methodological limitations that have dominated previous research in the area. By examining the psychometric properties of the measures we intend to lay a solid foundation for exploration of the theoretical constructs and hypotheses presented in the third chapter. Chapter three follows the evolution of the factorial model alluded to above, the individual psycho-ecological carrying capacity (IPECC), designed to examine the complex interplay between the main constructs of the thesis. Support for the utility of the model is garnered from a survey of third-level students in Dublin. This same line of enquiry is pursued and sustained in Chapter four within the first of two parallel studies conducted with second-level students. In Chapter five further methodological issues are highlighted and the psychometric properties of the revised research instrument are assessed. Building on the previous two chapters, in Chapter six we present longitudinal data from the second study with second-level students to explore, both the IPECC factorial model and a structural equation model of, the interplay between ecological philosophy, threat and well-being. Also presented in Chapter 6 are the findings from an evaluation of an experiential educational intervention, fielded as a pilot study with our sample, for schools in the European Union. In the last chapter results from the empirical studies presented thus far are summarised and evaluated within the theoretical context.
presented in Chapter 1. Limitations of the project are then discussed and implications for further research are examined.

Summary of research questions:

Throughout the chapters in this thesis we present a number of research questions to be examined by the work. In this section we organise these questions in a fashion that makes them more accessible to the reader when presented away from the context of the studies. In this framework we define sections dealing with analytical, methodological, and theoretical issues:

(i) Analytical issues

(a) The utility of eco-wellness paradigm:
   • *What is the best way to describe eco-wellness?*

(b) The appropriateness of the theoretical framework:
   • *Can eco-wellness be described within the context of overload theory?*

(c) Utility of the Structural Equation model
   • *What are the benefits of using the path model approach in this context?*

(d) Utility of the IPECC model
   • *What is the IPECC framework?*
   • *Is the IPECC framework sufficiently robust to variability in its substrates?*
   • *Can the model be usefully applied to longitudinal data?*

(c) The appropriateness of multiple levels of analysis:
   • *Are both uni-variate and multi-variate statistics necessary for the thesis?*
(ii) Methodological issues

(a) Construct validity:
• *What is the best way to operationalise the theoretical constructs?*

(b) Psychometric properties of research instrument:
• *Are there sub-categories of environmental hazards?*
• *What is the internal structure of the measure of environmental philosophy?*
• *How robust is the measure of environmental attitudes and knowledge?*
• *How valid is the measure of hedonic happiness?*
• *Do the measures of self-esteem and psychological distress retain their validity in the context of the current data?*

(c) Technological innovations:
• *How useful are data-entry technologies in large survey designs?*
(iii) Theoretical issues

This section re-frames the questions, posed in the data analyses, within seven headings:

(a) The nature of environmentalism:

- How are the various aspects of environmentalism related?
  - Philosophy and Threat
  - Philosophy and Attitudes
  - Philosophy and Knowledge
  - Threat and Attitudes
  - Threat and Knowledge

(b) The nature of well-being:

- What are the relationships between:
  - Self-esteem and Psychological Distress
  - Self-esteem and Happiness
  - Happiness and Psychological Distress
(c) The nature of eco-wellness:

- What are the relationships between:
  - Threat and well-being
  - Philosophy and well-being
  - Environmental attitudes and well-being
  - Environmental knowledge and well-being

- What is the effect of the belief that one's world is being poisoned?
- Are people who espouse pro-ecological worldviews more distressed by environmental degradation than those who espouse more traditional anthropocentric worldviews?
- What is the relative contribution of the constructs within the Eco-Wellness paradigm, describing the relationship between environmentalism and well-being?

(d) Relating environmental advocacy and well-being:
- Does threat perception predict environmental behaviour?
- Do those who engage in eco-behaviours enjoy better health?

(e) The mediating effect of Knowledge and Education:
- Does Knowledge moderate the effect of threat perception on health?
- What impact does Knowledge have on the relationship between environmental philosophy and health?
- What are the effects of environmental education, i.e. participating in the experiential education program, the Eco-enterprise Audit?

(f) The mediating effect of environmental facilities:
- What is the impact of recycling facilities on environmental behaviour?

(g) Gender effects:
- What differences were attributable to gender?
CHAPTER TWO: Psychometrics of Research Instrument

'Always be cautious in interpreting survey results because those results may be the product of poor question wording'.

(Weisberg, Krosnick & Bowen, 1996; p. 96)

2.1 INTRODUCTION

It is true to say that many criticisms have been levelled at surveying as a research methodology and the above quote encapsulates just one of the attendant concerns. Nonetheless, many substantial developments in the methodology have formulated specific processes whereby the results from surveys can be reliable and valid. One issue of concern is the use of validated measures. In the area of environmental research in particular, there has been a tendency to develop ad-hoc measures on a project-by-project basis. This latter critique is aligned with the observed lack of empirical rigor seen in the more descriptive approach adopted by researchers like Rachel and Stephen Kaplan or Ted Rozak to explore environmental preferences (Cantrill, 1995).

In this thesis, the principal aim is to explore a phenomenological view of the relationships between environmentalism and personal well-being, two constructs with very different theoretical histories that have been addressed by many disciplines. Therefore, to provide an empirical basis for the exploration of the theoretical arguments to follow it is first necessary to establish firm foundations.

The research instrument developed for this phase of the project contained standardized scales that had previously been used with comparative samples.
Six fundamental elements were involved in the selection of instruments:

- **Face validity**: Does the question wording really seem reasonable?
- **Convergent validity**: Does the scale give results similar to the results of other measures of the same concept?
- **Divergent validity**: Does the scale give results different from questions that are supposed to measure different concepts?
- **Criterion validity**: Can the scale be compared against a direct measure of the concept?
- **Content validity**: Does the scale measure the full breadth of the concept?
- **Construct validity**: Does the scale relate to other variables as theory and previous research suggests it should?

Whilst adherence to these criteria would potentially ensure a psychometrically robust research instrument, given the exploratory nature of the project, it was important to establish the psychometric properties of the research instrument within the current sample before any theoretical arguments could be developed.

**Aims of the Study**

The specific aim of this first study, therefore, was to focus on construction of a questionnaire with sound psychometric properties in order to explore the research questions and test the hypotheses generated in the next study. In this chapter, therefore, we examined various facets of validity in the research instruments. The battery was a compilation of nine established scales, these were the GHQ-60, and its six subscales, the Self-scale of the Environmental Awareness Inventory (EAI), and the New Ecological Paradigm scale (NEP-R²⁰).

In pursuit of this general aim, a review of the literature on each of the scales demonstrated the appropriateness of their choice in the current context. Validity analysis was conducted for each of the nine scales, within the limitations of the data. For example, it was not possible to conduct factor analysis of the GHQ-60 given the small sample size in the study.

²⁰ We are aware of a recent publication (Dunlap, Van Liere, Mertig and Jones, 2000) describing a revised version of the New Ecological Scale, we emphasise that it is the 1992 version we have used.
Within the literature, questions have arisen about the dimensionality within two of the scales, the EAI (see Walsh-Daneshmandi & MacLachlan, 2000), and the NEP-R (see Dunlap, Van Liere, Mertig, Catton Jr., & Howell, 1992). A description of these scales is given and the dimensionality issue explored within a factor analysis model, with a view to clarifying the issue within this sample.

*Rationale for Factor Analysis of the EAI-Self Scale*

A principle concern in this project is the perception of risk to the self from hazards in the environment, one aspect of the broader construct of ecological risk perception. It is clear that public concern about ecological risks has grown in parallel with a heightened awareness of environmental degradation and sustainability issues (Slovic, McDaniels, & Axelrod, 1996). For instance, a majority of international survey respondents have expressed the view that environmental protection is of persistent concern to them (Matas, 1995 in Canada; Dunlap, 1991 and Dunlap & Scarce, 1991 in Europe; see Dunlap, Gallup & Gallup, 1993, and The Roper Organization, 1993 for global comparisons). However, within academic circles, while there is recent recognition of increasing need for serious research on ecological risk management, much of the work to date has been undertaken by physical and biological scientists (Royal Society Study Group, 1983). In contrast, the psychological processes whereby ecological risks are characterized and assessed have received little attention (Slovic et al., 1996). For example, using special issues in journals as a crude indicator of topical research, the topic of ‘psychological aspects of technological risk and hazard’ was for the first time addressed by the Journal of Environmental Psychology in 1985, four years after it’s first issue (Canter, Craik and Brown, 1985). Further, in the Irish psychological literature, interest did not become apparent until 1996, when, twenty-five years after it’s first publication, the Irish Journal of Psychology printed a special issue entitled ‘Psychology and the Environment’ comprised entirely of theoretical papers. An important step in redressing this imbalance between popular sentiment and sparcity of psychological research is to empirically investigate perceptions of risk to the self using a psychometric approach similar to that employed in the human health risk perception field (e.g. Slovic, Fischhoff & Lichtenstein, 1980; and Slovic, 1992). Within such a paradigm, the development of standardized measures is a
necessary first step, and, a reliable and valid measure for appraisal of environmental hazards is a vital tool in this work (Walsh-Daneshmandi & MacLachlan, 2000).

First published in 1989, by Schmidt and Gifford, the EAI comprised a list of 24 hazards in the physical environment. These hazards were chosen to represent a range of hazards defined by source, extent of impact, and duration of impact. The items were rated, on a seven-point Likert-type scale, across three dimensions: threat to the self, threat to the environment and control appraisal, (a fourth dimension, responsibility, was included with an expanded scale by Fridgen, 1994). The present study focuses on one of these scales, the Self-scale, which measures appraisal of threat to the individual from environmental hazards. In two of the published studies addressing the psychometric properties of this scale, the authors recommended the development of sub-scales (Schmidt & Gifford, 1989; Fridgen, 1994).

Rationale for Factor Analysis of the NEP-R

The NEP scale has been in use for more than twenty years; indeed, it has been criticized as being ‘ahead of the times’ (Dunlap et al., 1992). Nonetheless, it has been useful in tracking changes in environmental thinking on several fronts. Indeed, it now seems to be comfortably ‘within the times’ and a considerable body of literature has grown up around the scale. Consistent with the wider literature on environmental concern, mixed effects were observed for gender in endorsement of the NEP. In some instances, men espoused a more environmental worldview (i.e. higher mean score) (Arcury & Christianson, 1990), while others found no difference between men and women in acceptance of the NEP (Scott & Willits, 1994; Gooch, 1995). There was a negative correlation between right wing authoritarianism and NEP-R scores (Schultz & Stone, 1994). Gooch (1995) observed only partial links between NEP support, Distrust of Science and Technology, Post material values and Concern for local environmental problems. In addition, cultural differences occurred between Swedish and Baltic samples. The suggestion arising from this finding was that environmental concern can be based either on direct personal experience of the environment or on symbolic general representations of reported global problems.
Another criticism levelled against the utility of the NEP scale concerns the issue of multidimensionality (see Albrecht et al., 1982; Geller & Lasley, 1985; and Noe & Snow, 1990; summarized in Dunlap et al., 1992). That is to say, whether it measures a single construct or is inherently multidimensional. Following the assumption that this ambiguity may have resulted from an imbalance in the direction of item wording, the revised scale was designed so that of the fifteen items the eight odd-numbered items were worded such that agreement with them indicates a pro-ecological view, and the seven even-numbered ones were worded so that disagreement indicates a pro-ecological worldview. A high score on the scale is synonymous with a pro-ecological worldview. Notwithstanding this correction, five constituent dimensions within the 15-item scale had been specified in the past, and have received some empirical investigation (Strumse, 1996). Given the nature of this project it was important not to overlook any avenue that might illuminate the exploration of connections between environmentalism and well-being. It would not be appropriate to simply compute sub-scale scores for these dimensions without a thorough examination of their stability.

A further issue emerging from the literature that may impact on the dimensionality of the scale is the variation in composition of scale items. Therefore, in the interest of clarity we here refer to the 1992 version of the 15-item NEP scale as the NEP-R. Coincidentally, Dunlap et al., (2000) have since published a revised version of the NEP, but we emphasise that the scale we used is the 1992 version.
2.2 METHOD

Design

This study employed a cross sectional questionnaire survey design with a convenience sample. Various techniques were used to explore the validity of the instrument, these included calculation of internal consistency parameters, including factor analysis where appropriate, and an exploration of concurrent and discriminant validity within the current context. Factor analysis of two of the scales was conducted within specified criteria.

Research Instrument

An introductory page was placed at the front of the questionnaire. This contained a brief description of the study, and instructions for completion of the survey (see Appendix A). The second page contained questions to elicit demographic details from the participants. Over the following pages three standard scales, the EAI, the NEP-R, and the GHQ-60 were presented. On the final page, an open-ended question was posed to evoke any comments. In total, the questionnaire contained 101 items.

Research lineage of the EAI and project specific details

First published in 1989, by Schmidt and Gifford, EAI comprised a list of 24 hazards in the physical environment. These hazards were chosen to represent a range of hazards defined by source, extent of impact, and duration of impact. The items were rated, on a seven-point Likert-type scale. The psychometric properties of this scale have been addressed in two published studies (Schmidt & Gifford, 1989 and Fridgen, 1994) and in both instances; reported internal reliability was impressive (Cronbach's
Alpha of 0.93 and 0.95 respectively). As we have already indicated, there has been a call for the development of sub-scales.

The original 24-item scale presented by Schmidt & Gifford (1989) formed the basis of the scale used in the current study. In this study certain changes were made:

(a) Item 3 on the original scale (Pollution from cars, factories, and burning trash') was separated into three distinct items (items 3, 4, and 5), and
(b) Item 5, on the current scale, was culturally adapted by substituting the word 'rubbish' for the word 'trash' (see Table 2.5).

The lead-in statement was positioned at the top of each page and read:

"Please rate how threatening the following problems are to you by drawing a circle around the response that best describes your position."

Available response options were:

'No Threat', 'Minimal Threat', 'Mild Threat', 'Moderate Threat', 'Strong Threat', 'Very Strong Threat', and 'Extreme Threat'.

Responses were coded from 1-7 for each of the options with degree of threat increasing with the coding scheme. Possible scores ranged from 26 to 182.

Research lineage of the NEP-R and project specific details

Various versions of the NEP scale exist in the literature, employing various combinations of items and different scoring techniques; indeed, this has given rise to some confusion in the literature. As already indicated, in the interest of clarity we have decided to call this version the New Environmental Paradigm Scale the NEP-R to recognise the revisions made in 1992 by Riley Dunlap and colleagues. This is the 15-item version with reverse scoring applied to uneven numbered items.

The psychometric properties of the scale have been favourably reported in the past (Dunlap et al., 1992, Strumse, 1996), and the scale authors have examined the predictive and construct aspects of validity. High scores were associated with heightened perception of the seriousness of world ecological problems, more support for pro-environment problems, air and water pollution perceived as serious issues, and more self-reported pro-ecological behaviours.
Response options to items were:

'Strongly agree', 'mildly agree', 'undecided', 'mildly disagree', and 'strongly disagree'.

These responses were coded 1-5 with appropriate reverse scoring applied. Possible scores ranged from 15 to 75.

Research lineage of the GHQ-60 and project specific details

The General Health Questionnaire (GHQ) is a self-administered screening test, designed to identify short-term changes in mental health (depression, anxiety, social dysfunction, and somatic symptoms). It is a pure state measure, responding to how much a subject feels that their present state "over the past few weeks" is unlike their usual state. It does not make clinical diagnoses and should not be used to measure long-standing attributes. The GHQ focuses on the client's ability to carry out "normal" functions and the appearance of any new disturbing phenomena. This standardized scale affords, in addition of a global measure of well-being, examination of six sub-constructs within the overall frame of mental distress. Reliability of this scale has been well established and is reported in the published manual for the scale.

For further information on the design of the GHQ-60, please refer to the User's Guide (Goldberg, 1988), and the website http://www.nfer-nelson.co.uk/ghq/faq.htm#6.

The sixty-item version of this scale was employed here and Likert-type coding was applied. Response options were:

'Less than usual', 'No more than as usual', 'Rather more than usual', and 'Much more than usual'.

Responses, coded 0-3, yielded possible scores in the range from 0 to 180.

Sample

Participants were recruited by virtue of being students of College lecturers known to the researcher. This convenience sample comprised three groups of university student volunteers (no incentives were offered), in two colleges (TCD and UCD) in the capital city, Dublin. The first group comprised 2nd and 4th year Psychology students and 4th year Physiotherapy students. Of the 150 questionnaires distributed, 46.67% of
the participants responded. Of the 70 questionnaires returned, three were excluded as they were returned late (beyond the three week period specified), and a further two were excluded because of excessive amounts of missing data. The second group comprised 2\textsuperscript{nd} year Psychology undergraduate students. Of the 59 questionnaires distributed, 42.37\% of the participants responded. Of the 25 questionnaires returned, two were excluded as they were unanswered, and a further one was excluded because of excessive amounts of missing data. In the third group, 150 questionnaires were distributed to undergraduate and masters level Computer Science students, and 48\% of the participants responded. To examine whether the three groups differed on the dependent variables, we conducted between group comparisons. As no significant differences emerged between the groups, group-based data divisions were collapsed and treated as one sample. Subsequent analyses were therefore conducted on a sample of 159 protocols from 104 female and 54 male participants ranging in age from 17-54 years with an average age of 22 (mean = 21.60; SD=6.28). The response rate for the entire sample was 45.68\%.

Procedure

Given the suitability of a college sample in the context of this exploratory study, various academic staff known to the researcher was contacted in an effort to recruit sufficient numbers for the study. Copies of the questionnaires were sent out to the relevant academics and once the co-operation of individual lecturers had been gained; permission was sought from relevant heads of departments (Psychology and Computer science). On receipt of such agreement, administration times were then scheduled in advance to suit the contact lecturers.

Questionnaire administration

On the scheduled day questionnaires were distributed during lecture time and completed at the student's own convenience. Distribution and collection procedures were replicated for each data collection session. At the beginning of the lecture period, the purpose of the study was explained by the researcher in a standard fashion by reading aloud the statements in the cover page of the questionnaire (Appendix A).
Questionnaires were then distributed and volunteers were asked to return the completed forms to the lecturer either one-week later at the same lecture time, or to the lecturer’s office, at any time over the next three weeks. The same researcher administered the materials at all collections. At the end of the data collection period, the co-operation of the academic staff was acknowledged formally.

Asymmetric carryover effects
To address the issue of the effect of 'embedding' the scales in a larger questionnaire a sub-group of the sample (n=72) were surveyed using a 'Balancing' technique whereby randomised Latin Square ordering was employed. Balancing the order of presentation of the questionnaire scales was examined in the context of asymmetric transfer.

Asymmetric transfer arises when strategies learned in one condition of a within-subjects design experiment are inappropriately carried over and used in another condition of the experiment. When the responses in one condition differ depending on which of the other conditions precedes it, differential transfer has influenced the original condition. The effect of this is an underestimation of differences between the conditions and a serious challenge to generalisability of any findings. If differential transfer has occurred, the average score will differ as a function of the order. The experiment involved the incomplete within-subjects design, so each participant completed each scale once. The order of presentation of the scales was determined using a Latin Square. Latin square is a technique to balance practice effects in the incomplete within-subjects design whereby:

1. Each condition appears at every ordinal position equally often
2. Each condition precedes and follows every other condition equally often (see Shaughnessy & Zechmeister, 1990 for complete discussion).

Data Preparation
Raw data was coded in line with established criteria for each of the scales and entered into the statistical package SPSS for analysis.
2.3 RESULTS

Missing Data Analysis

No trends were apparent in missing data. No case had values missing on more than 50% of the scales. Perusal of the data from the first study suggested the number of missing data points would be few. Therefore, 159 cases were included in subsequent analysis. Missing value analysis (MVA) was conducted using SPSS 10.0 and the results can be seen in Table 2.1 below.

Table 2.1: Missing Data in Study 1 (n=159)

<table>
<thead>
<tr>
<th>Missing N</th>
<th>Mean</th>
<th>SD</th>
<th>Skew</th>
<th>Count</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eco-Threat</td>
<td>148</td>
<td>74.03</td>
<td>25.02</td>
<td>.57</td>
<td>11</td>
</tr>
<tr>
<td>Eco-Philosophy</td>
<td>154</td>
<td>55.88</td>
<td>7.60</td>
<td>-.58</td>
<td>5</td>
</tr>
<tr>
<td>Mental Distress</td>
<td>153</td>
<td>54.33</td>
<td>24.29</td>
<td>.88</td>
<td>6</td>
</tr>
<tr>
<td>Somatic Symptoms</td>
<td>159</td>
<td>2.87</td>
<td>2.70</td>
<td>.42</td>
<td>0</td>
</tr>
<tr>
<td>Sleep Disturbance</td>
<td>159</td>
<td>4.11</td>
<td>2.83</td>
<td>1.04</td>
<td>0</td>
</tr>
<tr>
<td>Social Dysfunction</td>
<td>159</td>
<td>5.99</td>
<td>2.34</td>
<td>.71</td>
<td>0</td>
</tr>
<tr>
<td>Anxiety and Dysphoria</td>
<td>159</td>
<td>4.76</td>
<td>3.46</td>
<td>.60</td>
<td>0</td>
</tr>
<tr>
<td>General Illness</td>
<td>159</td>
<td>5.86</td>
<td>3.11</td>
<td>.58</td>
<td>0</td>
</tr>
<tr>
<td>Suicidal Tendencies</td>
<td>159</td>
<td>1.96</td>
<td>3.25</td>
<td>1.91</td>
<td>0</td>
</tr>
</tbody>
</table>

As can be seen from this table the highest number of missing data points occurred for the Eco-threat scale. This represented a portion well within the limits of acceptability (Hair et al., 1998) for variable inclusion in subsequent analysis. No trends were apparent in missing data and given the small quantity of missing data in the set, missing data points were replaced with means for cases with less than 10% of all points missing, in other cases the listwise exclusion method within Analysis procedures in SPSS was employed.
Asymmetric Carryover Effects

Multivariate analysis of variance showed no effect for any of the 10 balancing orders on the dependent variables (total scores for the GHQ-60, NEP-R, and the three EAI scales).

Descriptive Statistics

Descriptive statistics, including: sample size, mean, standard deviation and measures of skew are presented in Table 2.1 for each scale. The most significant deviation from normal distribution was observed in the Suicidal Depression sub-scale of the GHQ.

Gender Effects

Mean scores were compared across gender. Given the number of comparisons a multivariate model was applied to control for experimenter wise error. In all cases females (n=99) scored higher than males (n=41). Gender differences were not significant for Eco-threat or Sleep disturbance scores. Significant effects at varying levels of statistical significance were observed for the remaining scores and details are given in Table 2.2.
The gender effect reached the 1% level of probability for each of these scores except the Somatic Symptoms and Social Dysfunction scales (p< .05).

Effect sizes (measured by Eta Squared\textsuperscript{21}) and associated power levels\textsuperscript{22} are tabulated in the last two columns of Table 2.2.

Table 2.2: Measures of Association Between Scales and Gender

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>F (1,138)</th>
<th>Sig.</th>
<th>Eta$^2$</th>
<th>Observed Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>EAI</td>
<td>2.144</td>
<td>.145</td>
<td>.015</td>
<td>.307</td>
</tr>
<tr>
<td>NEP-R</td>
<td>7.363</td>
<td>.008</td>
<td>.051</td>
<td>.769</td>
</tr>
<tr>
<td>GHQ-60</td>
<td>8.353</td>
<td>.004</td>
<td>.057</td>
<td>.819</td>
</tr>
<tr>
<td>General Illness</td>
<td>7.387</td>
<td>.007</td>
<td>.051</td>
<td>.770</td>
</tr>
<tr>
<td>Somatic</td>
<td>4.651</td>
<td>.033</td>
<td>.033</td>
<td>.572</td>
</tr>
<tr>
<td>Sleep</td>
<td>.922</td>
<td>.339</td>
<td>.007</td>
<td>.159</td>
</tr>
<tr>
<td>Social</td>
<td>4.722</td>
<td>.031</td>
<td>.033</td>
<td>.578</td>
</tr>
<tr>
<td>Anxiety</td>
<td>10.513</td>
<td>.001</td>
<td>.071</td>
<td>.896</td>
</tr>
<tr>
<td>Depression</td>
<td>.626</td>
<td>.430</td>
<td>.005</td>
<td>.123</td>
</tr>
</tbody>
</table>

These statistics\textsuperscript{23} suggest possible practical significance in the gender difference observed for NEP-R, GHQ-60, General Illness, and Anxiety scale scores.

Scale Validity and Reliability

To examine the internal consistency of each of the scales, Cronbach’s Alpha coefficients were calculated.

\textsuperscript{21} Eta squared represents the proportion of variation in the dependent variable that is accounted for by the variation in the independent variable. It is the ratio of the between groups sums of squares and the total sum of squares.

\textsuperscript{22} The observed power gives the probability that the F test will detect the difference between groups equal to those implied by the sample difference. In this thesis Power was computed using alpha=.05

\textsuperscript{23} Reporting effect size and power statistics facilitates consideration of practical significance, an issue apart from and equally important as statistical significance (LeFort, 1993). This practice also facilitates meaningful meta-analysis of published data and adds value to the contribution of individual research efforts (Hevey & McGee, 1998; Prentice & Miller, 1998).
For the EAI and NEP-R scales, coefficients of .95 and .75, respectively, were observed.

Table 2.3: Correlations between GHQ-60 scores scale reliabilities

<table>
<thead>
<tr>
<th></th>
<th>GHQ General Illness</th>
<th>Somatic</th>
<th>Sleep</th>
<th>Social</th>
<th>Anxiety</th>
<th>Depression</th>
</tr>
</thead>
<tbody>
<tr>
<td>GHQ</td>
<td>.95#</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General Illness</td>
<td>.677</td>
<td>.85</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Somatic</td>
<td>.551</td>
<td>.484</td>
<td>.71</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sleep</td>
<td>.597</td>
<td>.401</td>
<td>.338</td>
<td>.71</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social</td>
<td>.699</td>
<td>.426</td>
<td>.137*</td>
<td>.348</td>
<td>.66</td>
<td></td>
</tr>
<tr>
<td>Anxiety</td>
<td>.887</td>
<td>.528</td>
<td>.435</td>
<td>.455</td>
<td>.546</td>
<td>.86</td>
</tr>
<tr>
<td>Depression</td>
<td>.714</td>
<td>.337</td>
<td>.409</td>
<td>.340</td>
<td>.371</td>
<td>.605 .91</td>
</tr>
</tbody>
</table>

*Correlation is significant at the 0.05 level (1-tailed). All other correlations are significant at the 0.01 level (1-tailed).

#Cronbach’s alpha coefficients for scale reliability are presented on the diagonal in bold.

Values for the ‘well-being’ scales, presented in Table 2.3, range between .66 and .95, with the lowest value for Social Dysfunction and the highest for the 60-item Total scale.

Discriminant and Convergent Validity

To examine relationships between the measures: EAI, NEP-R, GHQ-60 and its six subscales, two-tailed bivariate Pearson coefficients were calculated. Significant relationships emerged between the EAI scores and NEP-R scores (r = .38; p < .01).

Small but significant positive relationships were found between the NEP-R and GHQ-60 scores (r = .17; p < .05), Anxiety scores (r = .17; p < .05), and Suicidal Depression scores (r = .18; p < .05). As expected, significant correlations emerged between the GHQ total scale and each of its subscales, as depicted in Table 2.3 above.

Descriptive Analysis for EAI

Rank ordering of means with standard deviations for the EAI-Self items, is presented in Table 2.4. Comparison of either end of the continuum shows that ‘Change to the
ozone caused by pollution' was the item given the highest mean rating, while the item ‘Earthquakes’, was considered the least threatening by the sample.

Table 2.4: Ranked means, for the 26-item EAI-Self Scale

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Rank</th>
<th>Text</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Valid N</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>1</td>
<td>Change to the ozone caused by pollution</td>
<td>4.38</td>
<td>1.59</td>
<td>151</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>Pollution from cars</td>
<td>3.79</td>
<td>1.41</td>
<td>152</td>
</tr>
<tr>
<td>6</td>
<td>3</td>
<td>Smoking in public buildings</td>
<td>3.78</td>
<td>1.86</td>
<td>152</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>Pollution from factories</td>
<td>3.65</td>
<td>1.45</td>
<td>152</td>
</tr>
<tr>
<td>22</td>
<td>5</td>
<td>Radioactive fallout</td>
<td>3.49</td>
<td>2.14</td>
<td>150</td>
</tr>
<tr>
<td>24</td>
<td>6</td>
<td>Chemical dumps</td>
<td>3.46</td>
<td>1.84</td>
<td>151</td>
</tr>
<tr>
<td>21</td>
<td>7</td>
<td>Germs or micro-organisms</td>
<td>3.24</td>
<td>1.38</td>
<td>151</td>
</tr>
<tr>
<td>26</td>
<td>8</td>
<td>Pesticides and herbicides</td>
<td>3.23</td>
<td>1.55</td>
<td>151</td>
</tr>
<tr>
<td>1</td>
<td>9</td>
<td>Water Pollution</td>
<td>3.15</td>
<td>1.57</td>
<td>152</td>
</tr>
<tr>
<td>7</td>
<td>10</td>
<td>Acid Rain</td>
<td>3.11</td>
<td>1.47</td>
<td>151</td>
</tr>
<tr>
<td>18</td>
<td>11</td>
<td>Impure drinking water</td>
<td>3.09</td>
<td>1.63</td>
<td>151</td>
</tr>
<tr>
<td>5</td>
<td>12</td>
<td>Pollution from burning rubbish</td>
<td>3.03</td>
<td>1.37</td>
<td>152</td>
</tr>
<tr>
<td>14</td>
<td>13</td>
<td>Radioactivity in building materials (e.g. radon gas)</td>
<td>2.95</td>
<td>1.71</td>
<td>151</td>
</tr>
<tr>
<td>23</td>
<td>14</td>
<td>Fumes or fibres from synthetic materials (e.g. asbestos, carpets, plastics)</td>
<td>2.76</td>
<td>1.35</td>
<td>151</td>
</tr>
<tr>
<td>19</td>
<td>15</td>
<td>Large fires</td>
<td>2.66</td>
<td>1.54</td>
<td>151</td>
</tr>
<tr>
<td>9</td>
<td>16</td>
<td>Number of people (e.g. crowding, population explosion)</td>
<td>2.60</td>
<td>1.44</td>
<td>151</td>
</tr>
<tr>
<td>13</td>
<td>17</td>
<td>Visual pollution (e.g. billboards, ugly buildings, litter)</td>
<td>2.60</td>
<td>1.37</td>
<td>151</td>
</tr>
<tr>
<td>12</td>
<td>18</td>
<td>Noise</td>
<td>2.47</td>
<td>1.37</td>
<td>151</td>
</tr>
<tr>
<td>11</td>
<td>19</td>
<td>Water shortage (e.g. drought, water depletion)</td>
<td>2.37</td>
<td>1.53</td>
<td>151</td>
</tr>
<tr>
<td>25</td>
<td>20</td>
<td>Video screen emissions</td>
<td>2.30</td>
<td>1.23</td>
<td>151</td>
</tr>
<tr>
<td>8</td>
<td>21</td>
<td>Pollution from office equipment</td>
<td>2.17</td>
<td>1.26</td>
<td>151</td>
</tr>
<tr>
<td>2</td>
<td>22</td>
<td>Storms (e.g. lightning, hurricanes, tornados, snow)</td>
<td>2.13</td>
<td>1.05</td>
<td>152</td>
</tr>
<tr>
<td>20</td>
<td>23</td>
<td>Floods or tidal waves</td>
<td>2.05</td>
<td>1.51</td>
<td>151</td>
</tr>
<tr>
<td>17</td>
<td>24</td>
<td>Soil erosion</td>
<td>1.95</td>
<td>1.21</td>
<td>151</td>
</tr>
<tr>
<td>10</td>
<td>25</td>
<td>Fluorescent lighting</td>
<td>1.88</td>
<td>1.04</td>
<td>150</td>
</tr>
<tr>
<td>16</td>
<td>26</td>
<td>Earthquakes</td>
<td>1.82</td>
<td>1.45</td>
<td>151</td>
</tr>
</tbody>
</table>

Factor Analysis of the EAI-Self Scale

To assess the suitability of the data for the Factor Analysis procedure, we adopted three parallel approaches. Firstly, we looked for significant correlations in the matrix. SPSS offers the Bartlett test of Sphericity as a default statistic for this purpose, and in this case, the value was large ($V = 2534.86; p<.0001$), and statistically significant. Given the sensitivity of this test to sample size we also looked at the structure of the correlation matrix. Thus, the second approach was to assess the magnitude of individual correlation coefficients. Approximately eighty percent of the correlation
coefficients had absolute values greater than 0.3, (the generally recommended level), and all items had correlations of at least 0.4 with at least one variable. The third approach was to examine the size and relative contribution of the unique factors (constructs other than those described by the common factors). Partial correlations, produced in the anti-image correlation matrix, result when the effect of other variables has been removed from the paired correlation. When values are small, this suggests the presence of 'true' factors (Hair et. al., 1995). In this instance, there was such an indication with almost half (45%) of these correlation coefficients having absolute values less than 0.1.

Regarding the relative contribution of the unique factors, we employed another SPSS 'default' statistical measure, the KMO or measure of sampling adequacy MSA (Kaiser, 1970). In effect, a measure of the degree of inter-correlations among variables, this procedure specifies the variance attributable to unique factors relative to that of the common factors. These values were well within the optimal parameters set out in the literature (e.g. Kaiser, 1974; Hair et. al., 1995), with individual values ranging from 0.80 to 0.94, and a 'meritorious' value (KMO =0.89) for the entire matrix. From a synthesis of these three perspectives, we surmised that the data was well suited to the Factor Analysis procedure.

The Principal Components (PC) method was used for extracting factors. Six factors had an Eigenvalue >one, explaining 70% of the total variance. From the Scree Plot (Cattell, 1966; see Figure 2.1), it appeared that either a two or a three-factor solution would effect a parsimonious representation of the data.
The first three factors explained 57% of the total variance, with eigenvalues of 11.16, 2.19, and, 1.47 respectively.

![Figure 2.1: Scree Plot for 26-item EAI-Self Scale](image)

Given the profile in the scree-plot, and the considerable (0.72) gap between the values of the second and third eigenvalues, we specified a procedure to decide between these two solutions. We (1) compared the respective amounts of variance explained, (2) the percentage of communalities below a value of 0.5, and (3) the results of a model-fit test (see Ager & MacLachlan, 1998) comparing the fit of the 2-factor (Chi-square (DF: 274) = 683.3; p<. 001) and the 3-factor (Chi-square (df: 250) = 561.9; p<.001) models. This procedure showed that: (1) Extraction of a third factor explained 5.7% more variance than the 2-factor model. (2) The 3-factor model had a reduced number of items with communalities less than 0.5 (19% compared to 48%). Communality is the squared multiple correlation coefficient between a variable and all other variables in a matrix. Low communality indicates poor overlap of item variance, and subsequently a large specific variance. Within the terms of construct validity, it is important to maximize the common variance of individual items in the scale. (3) Finally, the 3-factor model was selected by the model-fit test (Chi-square (df: 24) =121.4; p<.001). Subsequently, the results of the 3-factor model were considered most salient.

The complexity of the unrotated three-factor solution indicated the necessity for rotation. While the orthogonal solution (VARIMAX) increased the simplicity, the oblique rotation (Direct OBLIMIN, Delta -1), interpreted from the Pattern matrix,
yielded the ‘simplest’ (Cooper, 1998) structure. The criteria for item selection were specified in terms of loading thresholds and variable complexity. The threshold for factor loadings was set at 0.5 with an optimum complexity of one (i.e. a large loading on one factor and near zero loadings on the other two factors), or a minimum difference of 0.2 between the principal and subsequent factor loading.

Table 2.5: Factor Loadings for Sub-scales of EAI-S20 Scale

<table>
<thead>
<tr>
<th>Item no.</th>
<th>Wording</th>
<th>Factor 1* Techno-human hazards</th>
<th>Factor 2 Natural-hazards</th>
<th>Factor 3 Everyday Life hazards</th>
</tr>
</thead>
<tbody>
<tr>
<td>24.</td>
<td>Chemical dumps</td>
<td>.845</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Pollution from factories</td>
<td>.845</td>
<td></td>
<td></td>
</tr>
<tr>
<td>26.</td>
<td>Pesticides and herbicides</td>
<td>.750</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22.</td>
<td>Radioactive fallout</td>
<td>.749</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Water Pollution</td>
<td>.714</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td>Change to the ozone caused by pollution</td>
<td>.687</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Pollution from burning rubbish</td>
<td>.680</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Pollution from cars</td>
<td>.660</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18.</td>
<td>Impure drinking water</td>
<td>.656</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Acid Rain</td>
<td>.577</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23.</td>
<td>Fumes or fibres from synthetic materials (e.g. asbestos, carpets, plastics)</td>
<td>.556</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20.</td>
<td>Floods or tidal waves</td>
<td>- .881</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16.</td>
<td>Earthquakes</td>
<td>- .840</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19.</td>
<td>Large Fires</td>
<td>- .675</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Storms (e.g. lightning, hurricanes, tornadoes)</td>
<td>- .570</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>Fluorescent lighting</td>
<td></td>
<td>.744</td>
<td></td>
</tr>
<tr>
<td>25.</td>
<td>Video screen emissions</td>
<td></td>
<td>.675</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>Pollution from office equipment</td>
<td></td>
<td>.585</td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>Noise</td>
<td></td>
<td>.580</td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td>Visual pollution (e.g. billboards, ugly buildings, litter)</td>
<td></td>
<td>.544</td>
<td></td>
</tr>
</tbody>
</table>

*Loading Criteria were .50 on the principal factor and a difference of at least .20 between subsequent loadings.

Eleven, four, and five items, in turn, loaded onto the three factors (see Table 2.5). Six items failed to meet the loading criteria. These were items 14, 21, 11, 17, 6, and 9 (‘Radioactivity in building materials’, ‘Germs or micro-organisms’, ‘Water shortage’, ‘Soil erosion’, ‘Smoking in public buildings’ and ‘Number of people’).
The shared variance of the three factors was 57% with individual factor contributions of 42.9%, 8.4% and 5.7%, respectively. The dimensions of the scale were thrown into relief by the oblique nature of the rotation procedure, which yielded three distinct, yet related factors. Each factor was correlated to a moderate extent with the first factor \( r_{1,2} = -0.37 \), \( r_{1,3} = 0.43 \) while the relationship between the second and third factors was considerably smaller \( r_{2,3} = -0.20 \).

Perusal of Tables 2.4 and 2.5 shows the ranked positions of the items loading onto the three factors. For instance, all of the items loading onto the first common factor ranked above 15. In contrast to the highly ranked items loading onto the first factor, those loading onto the second factor were ranked between 15 and 26. In similar relative positions, the items loading onto the third common factor ranked between 17 and 25. Given the nature of the items loading on to the factors, the names Techno-human hazards, Natural hazards and Everyday-Life hazards, were given to the sub-scales (see Table 2.5). The item-means for the three factors were 3.38, 2.28, and 2.16 respectively. One-way analysis of variance showed an overall difference between the factors \( F=54.09; \text{df}=2, 449; p<.0001 \) and post-hoc analysis (Bonferroni, \( p<.05 \)) confirmed the distinction between the first and the remaining two factors.

To further explore, and conceptually validate, the nature of these sub-scales and the difference between the first factor and the other two factors we employed a previously specified empirical framework (Slovic et. al., 1996). A panel of 10 independent judges classified the items across three dimensions: 'source', 'scale of impact', and 'news-worthiness'. Items were categorized as human generated versus natural phenomena, having global versus localized impact, and being a highly publicized hazard rather than something that is a contributory factor to a newsworthy hazard. A cut-off of 70% agreement was adopted when determining item categorization. Within this structure, Techno-human hazards were clearly human generated, however, there was a mix between the classifications of 'scale of impact' and 'news-worthiness'. Slightly more of the Techno-human hazards were viewed as having a global rather than localized impact, and as being contributors toward publicized hazards, rather than highly publicized hazards in their own right. The second sub-scale, 'Natural hazards' was unanimously defined as 'natural' and 'highly publicized'. One half of the
items were judged to have global impact and the other half were seen to have localized effects. The third factor ‘Everyday-Life hazards’ was the most clearly defined of the three. These items were classified as human generated hazards that have localized impact and contribute to highly publicized environmental hazards.

To examine the relationship between the EAI-Self Scale and the derived sub-scales with the other instrument in the study that addressed environmental attitudes (the NEP-R), we computed Pearson correlation coefficients. Significant positive relationships were found between the NEP-R score and the scores for the 26-item scale (r=.37; p<.001), the Techno-human sub-scale (r=.41; p<.001), and the Everyday Life sub-scale (r=.33; p<.001). There was a substantially lesser relationship between the NEP-R score and the score for the Natural hazards sub-scale (r=.15; p=.06).

Internal consistency of the 26-item scale, the derived 20-item scale, and the subsequent sub-scales was examined using Cronbach’s alpha. These coefficients are presented, along with respective means, standard deviations, and sample size on Table 2.6.

Table 2.6: Descriptive statistics and Cronbach's Alpha for the EAI scales

<table>
<thead>
<tr>
<th>Scale</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
<th>No. items</th>
<th>Cronbach's Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>EAI-S26</td>
<td>74.03</td>
<td>25.02</td>
<td>148</td>
<td>26</td>
<td>.94</td>
</tr>
<tr>
<td>EAI-S20</td>
<td>57.18</td>
<td>19.88</td>
<td>148</td>
<td>20</td>
<td>.94</td>
</tr>
<tr>
<td>Techno-human hazards</td>
<td>37.19</td>
<td>13.41</td>
<td>149</td>
<td>11</td>
<td>.93</td>
</tr>
<tr>
<td>Natural-hazards</td>
<td>8.65</td>
<td>4.70</td>
<td>151</td>
<td>4</td>
<td>.85</td>
</tr>
<tr>
<td>Everyday-hazards</td>
<td>11.41</td>
<td>4.66</td>
<td>150</td>
<td>5</td>
<td>.79</td>
</tr>
</tbody>
</table>

In each case, the internal reliabilities were impressive, the lowest value being an acceptable 0.79.
Descriptive Analysis of NEP-R

Rank ordering of means with standard deviations for the NEP-R items, is presented in Table 2.7. Comparison of either end of the continuum shows that items 9, 5, and 3 were the most salient and items 2, 11, and 6 the least salient. Their sample profiles can be examined in Figures 2.2 and 2.3.

Table 2.7: Descending Rank ordered Descriptive Statistics for NEP-R items

<table>
<thead>
<tr>
<th>Item number and wording</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>9. Despite our special abilities humans are still subject to the laws of nature</td>
<td>158</td>
<td>4.4114</td>
<td>.7991</td>
</tr>
<tr>
<td>5. Humans are severely abusing the environment</td>
<td>158</td>
<td>4.3734</td>
<td>1.0374</td>
</tr>
<tr>
<td>3. When humans interfere with nature it often produces disastrous consequences</td>
<td>158</td>
<td>4.2532</td>
<td>.9835</td>
</tr>
<tr>
<td>7. Plants and animals have as much right as humans to exist</td>
<td>158</td>
<td>4.2278</td>
<td>1.1053</td>
</tr>
<tr>
<td>8. The balance of nature is strong enough to cope with the impact of modern industrial nations</td>
<td>158</td>
<td>4.1076</td>
<td>.9942</td>
</tr>
<tr>
<td>15. If things continue on their present course, we will soon experience a major ecological catastrophe</td>
<td>158</td>
<td>3.9937</td>
<td>.9341</td>
</tr>
<tr>
<td>10. The so-called 'ecological crisis' facing humankind has been greatly exaggerated</td>
<td>157</td>
<td>3.9490</td>
<td>1.0730</td>
</tr>
<tr>
<td>13. The balance of nature is very delicate and easily upset</td>
<td>158</td>
<td>3.7405</td>
<td>1.1409</td>
</tr>
<tr>
<td>12. Humans were meant to rule over the rest of nature</td>
<td>158</td>
<td>3.6899</td>
<td>1.2098</td>
</tr>
<tr>
<td>14. Humans will eventually learn enough about how nature works to be able to control it</td>
<td>158</td>
<td>3.5633</td>
<td>1.1861</td>
</tr>
<tr>
<td>1. We are approaching the limit of the number of people the earth can support</td>
<td>158</td>
<td>3.4810</td>
<td>1.1930</td>
</tr>
<tr>
<td>4. Human ingenuity will insure that we do NOT make the earth unliveable</td>
<td>157</td>
<td>3.4777</td>
<td>1.1524</td>
</tr>
<tr>
<td>2. Humans have the right to modify the natural environment to suit their needs</td>
<td>158</td>
<td>3.3418</td>
<td>1.2352</td>
</tr>
<tr>
<td>11. The earth is like a spaceship with very limited room and resources</td>
<td>156</td>
<td>3.1859</td>
<td>1.1903</td>
</tr>
<tr>
<td>6. The earth has plenty of natural resources if we only learn to develop them</td>
<td>158</td>
<td>1.8734</td>
<td>1.0328</td>
</tr>
</tbody>
</table>
The three most salient items were: Item 9: ‘Despite our special abilities humans are still subject to the laws of nature’; Item 5: ‘Humans are severely abusing the environment’; and Item 3: ‘When humans interfere with nature it often produces disastrous consequences’. As shown in Figure 2.2, the most frequent response to each of these items was option 5 ‘Strongly agree’, and the majority of responses were coded 4 or 5. Recall, these items were coded 1-5 so that agreement with pro-ecological statements received a greater score, and conversely agreement with an anti-ecological statement received a low score.

Figure 2.2: Histogram of responses to three most salient NEP-R items

The definite response pattern observed for items with the highest mean ranks was not featured in the patterns for the items at the lower end of the rank order (Figure 2.3).
The three least salient items were: Item 6: ‘The earth has plenty of natural resources if we just learn how to develop them’; Item 11: ‘The earth is like a spaceship with very limited room and resources’; and Item 2: ‘Humans have the right to modify the natural environment to suit their needs’.

![Histogram of responses to three least salient NEP-R items](image)

In the item that received the lowest mean rank, an anti-ecological choice the most popular choice options by far were ‘mildly agree’ and ‘strongly agree’ with the majority of people making a definite choice by avoiding the ‘undecided’ option. A mixed response was apparent for item eleven, a pro-ecological statement, although the number of participants choosing the ‘undecided’ option was greater for this item and the most preferred option was ‘mildly agree’. For the second item, an anti-ecological statement, the strongest choice was distributed equally between ‘mildly agree’ and ‘mildly disagree’ with the next highest score representing the ‘strongly disagree’ option.

Factor Analysis of the NEP-R

To explore the existence of the five dimensions specified by Dunlap et al. (1992) it was appropriate to conduct a factor analysis of these scores. Suitability of data for factor analysis was determined within the parameters outlined for factor analysis of the EAI (Walsh-Daneshmandi & MacLachlan, 2000). In previous work (Strumse, 1996) Principal Axis Factoring with VARIMAX rotation was used to explore this issue, therefore, this technique was specified.
Analysis of the NEP-R with all items included, showed only 11.67% (14/120) of the correlations coefficients to be above 0.3. Hair et al. (1995), recommend having several correlations above 0.30, as does Cooper (1998). In this sample, we found only 14 of the 120 correlations satisfy this criterion. In isolation, this suggests that the matrix is not suitable for factor analysis. However, Hair et al. (1995), apply a 1% level of significance when assessing the appropriateness of factor analysis in their worked example (see Table 7.4, p. 392), the same criterion was applied by Strumse (1996). Applying this criterion, 28% of the correlations within the body of the matrix were significant at the 1% level of significance. Strumse (1996) reports 30% significance at the 1% level. Bartlett’s test of Sphericity yielded a significant result (457.03, p=.00000). Strumse (1996) reports a significant result of similar magnitude (416.75, p<.001). The MSA for each variable was examined in turn; using .50 as a cut-off point, Item 6 failed to reach adequacy (MSA = .49). Having excluded item 6 the overall KMO measure of sampling adequacy is 0.729. As the change in overall KMO - MSA was neither large (KMO coefficient for all items was 0.719) nor resulted in a change of statistical significance the removal of this item was questionable, at least in terms of enhancing this statistic. It may be of interest to note that the direction of endorsement of this item was opposite to the general trend for the other items on the scale.
The overall KMO measure of sampling adequacy (for all items) was 0.72; this is described as 'middling' by Hair et al. (1995). Strumse (1996) reports a KMO coefficient of .71.

The scree plot indicated the possible utility of a five-factor model, although a single factor model may be more appropriate. Within this single factor model, the first factor explained 24% of the total variance, and item loadings ranged between .134 (item 6) and .483 (item 10). Only six items had loadings greater than .30 (items 10, 15 8, 5, 4, 12). Given the models extant in the literature however, it was appropriate to examine the three- and five-factor models.

In Table 2.8, we can see that the three-factor model explained 30.26% of the total variance with the factors accounting for 14.82%, 8.31%, and 7.13% respectively.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Eigenvalue</th>
<th>% Variance</th>
<th>Cumulative %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2.223</td>
<td>14.820</td>
<td>14.820</td>
</tr>
<tr>
<td>2</td>
<td>1.246</td>
<td>8.308</td>
<td>23.129</td>
</tr>
<tr>
<td>3</td>
<td>1.070</td>
<td>7.131</td>
<td>30.259</td>
</tr>
</tbody>
</table>
Perusal of Table 2.9 indicates an increase of approximately 9% in total explained variance when the five-factor model was specified. These factors respectively explained 9.26%, 8.73%, 7.32%, 7.18%, and 7.17% of the total variance.

Table 2.9: Total Variance Explained in the five-factor model

<table>
<thead>
<tr>
<th>Factor</th>
<th>Eigenvalue</th>
<th>% Variance</th>
<th>Cumulative %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.388</td>
<td>9.256</td>
<td>9.256</td>
</tr>
<tr>
<td>2</td>
<td>1.309</td>
<td>8.726</td>
<td>17.982</td>
</tr>
<tr>
<td>3</td>
<td>1.098</td>
<td>7.318</td>
<td>25.300</td>
</tr>
<tr>
<td>4</td>
<td>1.077</td>
<td>7.180</td>
<td>32.480</td>
</tr>
<tr>
<td>5</td>
<td>1.076</td>
<td>7.171</td>
<td>39.650</td>
</tr>
</tbody>
</table>

Extraction Method: Principal Axis Factoring.

Tables 2.10 and 2.11 show the pattern of similarity between this and previous samples for the two solutions.

Table 2.10: Replicated Analysis of the Three-factor Model for NEP-R

<table>
<thead>
<tr>
<th>Three factor solution</th>
<th>Strumse 1996*</th>
<th>Present study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human environmental impact</td>
<td>3,4,5,8,10,13,15</td>
<td>10,15,5,8,3,13</td>
</tr>
<tr>
<td>The role of humans relative to nature</td>
<td>2,7,9,12,14</td>
<td>12,7,11,9,2</td>
</tr>
<tr>
<td>Limits to growth</td>
<td>1,6</td>
<td>14,1 (negative value), 4,2</td>
</tr>
</tbody>
</table>

*From adapted from Strumse 1996 (Table 5; p.41).
Figures in bold represent items that load as secondary factor items (>0.30).

In the three-factor solution we observed replication of six of the seven items on the first factor ‘Human environmental impact’, four of the five items on the second factor ‘The role of humans relative to nature’, and one of the two items on the ‘Limits to growth’ factor.
In the five-factor solution, there was more consistent agreement across study samples but the order of the factors was different.

Table 2.11: Replicated analysis of five-factor model for NEP-R

<table>
<thead>
<tr>
<th>Dunlap Model</th>
<th>Strumse 1996*</th>
<th>Present Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions</td>
<td>Items</td>
<td>Alpha Factor &amp; degree of similarity with present study</td>
</tr>
<tr>
<td>Limits to growth</td>
<td>1,6,11</td>
<td>.31 Factor 5 - 66%</td>
</tr>
<tr>
<td>Anti-anthropocentrism</td>
<td>2,7,12</td>
<td>.60 Factor 4 - 66%</td>
</tr>
<tr>
<td>The fragility of nature’s balance</td>
<td>3,8,13</td>
<td>.51 Factor 3 - 66%</td>
</tr>
<tr>
<td>Rejection of Exemptionalism</td>
<td>4,9,14</td>
<td>.31 Factor 2 - 66%</td>
</tr>
<tr>
<td>The possibility of an ecological catastrophe</td>
<td>5,10,15</td>
<td>.67 Factor 1 - 66%</td>
</tr>
</tbody>
</table>

*From adapted from Strumse 1996 (Table 5; p.41): Figures in bold represent items that load as secondary factor items (> .30).
2.4 DISCUSSION

Scale reliability
To examine the internal reliabilities for each of the component scales we computed Cronbach’s Alpha statistics. The EAI scales and NEP-R demonstrated impressive levels of consistency with coefficients of .95 and .75 respectively. As set out in Table 2.3, it seems that, in general the consistency of the health scales was equally satisfactory. One exception is the Social Dysfunction Scale with an alpha coefficient of .66; however, this level does lie within established parameters for survey research (Bryman & Cramer, 1997). These findings underpin the utility of these components in the project questionnaire.

Dimensionality of the NEP-R Scale
While the factor analysis of the NEP-R was appropriate, within the established parameters, questions remain regarding the suitability of the data for the procedure.

Given the results of the factor analysis of the five-factor model it is clear that this solution is unsuitable. Firstly, it is not recommended to have as few as three items representing a proposed factor (see Hair et al., 1995, p.347). Secondly, given the distribution illustrated in the scree plot, a single factor might be more appropriate. This position is supported by the low internal consistency values, previously reported, for the five dimensions. A similar conclusion arises for the three-factor solution, where, despite considerable agreement when the solution was compared to earlier work (Strumse, 1996), the fundamental stability of the solution is open to serious question. So, for the data in this study the total score was deemed most appropriate for use. Given the degree of similarity, dimensions identified in the literature should be used only in a discussion format.

Dimensionality of the EAI-Self scale
The analyses presented here are important in that they demonstrate that it is possible to simplify and order diverse information about hazard perception. In the first instance, by applying an empirical method, we ranked hazards in terms of salience. The item ‘Change to the ozone caused by pollution was found to be more threatening
to the self than any of the other twenty-five items presented. This is not so surprising given the high media profile afforded this issue in recent times. Indeed, one could surmise that ozone depletion has become a personally salient issue as a consequence of constant public health warnings about skin cancer and the aggressive marketing of sun block creams. That ‘Pollution from cars’ was ranked second may be explained by the media attention given to ‘traffic gridlock’ and ‘air pollution’ in a city where car numbers are increasing at a significant rate.

Current figures from the Irish Government’s Department of Environment show that the number of private cars in Ireland has exceeded one million for the first time ever. Further, there has been a nation-wide increase of 123.32% in the numbers of private cars, registered for the first time, from 1972 to 1996 - a period within the personal memory of the study participants. More salient, perhaps, is the December 1996 statistic indicating that almost one third (28.46%) of these vehicles were registered in the capital city Dublin (the location of the study). The effect of this ‘locally situated’ traffic is increased considerably by the large number of cars that are driven into the city, from other nearby registration areas, on a daily basis. Indeed, road traffic is now seen as the most significant source of air pollution in Ireland (EPA, 2000).

While both of the above items were selected by the adopted factor analysis model, it is interesting to note that although the topical issue ‘Smoking in public buildings’ was ranked third, it was not included in the factor-derived scale. Thus, while it is not surprising that this issue was ranked highly, (smoking prohibition laws have changed in recent years alongside targeted anti-smoking Government health campaigns), it is interesting to note that ‘Smoking in public buildings’ appears to be an issue separate from those represented in the three sub-scales. Why this should be is not clear and may warrant further research.

Of the three items at the lower end of the ranking (see Table 2.4), ‘Soil erosion’ was an item also excluded by the factor analysis. That this was the case is understandable insofar as soil erosion is an issue little discussed in Ireland, and where it is (e.g. in terms of coastal erosion), it is confined to specialist interest groups. This would contrast with, for instance, the public memory of the giant dust bowls in the centre of North America or soil erosion consequent to deforestation in many African and Asian
countries. That such an item is clearly influenced by local geography is exemplified by the difference between the ranking of 18 in the Canadian sample (Schmidt & Gifford, 1989) and the ranking of 24 in the Irish sample. Similarly, ‘Earthquakes’ were viewed as more threatening (ranked 17 and 26, respectively) by the Canadian than the Irish participants.

When we examined the rank order of mean responses for disembedded items 3, 4, and 5, it became clear that the impact of pollution from these sources was viewed differently. While pollution from ‘cars’ and ‘factories’ was ranked similarly, (2 and 4 respectively), and reflected the ranking of 3 in the British Columbian study (Schmidt & Gifford, 1989), pollution from ‘burning rubbish’ received considerably lower rank of 12. This may be related to the low incidence of waste incineration in Ireland, where municipal solid waste is predominantly disposed of in landfill sites (Dennison, 1996). In 1995, 84.7% of collected commercial waste and 94.7% of collected municipal waste - more than 2 million tonnes- was land filled (Department of Environment, 1998). This is in stark contrast with the position in other countries and, of greater pertinence, Canada, where the construction of incinerators for municipal waste in Ontario has now been prohibited (Gale, 1996). Given the low incidence of incineration in Ireland it is suggested that this item be adapted to ‘Pollution from disposal of rubbish’ in future studies in this country. The different mean rating for ‘cars’, ‘factories’ and ‘burning rubbish’, clearly justifies our ‘unpacking’ of this item as applied in previous studies.

The Factor Analysis procedure, employed here, has provided a parsimonious identification of sub-scales within the EAI-Self Scale. Given the ambiguity in interpretation of the scree plot, the application of the decision criteria specified above did result in a clear preference for the three-factor solution. However, it may well be that the structure of hazard perception may be unstable and would be likely, perhaps as a function of geography and age, to vary across samples. In this regard, additional studies, adhering to the procedures specified here, are required for cross-validation of the description of environmental threat perception to the self.

While the adoption of conservative loading criteria did result in the exclusion of some of the original items from the 26-item scale, it was useful insofar as we were clearly
able to define the sub-scales. We have named these sub-scales Techno-human hazards, Natural hazards, and Everyday-Life hazards. Techno-human hazards can be seen as hazards that accrue from human generated activities related to technology or industry. Natural hazards are phenomena that are intrinsic to the natural world, and Everyday Life hazards are phenomena that occur within people’s usual daily experience. When we looked at the relative impact of the sub-scales, we saw that there was a distinction between the sub-scales and in particular, between the Techno-hazards and the other two sub-scales. This was apparent both in terms of individual item ranking and in terms of sub-scale total scores. Further, we demonstrated relationships between the hazard perception scores and scores on the NEP-R. Thus, EAI-Self scores predict endorsement of an ecological worldview. The NEP-R has been reported as predictive of perceived seriousness of world ecological problems, support for pro-environment policies, perceived seriousness of air and water pollution, an self-reported pro-ecological behaviours (Dunlap et al., 1992), we would suspect that the EAI is predictive of at least some of these constructs. This is an issue that we are addressing in on-going work.

The results of the conceptual categorization were also informative. This paradigm offers an approach wherein the sub-scales can be described more richly. The results point to distinct separations between the notions of source of generation, scale of impact, and nature of public awareness, both across and within the sub-scales. This combined approach can facilitate a more meaningful forum for understanding the nature of human-environment interactions.

In conclusion, while it is wise to interpret the impressive reliability coefficients in this present analysis with caution, (Cooper, 1998), the similarity to previous results are noteworthy. The original EAI has provided an important springboard for the present research. Environmental hazards are diverse in nature and the empirical framework for data reduction, presented here, can be usefully applied in teasing out the underlying meaning construed in environmental risk to the Self. We have shown, for the first time, the presence of three distinct sub-scales within the EAI-Self Scale. For the present sample, ‘Techno-human’ hazards represent significantly more risk than either ‘Natural’ or ‘Everyday Life’ hazards, and predict endorsement of a pro-ecological worldview. In line with previous findings, (Cvetkovich & Earle, 1985;
Faughnan, 1998) comparison of ranked mean for the Canadian and Irish samples does indicate differences in hazard perception between the two cultures. We suggest that these cultural effects may be a function of geography and policy, rather than cultural per se, in nature.

While it may well be that we live in the 'age of ecology' (Dunlap et al., 1992) we also see evidence of unsustainable lifestyles. Namely, increases in resource usage far beyond sustainable levels, both at local and global levels of impact. For example, in terms of local impact, Irish farmers increased their use of phosphorous chemical fertilizers more than three-fold (20,000-62,000 tonnes) in the years 1950-1994. This addressed a one-time nutrient deficiency but current residual levels are so high as to represent a problem for water quality. An estimated 2,500 tonnes are lost from land to water annually and 18% of a sample of Irish lakes was polluted to such an extent to impair their 'beneficial use'. Moving from locally induced pollution to a more global scale, 'Radioactive fallout' ranked five in our sample, indicating awareness of threat that transboundary pollution poses. Ireland has no nuclear power stations but the East Coast is in close proximity to the nuclear reprocessing plant at Sellafield, in the United Kingdom. Discharge of low-level liquid wastes from that plant is the main source of man-made radioactive contamination in the Irish Sea (Faughnan & McCabe, 1998), and parts of the country were affected by radioactive fall-out from the Chernobyl nuclear explosion some years ago.

Refinement of the EAI-Self Scale has expanded work published a decade ago, and is informed by empirical work in the health-risk area. It contributes to an area that has traditionally eschewed the interest of psychologists, and, in the first instance, affords the beginnings of a description of environmental risk to the Self within a population where awareness is growing that the Emerald Isle may not be forever green. These issues, predominantly originating in the minority / industrialized world, have both local and global impact and require changes in behaviour at both local and global levels.
2.5 CONCLUSIONS

The instrument demonstrates impressive psychometric attributes, that concur with earlier findings reported in the literature and warrant retention for further analysis, guided by the research questions to be specified.

The NEP-R should be used in its total scale form, for the purpose of the central research questions. The dimensions specified by Dunlap can be applied in the context of a comparison between Irish samples and samples from the USA, but given the results of the dimensionality analysis it would not be prudent to depend on these subscales any further.

On the other hand, the findings from the dimensionality analysis of the EAI scale presented a more robust profile. Notwithstanding the apparent stability of the subscales however, it would be advisable to treat this finding with caution. The subscales of the EAI warrant further investigation and can be used, where appropriate, in the research.
CHAPTER THREE: Eco-Wellness in Young Adults

3.1 INTRODUCTION

When physiologist Walter Cannon addressed the Massachusetts Medical Society on emotions and disease in 1928, citing the case-history of a woman whose physical health was adversely affected by a negative (stressful) psychological event (seeing her husband out walking with another woman), he set the stage for drawing links between physical and psychological events and the study of the behavioural influences on health and disease. At that time however the dominant worldview, dating back to the 17th Century but with firm foundations in earlier Greek ideology, was heavily influenced by the Cartesian schism between the mental and physical self, posing a significant stumbling block to the study of how the body is influenced by the mind in health and disease (Lovallo, 1997).

Over the intervening eighty years or so models of disease and health have now evolved to facilitate an exploration of "...how our ideas - symbols - come to have power over our bodies." (ibid, p.3).

Notwithstanding such theoretical developments, in mainstream medicine 'disease' is still seen as a predominantly physical condition (Lovallo, 1997). Claims of a more expansive approach emanate from the discipline of psychiatry, which "... generally operates on the basis of a multi-factorial model of causation, in which environmental factors are assumed to interact with biological and other influences" (Freeman, 1998; p, 125).

Within this context then, it is quite appropriate to explore the concept of ecological well being, and to this end, we now outline the aims of the present study.

In the first chapter we have argued, the notion of eco-wellness, or ecological well-being, presupposes an ecological approach to the concept of well-being. In the
present context, we intend to explore the links between the person and their environment beyond the realms of the sociological sphere and reaching to the connections between the person and the biosphere. This proposition of links between the person and the biosphere requires a model whereby one may explore the dynamic relationships between the view that hazards in the physical environment can be a source of personal threat and the view that humans are connected to the global and local environment as part of the web-of-life. Within this model, it follows that degradation of the environment is synonymous with a reduction in one’s quality of life and therefore is likely to impact on personal well-being.

Environment and health

The traditional view of the ‘environment’ incorporates a sense of remoteness from the individual. However, the degree of connectedness changes following major disasters that damage the environmental amenities of the individual such as oil spillages at sea, pollution of fresh waterways and air. Such ‘outbreaks of concern’ relating to the environment are associated with unusual, bizarre or headline-grabbing incidents (Kilburn, 1996; Cole, Tarasuk, Frank and Eyles, 1996). One example of such a headline reported recently in a National newspaper was:

**WORRY:** Mothers living near landfill sites more likely to have unhealthy children

Dumps linked to birth defects

The lead statement followed this headline was equally stark:

“A new study which raises public health concerns about the incidence of birth defects in children living near landfill sites in Dublin, Kildare and Wicklow is to be referred to the Health Research Board.” (Evening Herald 12/3/2002; p. 24).

Yes, such a media report would certainly grab some attention, but according to this ‘remote’ view, the focus would be transitory and occur purely for self-serving reasons. Such a view is in accordance with the dominant social paradigm (HEP) described by Riley Dunlap, where humans, seen to have dominion over nature, are entitled to exploit its resources and do so in the knowledge that there is an inherent balance in nature and human ingenuity will ensure that solutions to any problems that
may ensue from such exploitation are found. Even if this view has merit, the increasing incidence of environmental degradation episodes, at both local and global locations, the increasing sophistication of media transmissions enabling 'real-time' communication of such episodes, and the zeitgeist of moral awareness of such problems, means that such 'outbreaks of concern' are becoming more frequent, changing the relative position of the environment from distal to proximal. In concordance with the view that awareness and concern increase because of loss of environmental amenities, it has been argued by Kets-de-Vries (1980), from a psychoanalytic perspective, that death (of the environment) is the arousing theme that is partly responsible for the recent increase in awareness.

A contrasting view holds the 'environment' to be proximal to the individual and Gallagher & Tierney (1996) argue that this proximity has potential negative consequences for human ill-health. However, Gallagher & Tierney confine their discussion of human-environment relationships to special populations: the effects of air pollution in the elderly and young children; exposure to agricultural environments in the farming community; and the environmental hazards of health care workers.

While behavioural psychologists have for some time been cognoscente of the '... central importance of the environment on self-image and well being' (Gallagher & Tierney, 1996), the topic has not held much research interest. This, according to eminent psychiatrist Professor Hugh Freeman, is indicative of the dominant scientific paradigm:

... The problem was well expressed by the great environmentalist Rene Dubos (1972): 'The study of man as an integrated unit and of the ecosystems in which he functions is grossly neglected because it is not in the tradition which has dominated science since the seventeenth century'. As a result, there is now an urgent need to examine those aspects of people's physical and social surroundings which are likely to influence mental health. (Freeman, 1998; p. 124)

Some inroads have been made however, in the psychiatric literature, Stark & Andresen (1994), and Barocka, Kalb, Triebig & Schiele (1994), have reported links between perception of modern ecological threats and mental ill-health. In the general population, links between environmental threat and stress have also been observed. A Californian study (Cohen, Evans, Stokols & Krantz, 1986; cited in Freeman, 1998)
showed that air pollution had no direct effect on mental health, but that it did act as a vulnerability factor - the effects of pollution were only evident in the simultaneous presence of a stressful life event. Thus, "... the cost to the individual of coping with such an undesirable, polluted environment is a reduced ability to deal with new stresses." (Freeman, 1998; p.131).

The importance of the relationship between mental health and the environment is also mirrored in general society. Over the past two decades, growing public awareness of environmental change has been principally concerned with the impact of such change on human health and development and quality of life (Stokols, 1992).

State of the environment in Ireland

According to a recent EPA report, the main environmental issues in Ireland are eutrophication of inland waters, the increase in the amounts of waste, the deterioration of the urban environment and allied transport problems and the need to reduce emissions of greenhouse gases. Depletion of natural resources is a further matter of concern. These problems are a product of the increased economic activity of the last thirty years and mirror similar though earlier changes in other countries. However, the scale of the problems here is still moderate and, in general, the quality of the Irish environment remains relatively good and compares favourably with that of other EU states (EPA, 2000).

Environmental attitudes in Ireland

Relative to their European counterparts, low levels of environmental knowledge, support for environmental protection, and engagement in environmentally protective behaviour has been reported among Irish citizens (Faughnan & McCabe, 1998). The links between levels of the three constructs concurs with the literature where relationships between environmental behaviours and personal-philosophical values and emotions have been demonstrated (Grob, 1995).
Nonetheless, Irish respondents viewed certain threats, for example nuclear power stations, as ‘extremely dangerous’, and background characteristics, including age, gender and education influenced the attitudes, knowledge, and behaviour reported (Faughnan & McCabe, 1998). In particular, younger respondents reported higher levels of concern in relation to threats posed by nuclear power stations, air pollution caused by industry and the rise in the world’s temperature caused by the greenhouse effect.

**Threats to health from environmental degradation**

Threat perception from environmental hazards has been reported to be a more significant predictor of environmental behaviours than demographic characteristics or political factors. In a study of 640 Californian, (Orange County) adults, those who perceived that environmental problems pose a very serious threat to their health and well-being were more likely to engage in environmental practices, specifically recycling, conserving water, buying environmentally safe products, and limiting their driving (Baldassare & Katz, 1992).

In general there has been a worldwide discernable shift toward a more environmentalist ideology (Dunlap et al., 1993; Dunlap et al., 1992) and concern about deterioration of environmental quality and increased acceptance of responsibility for this situation has been reported in both developed and developing countries (Bloom, 1995). Such concerns have also been reported in Ireland, by the general population and by children (cf. Walsh-Daneshmandi & MacLachlan, 1996).

It is likely that as knowledge of environmental degradation becomes more widespread, increased awareness results in a more proximal position of the environment, and if that proximity is associated with negative health, then there is a need to explore the impact of such increased awareness, on the well-being of the general population. A review of the literature on relationships between psychological distress and well-being within the context of perceptions of environmental degradation supports the view that threat perception has tangible health implications.
For example, while most of the scientific interest in the Chernobyl accident has, understandably, been concentrated on radiation measurements, protection and therapy; there is a view that the main human legacy of the accident has been anxiety about health and social disruption (including relocation of homes and services) that has manifested in widespread health disorders (e.g. psychological distress) not induced by radiation. These are attributable to, the mechanisms now generally accepted by medical science as, stress: the negative interaction of mental with bodily processes. There is a general consensus between psychiatrists, psychologists, and sociologists that addressing the physical and mental effects of stress is the main issue (Lee, 1998) of concern in the aftermath of the Chernobyl accident. Stress can be defined as the process by which adverse mental experiences have negative effects on bodily functions. The mechanism is physiological, mediated through the autonomic nervous system and the endocrine system. This definition is consistent with the triple component model of stress proposed by Lazarus (1966): (a) the stimulus, (b) the individual's appraisal of the situation, and (c) some form of response to the stimulus.

Threats from Nuclear plants are not the only potential source of psychological stress. Indeed according to Lee (1998), accidents involving a continuing awareness of chemical pollution of the soil, contamination of water supplies, seepage from a landfill site, and the threat of flooding, radon gas, the discovery that roads had been sprayed with dioxin tar, even the belief that electromagnetic fields due to power lines or substations are damaging to health -- all present similar chronic threats with diffuse origins that may result in stress.

This anxiety and stress relating to environmental hazards has implications even when 'accidents' do not galvanise attention. For instance, an epidemiological study conducted across Germany has revealed that higher than average rates of childhood leukaemia are found not only in places where nuclear power stations exist, but also in places where nuclear power stations are planned (cf. Lake, Bock & Akrill, 1993).

Definitions of adverse reactions to environmental hazards

Formally described as a special kind of environmental event that pose threats to humans and to things that humans value, hazards represent the potential occurrence of extreme conditions of the natural environment or the malfunctioning of the human-
built technological environment (Cvetkovich & Earle, 1985). Questions relating to definition of the maladaptive effects of exposure to environmental hazards are also an issue in the literature. Generally formulated within a traditional ‘disease-state’ health model (Lovallo, 1997), Environmental-Risk assessments fail to consider the effects of stress when assessing the effects of chemicals or radioactive substances. In addition, health impact studies rarely include, in any serious way, well-being and psychological contributions to health. Consequently, little empirical evidence can be brought to bear on such questions as:

- What is the effect of the belief that one’s world is being poisoned?
- Does this evoke stress and stress-related consequences for health and happiness?

Several authors, who have reported evidence of physical stress effects (e.g. headaches, nausea) and attitudinal changes (e.g. demoralization, upset, perceived threat, declining quality of life and distrust of authorities) associated with toxic waste disposal sites would propose Chronic environmental stress disorder (CESD) as a more useful formulation for describing the effects seen in the general population affected by the Chernobyl accident (Lee, 1998). Post-traumatic stress disorder (PTSD) would then be reserved for those victims who had experienced the initiating, traumatic event. Another environmental health disorder that has been classified is ‘Environmental Illness / Multiple Chemical Sensitivity’. Using associative networks, these patients have been distinguished by their beliefs about concepts relating to their illness from allergy and asthma patients, doctors and controls (Gomez, Schvaneveldt & Staudenmayer, 1996).

Coping mechanisms

Within a psychoanalytic framework the psychological impact of environmental degradation has been associated with bereavement coping styles, and four coping styles, for handling ‘death of the environment’ are posited by Kets-de-Vries (1980): constructive, noncommitted, displacement, and denial-depressive. The last style has common threads with the ‘repressor’ personality characteristic (Bell & Byrne, 1978), whereby a tendency to “... deal with threat by denying the existence of the threat and not verbalizing uneasy feelings about a potential danger.” (Fisher, Bell & Baum, 1984; p. 28).
A review of the social psychological literature (Stroebe & Stroebe 1995) has shown the buffering effect of ‘hardiness’ on stress effects on health (Kobasa & Puccetti, 1983) and hardiness-related differences in appraisal of stress (Rhodewalt & Zone, 1989) has received mixed results. Also illustrated are limitations in the literature in terms of methodological confounds relating to the operational definition of hardiness. In addition, self-report measures of both stress and of health complaints were shown to reflect a mood disposition of negative affectivity or neuroticism. As Stroebe and Stroebe (1995) conclude from their review, it may be that non-hardy individuals are actually neurotic and psychologically maladjusted, therefore reporting more negative and stressful lives and higher levels of health complaints, rather than the hardy individuals being particularly stress-resistant.

So it seems, that while there has been extensive research on coping strategies, the differential effectiveness of the strategies adopted is not so clear. As Stroebe & Stroebe (1995) illustrate: avoidance coping strategies such as denial may be effective at certain times, at the early stages of dealing with traumatic events for instance (Stroebe, 1992), but chronic avoidance strategies are a possible risk factor for adverse responses to stressful life events (e.g. Rohde et al., 1990; Carver et al., 1993; Stanton & Snider, 1993). In their view, this is consistent with research on positive health impact of writing about, previously undisclosed traumatic events (Pennebaker & Beall, 1986; Pennebaker et al., 1988), or recent upsetting experiences (Pennebaker et al., 1990). So, being consciously aware of stressful events may alleviate some of the negative health impact. Pennebaker explained the findings within his theory of inhibition, which outlines the processes whereby poorer health ensues from failure to confront traumatic events (Stroebe & Stroebe, 1995). At the heart of this theory is the assertion that by inhibiting thoughts, feelings and behaviour one engages in active processes requiring psychological work. The cumulative effect of this inhibition of thoughts or feelings, over long periods of time, is increased vulnerability to stress-related disease.

This view is congruent with Robert Bechtel’s (1997) suggestion that denying the existence of the ‘ecological crisis’ has a psychological cost, and in the long-term, engaging in pro-active environmentally protective behaviours is health promoting.
Specific goals of this study

To this end within this present study, we set out to achieve three outcomes. The first goal was to develop a theoretical framework to explore the idea that environmental concern is related to perception of self-threat from environmental hazards, and that the interplay of these two variables is related to psychological well-being. With such a framework in place, one could formulate testable hypotheses. Finally, we would conduct a critical analysis of findings and make recommendations for future work.

Within the first goal, we formulated a series of research questions:

- Is environmental threat perception associated with experience of psychological distress?
- Are people who espouse an ecological worldview, more distressed by environmental hazards than those who espouse a more traditional worldview?
- Are threat perception and eco-philosophy related?
- Do threat perception and eco-philosophy interact to impact on psychological well-being?

The first two questions sought to clarify the direct relationships between the operational definition of psychological well-being (GHQ) with those definitions of eco-threat perception (EAI), and eco-philosophy (NEP-R) defined in the previous chapter. The third question in this study was how one’s orientation on human-environment relationships i.e. one’s ‘sense of connectedness with the biosphere’ is related to ‘threat to the self from environmental hazards’. Having established this, the secondary question was how the interplay of eco-philosophy and eco-threat perception is related to psychological well-being.
Factorial model of Eco-wellness

Environmental-load theories suggest an optimal level of input beyond which maladaptive coping behaviours occur (Bell, Greene, Fisher and Baum, 1996). Such theories have currency within several academic disciplines, more particular to this argument within the general study of environmental sciences and also within the area of environmental psychology. The premise is that any system has a carrying capacity beyond which the normal mechanisms operating within the system fail to be functional. Within the current discussion, a certain level of threat perception associated with environmental hazards is appropriate and the level of threat is appraised within the broader context of one’s beliefs about the environment. The dynamic between these mechanisms has implications for the well-being of the system. Therefore, as a means to construct an empirical study of the area we formulated the Individual Psycho-Ecological Carrying-Capacity (IPECC) Model.

![Figure 3.1: Model for Individual Psycho-Ecological Carrying-Capacity (IPECC)](image)

The Individual Psycho-Ecological Carrying-Capacity (IPECC) states that: Eco-philosophy is associated with awareness of threat to the self from environmental hazards and that the interplay of these variables (perceived ecological-load) is related to psychological well-being (see Figure 3.1).
Research Hypotheses

Scores on the EAI scale will be positively related to scores on the GHQ scales.
Scores on the NEP-R scale will be positively related to scores on the GHQ scales.
EAI and NEP-R scale scores will be positively related.
The IPECC phenomenon will be observed on GHQ scale scores.
3.2 METHOD

Sample

The protocols from 159 participants were utilized in this study. Sample characteristics have already been described in the first study of the project presented in Chapter 2 of this volume.

Procedure and Materials

The procedure for this study has already been described in study 1, where the psychometric properties of the research instrument were established.

Design

As this was an exploratory study, survey methodology using a convenience sampling technique was used. A multi-method design was employed, where correlation analysis using Pearson Product Moment statistics was conducted to address the first three hypotheses. To explore the third hypothesis, multivariate analysis of variance was conducted on 2x2 within-subjects natural groups design, where groups were distinguished by high and low scores, split at the median, on paper and pencil tests. The first independent variable Eco-threat perception was operationalised as total scores from the 26-item EAI-Self inventory and the second independent variable, Eco-philosophy/worldview was measured by total scores on the NEP-R. The dependent variables, psychological well-being, were defined by total scores for the 60-item GHQ and its six subscales measuring; General Illness, Suicidal Depression, Sleep Disorder, Somatic Symptoms, Anxiety and Dysphoria, and Social Dysfunction. To explore the salience of the subscales of the EAI-Self scale, generated in the first study, we applied the same experimental design where the EAI total scores were substituted by each of the subscales, Techno-human, Natural, and Everyday Life, hazards, in turn.
3.3 RESULTS

To explore the first three hypotheses a bi-variate correlation matrix was computed to produce Pearson Correlation coefficients (1-tailed). With respect to the first hypothesis, which asserted a positive relationship between EAI and GHQ scores, this was indeed the case for two of the well-being sub-scales. EAI scores were significantly correlated with Somatic Symptoms scores (r = .147; p< .05), and Anxiety and Dysphoria scale scores (r = .143; p< .05).

The second hypotheses predicted a positive relationship between NEP-R scores and GHQ scores.
NEP-R scores were indeed positively related to GHQ-60 scores (r = .162; p< .05), Anxiety and Dysphoria scores (r = .167; p< .05), and Suicidal Depression scores (r = .180; p< .05).

The third hypotheses predicted the positive association between EAI and NEP-R scores. Significant positive relationships were found between the NEP-R score and the scores for the 26-item EAI scale (r = .38; p< .001), the Techno-human sub-scale (r = .41; p< .001), and the Everyday Life sub-scale (r = .33; p< .001). There was a substantially weaker relationship between the NEP-R score and the score for the Natural hazards sub-scale (r = .15; p= .07).

The fourth hypothesis for the study predicted that the IPECC phenomenon would be observed on GHQ scale scores. As we recall, the IPECC hypothesis states that Eco-philosophy is associated with awareness of threat to the self from environmental hazards and that the interplay of these variables (perceived ecological-load) is related to psychological well-being (see Figure 3.1).

With eco-load being conceptualised as the product of the EAI and NEP-R scores, correlation coefficients were computed to examine relationships between this construct and the measures of psychological well-being. Small but statistically significant relationships emerged for Somatic Symptoms (r = .14; p< .05) and Anxiety & Dysphoria (r = .15; p< .05) subscale scores.

Factorial Model
To test the robustness of the fourth hypothesis further, variation within ‘eco-load’ was examined. Subsequent to the correlation analysis findings, we explored the possibility of variation within the Eco-Threat scores, initially for the two scales previously identified. As shown below in Figure 3.2, box-plots indicated the utility of pursuing a factorial analysis model (Hair et al., 1995).

![Box-Plots of GHQ subscales by median split EAI scores.](image)

Figure 3.2: Box-Plots of GHQ subscales by median split EAI scores.

Dividing the EAI, its three subscales, and NEP-R scores at the median, we examined the effects of eco-threat and eco-philosophy across the range of available measures of well-being, GHQ-60 total scores and all six sub-scale scores. We controlled for experimenter-wise error by using a series of MANOVA procedures. Details of effect size and observed power are also reported.

The assumption for the multivariate approach is that the vector of the dependent variables follows a multivariate normal distribution, and the variance-covariance matrices are equal across the cells formed by the between-subjects effects. While there is no effective test of multivariate normality, the presence of uni variate normality across the variables is generally indicative of suitability of the data. Perusal of the data presented in Table 2.1 suggested an acceptable level of skewness for each
of the sub-scales except Suicidal Depression. Having said this, with adequate sample sizes and sufficient within-cell sizes, approximately 30 in this design (Hair et al., 1998), the ANOVA is robust to departures from normality. Box’s M tests the null hypothesis that the observed covariance matrices of the dependent variables are equal across groups. If the significance level is small (p < .05) then the null hypothesis is rejected. At a univariate level, Levene’s test of equality of error variance is also rejected if the significance level is small.

Employing total scores for EAI and NEP-R scales as the independent variables, the assumption of equal covariance across groups on the overall test of dependent variables was supported. Multivariate tests showed main effects for EAI scores (Wilks’ Lambda = .887; F (7,131)= 2.38, p< .05; Eta^2 = .113; Power=.84). At a univariate level, Levene’s test located an inequality of variance on the Suicidal Depression scores (F (3,137) = 3.51; p< .05).

Main effects for Eco-threat emerged on the total scale score and two of the sub-scale scores; for the GHQ-60 scores (F (1, 137)= 5.03; p < .05; Eta^2 = .035; Power = .605), the Anxiety & Dysphoria scale (F (1, 137)= 5.12, p < .05; Eta^2 = .037; Power = .619), and the Somatic symptoms scale (F (1, 137)= 8.11; p < .01; Eta^2 = .056; Power = .807) scores. In each of these cases above median EAI scorers (n=72) reported higher symptomatology than those reporting lower levels of eco-threat (n=69).
Interaction effects also emerged on the Sleep Disturbance scale ($F(1,137) = 6.71; p < .011; \text{Eta}^2 = .047; \text{Power} = .730$) scores. Means for groups are shown in Table 3.1, and perusal of the data shows a pattern of disordinal interaction between the levels of the independent variables and the dependent variable.

Table 3.1: Factorial cells in IPECC effect on Sleep

<table>
<thead>
<tr>
<th>Sleep Disturbance</th>
<th>EAI</th>
<th>NEP-R</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>.00*</td>
<td>.00</td>
<td>4.2667</td>
<td>3.0332</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>1.00#</td>
<td>.00</td>
<td>3.4167</td>
<td>2.1247</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td>3.9710</td>
<td>2.7652</td>
<td>69</td>
</tr>
<tr>
<td>1.00</td>
<td>.00</td>
<td>.00</td>
<td>3.3333</td>
<td>2.5481</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>1.00</td>
<td></td>
<td>5.0625</td>
<td>2.9780</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td>4.4861</td>
<td>2.9407</td>
<td>72</td>
</tr>
<tr>
<td>Total</td>
<td>.00</td>
<td>.00</td>
<td>3.9420</td>
<td>2.8896</td>
<td>69</td>
</tr>
<tr>
<td></td>
<td>1.00</td>
<td></td>
<td>4.5139</td>
<td>2.8184</td>
<td>72</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td>4.2340</td>
<td>2.8577</td>
<td>141</td>
</tr>
</tbody>
</table>

*0=Below median group
#1=Above median group

When the EAI scores were controlled (the two penultimate lines in Table 3.1), high scorers on the Eco-Philosophy measure reported increased levels of sleep disturbance. This situation was mediated however by the position adopted on Eco-Threat construct, as we can see the patterns reverse when low scores on the EAI scale are observed.
This pattern is illustrated further in Figure 3.3 below where the black line represents the above median scores and the grey line represents below median scores on the NEP-R scale.

![Estimated Marginal Means of SLEEP DISTURBANCE vs. ECO-THREAT PERCEPTION](image)

Figure 3.3: Line graph depicting disordinal interaction for Sleep Disturbance

While the interactive effect is quite apparent in the graph, it is also clear that the main difference appears to be associated within the high threat perception condition.

Gender effects

The average EAI score was higher for females (Mean =75.35; SD=25.32; n=99), than males (Mean =69.75; SD=24.05; n=45), which was also the case for the NEP-R scores with females scoring an average of four points higher (Mean =57.13; SD=6.64; n=99), than males (Mean =53.49; SD=8.13; n=45).

Gender differences were not significant for Eco-threat, Depression, or Sleep disturbance scores. Significant effects at varying levels of statistical significance were observed for the remaining scores and details are given in Table 3.2.
The gender effect reached the 1% level of probability for each of these scores except the Somatic Symptoms and Social Dysfunction scales (p< .05).

Table 3.2: Measures of Association Between Scales and Gender

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>F (1,138)</th>
<th>Sig.</th>
<th>Eta2</th>
<th>Observed Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>EAI</td>
<td>2.144</td>
<td>.145</td>
<td>.015</td>
<td>.307</td>
</tr>
<tr>
<td>NEP-R</td>
<td>7.363</td>
<td>.008</td>
<td>.051</td>
<td>.769</td>
</tr>
<tr>
<td>GHQ-60</td>
<td>8.353</td>
<td>.004</td>
<td>.057</td>
<td>.819</td>
</tr>
<tr>
<td>General Illness</td>
<td>7.387</td>
<td>.007</td>
<td>.051</td>
<td>.770</td>
</tr>
<tr>
<td>Somatic</td>
<td>4.651</td>
<td>.033</td>
<td>.033</td>
<td>.572</td>
</tr>
<tr>
<td>Sleep</td>
<td>.922</td>
<td>.339</td>
<td>.007</td>
<td>.159</td>
</tr>
<tr>
<td>Social</td>
<td>4.722</td>
<td>.031</td>
<td>.033</td>
<td>.578</td>
</tr>
<tr>
<td>Anxiety</td>
<td>10.513</td>
<td>.001</td>
<td>.071</td>
<td>.896</td>
</tr>
<tr>
<td>Depression</td>
<td>.626</td>
<td>.430</td>
<td>.005</td>
<td>.123</td>
</tr>
</tbody>
</table>

These statistics suggest a possible practical significance in the gender difference observed for NEP-R, GHQ-60, General Illness, and Anxiety scale scores.

When gender was included as a factor in the IPECC model (see Table 3.3) protocols from 99 females and 41 males were considered. Cell sizes were particularly low in the Male/ below median EAI/ above median NEP-R group (n=6), and the Male/ above median EAI/ below median NEP-R group (n=7). No significant effects emerged at the multivariate level of analysis. Inequality of error variance across groups was observed for the Suicidal Depression scores (F (7,132) = 3.91; p< .01).

At the univariate level, the main effects for Eco-threat on the Somatic scores observed earlier remained, however while there was no change in the statistical significance of the effect, the influence of gender in the model served to reduce the practical significance and power of the effect.
Gender effects observed earlier (see Table 3.2) also occurred for the Social Dysfunction scores.

Table 3.3: Results of IPECC analysis when Gender is included as a factor

<table>
<thead>
<tr>
<th>Source</th>
<th>Dependent Variable</th>
<th>Means</th>
<th>F (df: 1,132)</th>
<th>Sig.</th>
<th>Eta Squared</th>
<th>Observed Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>General Illness</td>
<td>*F=6.322 M=4.644</td>
<td>7.449</td>
<td>.007</td>
<td>.053</td>
<td>.773</td>
</tr>
<tr>
<td>Gender</td>
<td>Social Dysfunction</td>
<td>F=6.206 M=5.245</td>
<td>4.198</td>
<td>.042</td>
<td>.031</td>
<td>.529</td>
</tr>
<tr>
<td>Gender</td>
<td>Anxiety &amp; Dysphoria</td>
<td>F=5.095 M=3.513</td>
<td>5.930</td>
<td>.016</td>
<td>.043</td>
<td>.676</td>
</tr>
<tr>
<td>Gender</td>
<td>GHQ-60</td>
<td>F=55.499 M=45.148</td>
<td>5.430</td>
<td>.021</td>
<td>.040</td>
<td>.638</td>
</tr>
<tr>
<td>EAI</td>
<td>Somatic Symptoms</td>
<td>#BM=1.977 AM=3.319</td>
<td>6.695</td>
<td>.011</td>
<td>.048</td>
<td>.729</td>
</tr>
<tr>
<td>Gender * EAI</td>
<td>Suicidal Depression</td>
<td>3.950</td>
<td>.049</td>
<td>.029</td>
<td>.505</td>
<td></td>
</tr>
<tr>
<td>EAI * NEP-R</td>
<td>Sleep Disturbance</td>
<td>4.178</td>
<td>.043</td>
<td>.031</td>
<td>.528</td>
<td></td>
</tr>
</tbody>
</table>

*F: Female; M: Male #BM: Below median group; AM: Above median group

Interaction effects occurred for Gender by Threat perception (see Figure 3.4), on suicidal depression scores, but the observed power was low at .505.

Figure 3.4: Interaction plot for Gender*EAI on Suicidal depression
Perusal of the plot in figure 3.4 clarifies the increased level of symptoms for groups of females in the high threat perception condition, in contrast to the corresponding low level of symptoms for the male participants. Reversals of relative positions were observed in the low-threat condition. Cell characteristics are given in Table 3.4, where the variation in cell sizes and standard deviations are tabulated. Of particular note is the larger mean score and standard deviation for the females in the high threat condition.

Table 3.4: Cell statistics for the Gender by EAI interaction

<table>
<thead>
<tr>
<th>EAI</th>
<th>NEP-R</th>
<th>GENDER</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suicidal Depression</td>
<td>.00</td>
<td>Total</td>
<td>Female</td>
<td>1.1778</td>
<td>1.9574</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Male</td>
<td>1.7917</td>
<td>3.1205</td>
</tr>
<tr>
<td>1.00</td>
<td>Total</td>
<td>Female</td>
<td>2.6111</td>
<td>3.8432</td>
<td>54</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Male</td>
<td>1.1176</td>
<td>1.7636</td>
<td>17</td>
</tr>
</tbody>
</table>

*0=Below median group
#1= Above median group

While the interaction between eco-threat and eco-philosophy on Sleep disturbance remained robust to the effect of gender, comparison between the relevant statistical values shows a reduction in terms of statistical significance, effect size and power. The strengths of each of the observed effects are tabulated in Table 3.3, alongside estimates of effect size and power. Effect sizes ranged from .029 to .053 with associated power of .505 and .773 respectively.

In summary, while no three-way interaction occurred when gender was entered as a third variable in the IPECC model, gender did have a reducing influence on the interactive effect on sleep disturbance. In terms of the effect on eco-threat main effects, gender had a very slight influence on the effect observed on the Somatic symptoms scores.
Salience of the EAI subscales in the IPECC model

Analysis of salience of the EAI subscales within the IPECC model was also conducted. Details of the analysis are given in Appendix I. Results for the Technological hazards and NEP-R scores as the independent variables show a significant main effect was observed for the Technological Hazard scale on the Somatic Symptom scores above median scorers reported higher score. No interaction effects emerged. When Gender was included in the factorial model (gender * technological hazards), a disordinal interaction effect emerged on the Suicidal Depression scores. An interaction effect emerged between NEP-R and Natural Hazards on the Suicidal Depression scale, while no significant effects emerged in the model where Everyday Hazards was the threat variable in the IPECC model.
Findings from the correlation analysis partially supported the first hypothesis, by highlighting a positive, but weak relationship between Eco-Threat perception and both Somatic Symptoms scores and Anxiety and Dysphoria scale scores at the 5% level of significance.

The second hypotheses, which predicted a positive relationship between Eco-philosophy and psychological well-being, was also partially supported with links observed between the Mental distress, Anxiety and Dysphoria, and Suicidal Depression; each at the 5% level of significance. These findings concur with the proposition that discernable relationships exist between environmental views and psychological well-being (Baldassare & Katz, 1992; Bechtel, 1997). The growing body of evidence for such a proposition (Lee, 1998; Lake et al., 1993) confirms the importance of including socio-psychological considerations in studies of environmentalism.

The third hypothesis predicted the positive association between EAI and NEP-R scores. This was the case for the 26-item EAI scale, the Techno-human sub-scale, and the Everyday Life sub-scale. In each case, the Eco-Philosophy and Eco-threat scores were related moderately at the 1% level of significance. There was a substantially weaker relationship between the NEP-R scores and the scores for the Natural hazards sub-scale, which failed to reach the 5% level of significance. This distinction between classes of hazards appears to disassociate threat from Natural hazards from the more robust relationship between the constructs of Eco-Philosophy, and a more general construct of Eco-Threat perception.

The fourth experimental hypothesis for the study was also partially supported by the findings of the correlation analysis and the factorial analysis in turn. As we recall, the IPECC hypothesis states that Eco-philosophy is associated with awareness of threat to the self from environmental hazards and that the interplay of these variables...
(perceived ecological-load) is related to psychological well-being (see Figure 3.3). Within the co-relational design, with eco-load being conceptualised as the product of the EAI and NEP-R scores, small but statistically significant relationships emerged for Somatic Symptoms, and Anxiety & Dysphoria subscale scores.

Within the factorial model, using MANOVA analysis, we found instances where violation of the homogeneity of variance assumption had occurred. The ANOVA, and therefore by extension the MANOVA procedure, is reported to be robust to this violation (http://www.statsoft.com/textbook/stanman.html#multivariate), but one instance when the ANOVA is not robust to such violations is when outliers are present in the data thereby inflating the mean and standard deviation and yielding a significant F value erroneously. The question of outliers causing the heterogeneity of variance was ruled out, where appropriate, by an observed closeness between the standard deviations for the relevant groups.

Employing EAI total scores and NEP-R scores as the independent variables, multivariate tests showed significant effects for EAI scores across various combination of GHQ scores. The observed power of this effect suggested certain robustness in the finding, which concurred with the findings of the correlation analysis outlined above. Before examining the main effect at a univariate level of analysis, we first focus on the interaction effect that emerged on the Sleep Disturbance scale, which was strong and associated with relatively high power.

Interactive effect interpretation

If one has a high level of concern for the environment, thereby endorsing a pro-ecological philosophy, it is arguable that such a perspective is conducive to a sense of feeling connected with the larger environment - the biosphere. It follows then that hazards in that same environment may be perceived as threatening to the self. The question is, does this perception necessarily follow? Well if it did, we would expect to find a near perfect correlation between the two measures - which we did not. What we did observe were consistently significant linear relationships between the constructs (i.e. eco-philosophy and the various classifications of eco-threat) that were moderate in magnitude. By employing the factorial model, we provided a means of throwing this interplay into relief in terms of their effect on well-being.
This stimulus load approach (overload and under load) is one theoretical perspective that has been dominant in environmental psychology (Fisher, Bell & Baum, 1984; pp. 65-67). Before discussing the overload approach, it is important to outline the arousal approach, which has consequences for performance. Formulated through the Yerkes-Dodson Law the arousal approach holds that performance is maximized at intermediate levels of arousal and worsens as arousal falls below or rises above this optimal level. This curvilinear relationship suggests that humans seek intermediate levels of stimulation. Low arousal is not conducive to maximum performance, and extremely high arousal interferes with concentration on a single task. This framework for optimal performance may offer some insight into the finding that those who held the ‘middle-ground’ position reported less sleep disturbance, that is, ‘greens’ with low levels of threat perception and the ‘non-greens’ with high levels of threat perception. Perhaps this mixed positioning offered a sense of balance that was beneficial in health terms. It may be that ‘greens’ have greater levels of knowledge and therefore have a more balanced view of eco-threat.

This brings us to the environmental load approach. From this perspective, which relies heavily on the limited capacity model of attention (e.g. Cohen, 1978; Milgram, 1970), when the amount of information in the environment goes beyond the person’s capacity to process that information - then information overload occurs. The effect of such overload is that some of the input is (selectively) ignored. Two of the four main tenets underpinning Cohen’s (1978) model are perhaps relevant here: that more intense, unpredictable or uncontrollable inputs receive more attention; and that prolonged demands place an undue amount of strain resulting in overload from even small demands. With respect to the after-effect of prolonged demands, Milgram (1970) suggests that the after-effect of overload, from the demands of everyday functioning in large urban areas, results in a situation where peripheral social cues receive less attention and subsequently an aloof attitude towards others develops in people living in such environments. Perhaps this could offer some insight into the category of ‘greens’ with high threat perception. The most disturbances were reported by people who espoused the NEP-R, i.e. ‘greens’ that perceived high levels of threat. This situation is conducive to an incremental notion of awareness and threat. Perhaps by paying attention to the hazards an overload condition occurs but unlike the ‘distancing’ practice observed as an adaptive mechanism in the social context, by being ‘connected’ to the biosphere the ‘greens’ have no protective shield
from the stress associated with the hazard awareness and therefore manifest this stress in sleep disturbance.

That the next highest level of distress was observed in the ‘non-greens’ with low levels of threat is curious. This could perhaps be interpreted in light of the repressor personality characteristic (Fisher et al., 1984). Defined by the denial of the existence of threat and not verbalizing ‘uneasy feelings about a potential danger’. Bell & Byrne (1978) observed, this ‘repressor’ characteristic in those who made an effort to minimize the impact on their lives of environmental damage from flooding. We have already shown how public awareness of health hazards in the environment has increased in Ireland and internationally. The psychological energy invested in suppressing the threat (low levels of eco-threat) and rejecting the emerging pro-ecological worldview (low eco-philosophy) is perhaps taking it’s toll and becoming manifest in non-verbal mechanisms like sleep disturbance. This interpretation receives some support from the buffering effect, observed in the current data, of espousing the new paradigm in the group who reported low eco-threat scores. This interpretation is somewhat related to the view proposing denial-depression as one of the coping styles for handling ‘death of the environment’ (Kets-de-Vries, 1980).

The direct positive effect of applying factorial levels of Eco-threat perception on Somatic symptoms scale scores was impressive in terms of statistical and practical (i.e. effect size and power) significance. The manifestation of stress as somatised representations is a recognised phenomenon (Lask & Fosson, 1989), and all the more interesting, in the present context, when this was not buffered by the effect of ecological world-view (i.e. the lack of an interaction effect). Perhaps this is an interesting finding or perhaps it is simply an artefact of the data, it is therefore a question requiring further research. The main effects of Eco-threat on Anxiety & Dysphoria, and on the GHQ-60 scores were less impressive both in terms of statistical probability and observed power. Nonetheless, given the context, they serve as further confirmation of the utility of the current approach.

Gender effects
Females scored higher than males in the scale measuring Eco-philosophy, suggesting a stronger connection to the biosphere in females. This finding concurs with the eco-
feminist viewpoint (Bragg, 1998) but runs counter to findings from previous studies using the NEP-R. For example, although there is evidence of a weak association between the two variables (Widegren, 1998), being female does not hold predictive value in identifying pro-ecological thinkers (Stern et al., 1995). Accumulated research findings show that women tend to express higher levels of concern toward technology and the environment than do men, but that the tendency is not universal. The findings are particularly clear-cut for local facilities and/or nuclear and other technologies that are often seen as posing risks of contamination; findings appear to be more mixed for broader patterns of environmental concern (Davidson & Freudenburg, 1996). The absence of a gender bias on eco-threat perception is therefore not in line with the general research, or the ‘perceived vulnerability’ hypothesis (Bord & O’Connor, 1997). This finding is possibly best interpreted as yet another inconsistency in the literature perhaps occurring as a function of unexplained underlying dynamics.

When gender was included as a factor in the multi-factorial model, we noted that cell sizes were particularly low in certain instances. Normally the absolute minimum sample required in a cell is the number of dependent variables, in this case seven, however this did not have an impact in the current context as no three-way interactions occurred.

The main effect of Eco-threat on Somatic symptoms, observed earlier, remained significant when the effect of gender was included from the model. This was also the case when the Technological Hazards substituted for the EAI scores in the model. The effect for Technological Hazard level on the Somatic Symptom scores, however, given the significance level (p= .044) and the weak power of the test, would be unlikely to emerge in any but large sample sizes. The implication here is that no benefit accrues from conducting the IPECC analysis on the sub-scales of the EAI scale.

The interaction between Eco-threat and Eco-philosophy remained salient for the Sleep disturbance scores, although the power of the test was considerably reduced. The impact of Gender as a variable was apparent for General Illness, Social Dysfunction, Anxiety and Dysphoria, and GHQ-60 scores. A similar finding of heightened scores for females, was observed when the Technological Hazards, Natural hazards, Everyday Hazards scales were substituted for the EAI 26-item scale.
The higher scores for females, in psychological distress, have precedence in the literature across various groups in different countries. The cause of this difference may not be biological however, rather it may occur as a function of sociological determinants such as social circumstances or personal attributes toward sexual stereotypes (Goldberg & Williams 1991; pp. 71, 81-82).

The interaction effects which occurred for Gender by Eco-threat perception, for the EAI, Technological Hazard, and Natural Hazard scales need to be interpreted in the light of the inequality of error variance across groups that was observed for the Suicidal Depression scores. This strikes a cautionary note particularly in light of the skewed balance of cell size, particularly when females and males are compared in the high threat condition, the small effect size, and low level of observed power.
Findings support the IPECC hypothesis. Concern about environmental issues was demonstrated in this Dublin sample of college students, and the relationship between ecological concern and psychological well-being was shown to be complex. It appears the results confirm the utility of the IPECC Model as a theoretical framework to explore the dynamic between eco-philosophy, threat perception, and psychological well-being. Somatic Symptoms, Sleep disturbance, and Anxiety & Dysphoria sub-scales were elevated in the conditions predicted by the model. The IPECC hypothesis examined the idea that environmental concern is related to perception of self-threat from environmental hazards, and that the interplay of these two variables is related to psychological well-being.

In the last chapter, the construct of general environmental threat perception was expanded to include measurable sub-facets. When these three sub-scales were entered into the current model of environmental and personal well-being, limited evidence of the IPECC phenomenon was observed. It may well be that the constructs, defined by the Technological, Natural and Everyday hazard subscales, were too cohesive to afford the variation required in the analysis. Therefore, the conclusion must be that further research should limit the use of these subscales to a less complex analysis design.

A drawback in this study was that participants were all third-level students, experiencing pressures outside those of interest in the study. That students were sampled from different faculties and different colleges, at a time of year when no examinations were pending, may help ameliorate the impact of college-life stress. However, as the effects observed can be loosely described as symptoms of stress (e.g. sleep disturbance and somatic symptoms) it may be impossible to partial-out the effect from eco-overload. The strongest statement that can be made, therefore, is that the present study shows that environmental concern may have an impact on well-being.
Further study of this phenomenon would require an experimental design, to establish a cause-effect relationship, that controls for stress effects emanating from other sources salient in participant's lives.

What is important in the current findings, however, is that 'eco-overload' is an issue that might be fruitfully addressed in the design of information and education programs addressing environmental issues. Sensationalism and scare mongering in this arena may indeed be more than simply distasteful, or ineffective in terms of changing behaviour. In the present study, people who care about the environment were sometimes personally threatened by hazards in the environment and the combined effect was related to increased sleep disturbance.

Ad-hoc designs of information campaigns and environmental education programs may result in more than ineffective campaigns. What are required are informed design methodologies and a systematic evaluation technique of the impact of educational material from both the behaviour-change dimension and the psychological well-being dimension. Further, it must be recognized that 'repression' and its resultant effects is one mechanism that people may use to cope with ecological information that is perceived as threatening to the self.

Apart from the notion of 'reactance' (i.e. rejection of over-forceful messages) to efforts to change environmentally destructive behaviours, the phenomenon of 'repressive' tendencies may be equally important to the design of behaviour-change interventions. It is important to examine the processes whereby repression of threatening information and reactance to behaviour-change attempts occur. Further research questions arising from the current findings might include:

- Given the limitations of the sample is it likely that these current observations can be generalized?
- What are the roles of knowledge and behaviour in this dynamic between eco-load and well-being?
- Would the construction of threat and philosophy be the same in a younger age group?
CHAPTER FOUR: Eco-Wellness in a Cross-sectional Teenage Sample

4.1 INTRODUCTION

Given the findings of the first study, it was necessary to explore the model of eco-load and distress within a different sample. While it would have been defensible to replicate the study with a larger sample of adults, a more interesting prospect was to focus on a younger age group. Some 50% of the Irish population aged between 14 and 24 years of age were in education in 1989 (O’Donnell, 1993). This is a sizable portion of the national population.

The literature shows that younger people also incorporate environmental awareness into their mental models of the world (Kahn, 1999; Kellert, 1996; Sheehy et al., 2000; Wylie et al., 1996, 1998).

In the 1996 ISPCC/NSPCC report on Irish children, it appears that environmental issues are salient in children’s cognitions (age range 8-15 years). Childhood may well be a crucial time in the establishment of sensitivities and commitment to environmental issues, and children are seen as appropriate agents of change at a family level (Geller, 1989; Wylie et al., 1996).

From a theoretical standpoint however, the issue of construct validity poses questions when moving from an older to a younger age sample. Age development theorists would justifiably criticize the notion of treating children as ‘little adults’. A central issue for the chapter then was to address the question of how the concepts of environmentalism and well-being might be differently defined in this younger age group.

Environmentalism

The conceptual space, relating the person to the environment may be quite different for the teenager and the young adult. Levels of altruism and interest in philosophical
perspectives are heightened at this stage of development. Another distinguishing characteristic is the influence of one's peers at this stage of development would be expected to be greater. So, the motivating forces for environmental consciousness may be different in the adolescent to those salient for young adults. World-view may be more strongly rooted in the public persona at this time of life, rather than the integrated perspective in later stages of development. Therefore the operational definition of environmental consciousness derived for the young adult sample, was revised to include a more concrete measure of environmental attitudes.

Given the proximity in age between the two samples, it was important to maintain a sense of continuity in formulating the relevant operational definitions. In acknowledgement of the recommendation that research techniques should “benefit from the prior measurement efforts of others” (Gray, Borden and Weigel, 1985; p.30), the Children’s Environmental Attitude and Knowledge Scale, CHEAKS, (Leeming, Dwyer & Bracken, 1995), was modelled on the structure and content of an adult scale (Maloney, Ward, and Braucht, 1975) that had been developed to measure ecological knowledge and attitudes. The scale enjoys the reputation of being the best example of a scale intended to measure multiple attitudinal components (Gray et al., 1985). Subsequently the CHEAKS, in addition to assessing ecological knowledge, was constructed to encompass items that relate to major attitudinal components of commitment (verbal and actual), behaviour, and affect. In response to the lack of scales with robust psychometric properties (Leeming et al., 1995), and in an effort to produce a scale to assess the effectiveness of environmental education, the CHEAKS was developed. The scale was reported to have impressive psychometric properties and appears to fill an important gap in this area of research.

In addition to the possible philosophical differences as a function of age, a limitation in the current definition of the construct of environmentalism is the absence of reference to examples of pro-ecological behaviours. For instance, in his view of the relationship between environmental behaviour and well-being Robert Bechtel asserted a positive relationship between the two. One of the examples of appropriate actions and behaviours, offered by Bechtel (1997) was to ‘Engage in every day energy conservation behaviours (e.g. saving water while brushing teeth) that have low individual impact but significant cumulative impact’. This type of behaviour was specifically mentioned in the ‘actual commitment’ items of the Attitude scale on the
CHEAKS. Given this data, we could directly assess Bechtel’s hypothesis that those who engage in proactive behaviours are healthier.

Revision of the construct well-being was also necessary. Self-esteem has sometimes been used as a predictor of psychological distress, however several important criticisms have been proffered (cf. Damon & Hart, 1991) against the use of self-esteem to interpret mental-health problems. Indeed, there has been a lack of empirical support for the self-esteem approach to mental-health. For example Wylie (1979; cited in Damon & Hart, 1991) reports weak or null relationships between self-esteem and social, academic and emotional functioning in the majority of studies. In addition, theories and research focusing on self-esteem have suffered from various conceptual and empirical problems. In isolation, low self-esteem scores do not give any insight into which aspects of self a person finds undesirable, or into whether these aspects are likely to change. Little is known about the substance or stability of this “factor”. It is not sensible to use it as a predictor of psychological adjustment, rather, self-esteem is best seen as a simple outcome or indicator of adjustment (Damon & Hart, 1991).

It has been noted further that the link between mental-health and self-esteem is not linear. Indeed, counter-intuitively it may not always be ‘good’ for adolescents to think well of themselves. Hartup (1983) in a review of literature on peer relations observed that extremes of self-esteem are related to friendship difficulties. An inflated view of the self, even in young children, was perceived as a barrier to maintaining relationships. From a young age, people are not particularly attracted to ‘big-heads’.

Some approaches to self-esteem research have been more considerate of these general problems, however. Rosenberg’s (1985) ‘Self-concept and Psychological well-being in adolescence’ and Harter’s (1983) ‘The development of the self and the self-system’ are two examples of what Damon & Hart (1991) consider exceptions to the tendency to treat self-esteem global scores as representations of a person’s self-concept (e.g. Coopersmith, 1967).

Another measure in this school of thought is the Piers Harris measure of self-concept. This measure offers a broader perspective on the self and is in line with seminal views in the area “Our belief in the centrality of the underlying understanding of self, rather
than on self-esteem, is shared by clinicians who employ a cognitive-therapy approach" (Damon & Hart, 1991; p.143). Offering six dimensions of the self alongside a global measure of self-concept the instrument was designed to identify difficulties in psychological well-being.

While self-esteem has been presented as a buffering agent against psychological ills the issue of it’s measurement comes into focus here. Various measures afford an operational definition of the construct, however the Piers Harris was specifically designed to measure psychological difficulties. This is defined as a state measure and yields, not only a global measure, well defined and validated, but also six clusters of items defining various aspects of the person. In the current context, it has been presented as an outcome measure.

Within the context of adapting the IPECC model for this study, by replacing the NEP-R (as no norms are available for this age group) by CHEAKS what difference might be expected to occur? Well, the NEP-R measures fundamental beliefs – a worldview, how connected one feels to the biosphere – a philosophical perspective. CHEAKS on the other hand is about attitudes, about specific aspects of environmental consciousness. Such attitudes are perhaps operating at a more superficial level of cognitive analysis. So, eco-threat / risk perception should be less strongly related to these attitudes than the beliefs. Consequently, the CHEAKS responses should be more open to resistant mechanisms, for example peer norms, than the responses for the NEP-R measuring beliefs that are more fundamental.

Aims of second study
The principal aims of the study were therefore to develop a methodology whereby relationships between environmental and personal well-being constructs can be explored in young people. Secondly, to explore the research questions illuminated by the findings of the first study, and thirdly, to investigate the functionality of the Optimal Mark Recognition OMR software for data collection.
Research questions
What are the psychometric properties of the instrument used?
How are the various aspects of environmentalism related?
How do the various aspects of personal well-being interact?
Do those who engage in proactive behaviours enjoy better health?
Does threat perception predict environmental behaviour?
Does the IPECC phenomenon, as specified in its current state, occur in a younger age group?
Can the IPECC model be applied to other operational definitions of the substrates of environmentalism and personal well-being?
How viable is the use of OMR software in this type of study?

Experimental Hypotheses
1. The IPECC model (that threat perception predicts well-being but is moderated by philosophy) will afford explanatory power within this younger age group.
2. The substrates of the IPECC model will be variable, and CHEAKS combined with EAI will have different health implications than NEP-R combined with EAI.
3. Eco-threat (EAI scores) will be a significant predictor of environmental behaviour (CHEAKS Commitment scores).
4. High commitment, compared to Low commitment scores will be associated with higher self-esteem and lower psychological distress scores.
4.2 METHOD

Sample
The students in the convenience sample constituted the members of the transition year program in two second-level schools, both with religious affiliations, situated in different areas in the capital city Dublin. A total of 166 students, (56 females and 110 males), drawn from the two single-sex secondary schools completed the survey. The males attended Belvedere College, a school was situated in the North inner city, and the female students attended St. Benildus College, situated in the suburbs of South Dublin. Valid protocols from 160 participants, 52 females and 108 males, aged between 15 and 16 years of age were utilized in the analysis.

Construct Definition
Given the difference in age between samples in this and the previous study, and in light of the nature of the research questions it was deemed necessary to augment the operational definitions of environmentalism and well-being here. As the constructs of threat perception and philosophy remained seminal, we retained their extant operational definitions here. Given the simplicity of the language used in the scales (EAI and NEP-R) this was deemed appropriate. A series of consultations with educational experts facilitated this decision process.

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24 Transition Year is generally the fourth year at second level in the Republic of Ireland. Students have completed the Junior Cycle and have not yet embarked on the Senior Cycle. Not all schools offer the program to the students, and the program curriculum is developed by each school under broad guidelines issued by the Department of Education. A network of teachers participating in the program has been established under the auspices of the Blackrock Educational Centre, a government funded teacher training body. The transition year program offers a variety of experiences to the student including work experience.
It was necessary, to include the concepts of eco-knowledge and eco-behaviour within the model in order to examine the questions arising from the first study. In keeping with the fundamental aim of maximizing empirical power, a review of the literature yielded a measure of general Environmentalism specifically designed and standardized for children. This scale, the CHEAKS (Leeming et al., 1995), yields a total score to represent general environmentalism and contains sub-scales to measure Attitude and Knowledge. The Attitude section contains equal numbers of items relating to Affect, Verbal commitment (behavioural intentions) and Actual commitment (behaviour).

The construct of psychological distress was also expanded in this design. It may well be that psychological distress would manifest in a different way in a younger sample. Children tend to somaticise their psychological distress differently than adults (Lask & Fosson, 1989), but they may also express their distress in behavioural difficulties and adjustments to their self-concept. Consequently, we incorporated a measure of self-concept into the model of well-being. Following a review of the literature the Piers Harris Scale was identified as the most relevant measure. Total scores were used to represent a global measure of self-concept. Sub-scale scores were used to identify manifestations of distress in six distinct areas including Behavioural difficulties, Intellectual and School Status and Happiness and Satisfaction. Given the nature of the constructs encapsulated in the two salient GHQ sub-scales, in the previous study, we retained the Somatic Symptoms and Sleep disturbance scales from the GHQ-60 as measures of psychological distress.

Design

The experimental design of this second study mirrored that of the first study, with respect to the multi-method framework. A quasi factorial design was formulated on the basis of within group categories defined by median split scores on the environmental variables, EAI, NEP-R, CHEAKS total, CHEAKS attitude, and CHEAKS knowledge. The dependent variables were the health related scores from the Piers Harris Self-Esteem total scale, the six sub-scales Behaviour, Intellectual and
School Status, Physical Appearance, Anxiety, Popularity, Happiness and Satisfaction; and the GHQ-60 subscales of Sleep Disturbance and Somatic Symptoms. Reliability and validity analyses for each of the scales were conducted, along the same lines set out in previous chapters.

Ethical considerations
Prior to data collection, consent forms were signed, in *locus parentis*, by the school Principals (Appendix B). This was deemed appropriate given the minimal risk, to the participants because of being associated with the study, and the provision of open discussions following data collection that would serve as de-briefing sessions.

*Materials*

In an attempt to streamline the data collection process, Optimal Mark Recognition (OMR) Technology was applied in this study. Theoretically, this technology can eliminate the keypunching stage of data processing and given the sample size planned for the third study of the project it was prudent to experiment with the technology in a smaller sample initially. The design of the questionnaire therefore required substantial adaptation from that of the first study. These adaptations were made using specialised equipment under the supervision of experts in the field, in particular Mr. Jim Laragy and Mr John Soye, employed at the Information Services Department in TCD. Given the experimental nature of the research instrument, we included a report form to be completed by each of the teachers (see Appendix E) during the administration period. This would serve as an objective criterion for evaluating the technical aspects of the questionnaire.

*Research Instrument*

The survey questionnaire comprised: a cover letter (see Appendix C), 197-items from six standardized scales, items to elicit demographic details, and some open-ended questions (see Appendix D). Environmental constructs measured by the questionnaire were: Eco-threat perception (EAI), Eco-philosophy (NEP-R), and General Environmentalism (CHEAKS). Constructs related to Health were Psychological
distress (Somatic Symptoms and Sleep Disturbance subscales of the GHQ-60) and Self-concept (Piers-Harris). Project specific details of the scales are as follows.

The EAI
The 26-item version of EAI Self scale, validated in the first study (see Chapter 2), was used in the current study. The total score was computed by summing scores for each individual item on the scale.

The NEP-R
The 15-item version of NEP-R scale, validated in the first study, was used in the current study. Once again, reverse coding was applied as specified and the total score was computed.

The GHQ-60 Sub-scales
Two five item subscales to measure Somatic Symptoms, and Sleep Disturbance, validated in the first study, were employed in this study. While the GHQ, was not developed for use with children, several researchers (e.g. Mann et al., 1983; Darcy & Siddique, 1984; Weyerer, Elton & Fichter, 1986; all cited in Goldberg & Williams, 1991) appear to have used it successfully with adolescents. Likert-type scoring was used and total scores for each of the scales were computed.

The Piers-Harris Scale
The Piers-Harris Children’s Self-Concept Scale, subtitled ‘The Way I Feel About Myself’ represents a brief, self-report measure used to assess self-concept in children and adolescents. The construct, which this scale measures, has been defined as a “... relatively stable set of self-attitudes reflecting both a description and an evaluation of one’s own behaviour and attributes” (Piers, 1996; p.1). Scale items are presented with dichotomous ‘yes’, ‘no’, response options and are scored in either a positive or negative direction to reflect stability in self-evaluation. A high score on the scale suggests a positive self-evaluation while a low score is indicative of a negative self-evaluation. The Piers-Harris is a direct measure of children’s conscious self-perceptions given by the children themselves, rather than indirect assessments or inferences (ibid). This view is consistent with Wylie’s (1974) phenomenological view of ‘self-concept’ and is held to be interchangeable with the terms ‘self-esteem’ and
‘self-regard’. The 80 items incorporated in the original scale were included with minor adaptations to address cultural differences. These changes (see Appendix F) were guided by a normative study, with a slightly younger sample, conducted in Dublin (Harris, 1996). Within the procedures set out in the scale manual, six cluster scores were computed to measure Behaviour, Intellectual and School Status, Physical Appearance and Attributes, Anxiety, Popularity, Happiness and Satisfaction.

The CHEAKS
The 66-item CHEAKS provides a measure of Environmentalism with two substrate components tapping Attitudes and Knowledge. The Attitude sub-scale comprises 36 items that measure students’ attitudes towards environmental issues reflecting verbal commitment, actual commitment, and affect (12 items for each dimension). The Knowledge sub-scale comprises 30 items. The total scale score is derived from a combination of the scores obtained on the attitude and knowledge scales. The attitude scale items are presented in a 5-point Likert-type response format (‘very true’, ‘mostly true’, ‘not sure’, ‘mostly false’ or ‘very false’). Nine of the attitude items, three in each section, are negatively connoted and reverse scored to reduce the likelihood of student response set. The most pro-environmental response to each item is awarded 5 points, whereas the least environmental response is given a 1-point credit. Possible scores on the Attitude sub-scale range between 36 and 180, inclusive. For the 30 knowledge questions, correct responses receive a 6-point credit; therefore, possible scores range from zero to 180. Subsequently, possible scores on the CHEAKS Total Scale range from 36 to 360, with higher scores indicating combined positive attitudes and increased knowledge. This 66-item scale underwent minor alterations to adjust for cultural sensitivities. These changes (see Appendix G) were made after consultation with appropriate educational specialists. Within the guidelines given by the author, sub-scale totals were computed to measure Attitudes (the sum of Affect, Verbal Commitment, and Actual Commitment), and Knowledge.
Procedure

Following representations to the Department of Education, we made contact with the network of Transition year teachers via the Blackrock Education Centre (BEC). This publicly funded organization had the ability to facilitate access to individual teachers in schools. This involved a series of meetings with the director of the centre and the national co-ordinator of the transition year program. Through mediation of a friend employed as a teacher, the Principal in a girl’s secondary school was contacted. In consultation with the director of the BEC, one boy’s school was chosen, and the relevant parties, teachers and school principal, were approached through a series of telephone calls.

Questionnaire administration

On the scheduled day, questionnaires were distributed during class time to classes of students, located in adjoining classrooms. The teachers involved in administration were given standardized instructions in a group meeting that took place immediately prior to administration. Then, teachers distributed the questionnaires under supervision of the researcher who visited each classroom on a cyclical basis. A report form was completed by each of the teachers (see Appendix E) during the administration period. This was included to highlight any administrative difficulties that might emerge.

De-briefing

Following survey completion, class discussion was facilitated around the topics examined in the survey, research methods, and psychology as a discipline. The nature of these discussions varied from class to class. At the end of the data collection period, the co-operation of the academic staff was formally acknowledged in writing.
4.3 RESULTS

Data preparation

Raw data was entered into a series of pre-defined DOS based files via an automated laser-read machine. These files were then transported into a statistical package SPSS and coded in line with established criteria for each of the scales in preparation for analysis.

Missing data

As detailed below, there were considerable problems regarding missing data. Automated data entry problems were numerous and required manual checks on all the protocols before the true profile of missing data in the set could be assessed. Once this process had been completed, missing value analysis was conducted within the MVA procedure of SPSS.

Preliminary examination of the raw data indicated the possibility of problems ensuing from missing data in the set. It was prudent therefore to specify a procedure to deal with the issue. We were guided by two principle sources: writings of Hair and colleagues (Hair et al, 1998), and advice from Dr. Myra O'Regan, in the Department of Statistics here at Trinity College Dublin.

In light of this advice, we established two principle points. No case with missing values on more that half of the variables of interest would be included. Secondly, if the extent of missing data were substantial only protocols with 90% of items with valid responses on a scale would be included in the sample. Thirdly, sum scores would be calculated by first calculating an average score, using the number of items answered in any given scale as the denominator, then multiplying the average score by the number of items contained in the scale to get the corrected sum score.

Firstly, by eliminating cases with more than 50% of the data missing ensures a more valid sample and reduces the number of missing cases when analyses across variables
is to be conducted. Secondly, the inclusion of cases with 90% or more of data points present increases the internal validity of the scale total scores. Thirdly, using the summation method outlined above ensures that the scores are more reliable without compromising the variation in scores, a problem ensuing from the more common methods of imputation (e.g. mean replacement) used to address the problem of missing data.

Application of the first principle resulted in the removal of four cases. Following exclusion of four cases, the sample size was 160.

Summary statistics for each of the variables of interest are presented in Table 4.1. Stage 1 refers to the data set after the initial procedure for addressing the missing data issue had been implemented. Stage 2 refers to the data set after the second and final procedure for addressing the missing data had been implemented. As can be seen from the two columns depicting the spread of missing data, at Stage 1 the extent of the problem ranged from a high of 42.5% on variable 12 (Self Esteem) to a low of 0.0% on variables 6 through 11.
The percentage of missing data for all the other variables fell below 30% and therefore did not warrant exclusion at this stage. The extent of missing data on variable 12, however, required further examination.

Table 4.1: Details for all variables across missing data process

<table>
<thead>
<tr>
<th>Variable</th>
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</tr>
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<td>SD</td>
<td>N</td>
<td>%</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Stage 2</td>
<td>%</td>
<td>%</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>2.5</td>
<td>19.4</td>
<td>129</td>
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<tr>
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<td>8.35</td>
<td>159</td>
<td>.6</td>
<td>14.4</td>
<td>137</td>
</tr>
<tr>
<td>3. Eco-Attitude</td>
<td>97.07</td>
<td>21.68</td>
<td>160</td>
<td>.0</td>
<td>27.5</td>
<td>116</td>
</tr>
<tr>
<td>4. Eco-Knowledge</td>
<td>123.21</td>
<td>22.97</td>
<td>158</td>
<td>1.3</td>
<td>28.8</td>
<td>114</td>
</tr>
<tr>
<td>5. Eco-Self</td>
<td>229.72</td>
<td>35.37</td>
<td>154</td>
<td>3.8</td>
<td>10.6</td>
<td>143</td>
</tr>
<tr>
<td>6. Behaviour</td>
<td>12.38</td>
<td>3.04</td>
<td>160</td>
<td>.0</td>
<td>0</td>
<td>160</td>
</tr>
<tr>
<td>7. Intellect and School Status</td>
<td>11.37</td>
<td>3.08</td>
<td>160</td>
<td>.0</td>
<td>0</td>
<td>160</td>
</tr>
<tr>
<td>8. Physical Appearance</td>
<td>8.51</td>
<td>2.97</td>
<td>160</td>
<td>.0</td>
<td>0</td>
<td>160</td>
</tr>
<tr>
<td>9. Anxiety</td>
<td>9.29</td>
<td>2.98</td>
<td>160</td>
<td>.0</td>
<td>0</td>
<td>160</td>
</tr>
<tr>
<td>10. Popularity</td>
<td>8.83</td>
<td>2.21</td>
<td>160</td>
<td>.0</td>
<td>0</td>
<td>160</td>
</tr>
<tr>
<td>11. Happiness and Satisfaction</td>
<td>8.02</td>
<td>1.82</td>
<td>160</td>
<td>.0</td>
<td>0</td>
<td>160</td>
</tr>
<tr>
<td>12. Self-Esteem</td>
<td>58.81</td>
<td>9.20</td>
<td>160</td>
<td>.0</td>
<td>42.5</td>
<td>92</td>
</tr>
<tr>
<td>13. Sleep Disturbance</td>
<td>3.45</td>
<td>3.23</td>
<td>150</td>
<td>6.3</td>
<td>6.3</td>
<td>150</td>
</tr>
<tr>
<td>14. Somatic Symptoms</td>
<td>2.39</td>
<td>2.8570</td>
<td>155</td>
<td>3.1</td>
<td>3.1</td>
<td>155</td>
</tr>
</tbody>
</table>

Totals for these variables were re-computed (as specified above) using a 10% ceiling for missing data points on all scales. This would ensure that total scores were only computed for cases with at least 90% valid responses on any scale. While we were cognisant that the authors of the CHEAKS scale recommended exclusion of any case where less than 50% of data was present for any subscale of the questionnaire, given the size of the protocol PEHQ, and the nature of the research questions to be explored in this data set, we decided to adopt a more conservative approach in line with Hair and colleagues (Hair et al., 1998).
The second part of Table 4.1 summarises the statistics for the cases (Stage 2) with valid values (i.e. at least 90% of data points present on a scale) including the percentage of cases with missing data on each variable.

Following application of this second part of the proscribed procedure the highest incidence of missing data occurred for variable 13 (Sleep Disturbance) at a rate of 6.3%.

The change in mean scores was slight for all variables and no substantial change in dispersion emerged because of the intervention, with any change in standard deviations being miniscule.

Given this general improvement all of these 160 protocols were included for further analysis.

**Descriptive statistics**

Valid protocols from 160 students were used in the analysis. Within the sample, the majority reported both parents working, 30% had one parent working 4.4% had no parent working and 4.4% chose not to give answers to these questions. The majority of the sample was male and 70.5% of the boys came from homes with both parents working while only 50% of girls had the same experience. Four girls (8.3%) and three boys (2.9%) stated that neither of their parents was employed.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Transition Year Sample (Study 2)</th>
<th>University Sample (Study 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean</td>
</tr>
<tr>
<td>1. EAI</td>
<td>156</td>
<td>81.08</td>
</tr>
<tr>
<td>2. NEP-R</td>
<td>159</td>
<td>52.99</td>
</tr>
<tr>
<td>3. Sleep Disturbance</td>
<td>150</td>
<td>3.45</td>
</tr>
<tr>
<td>4. Somatic Symptoms</td>
<td>155</td>
<td>2.39</td>
</tr>
</tbody>
</table>

Comparing the descriptive statistics for this sample with the relevant variables examined in the previous study, (see Table 4.2) we noticed a broad similarity on
central tendency and dispersion. Of particular interest were the higher EAI scores and lower NEP-R scores.

Somatic symptoms reached a similar level in this sample but sleep disturbance was less evident. The levels of skew in the distribution were particularly high for the NEP-R and Somatic Symptoms scores when compared to the data from the first study. As the skew statistic in the Somatic Symptoms scores was well above the value of one (SPSS help file recommends this as the acceptable level for normal distribution) and given that this variable would be employed as a dependent variable in the model, these scores were transformed using the log function. To effect this procedure, each total score was increased by 10 points, and then the log of these scores was computed. The result was a substantial reduction in skewness to 1.28, an increase of 10-points to the mean score and no change in the standard deviation.

Scale validity and reliability

The Piers Harris Scale

The internal consistency of this scale was assessed computing Cronbach’s alpha coefficients, and item-total correlations for each of the sub-scales were examined to assess the utility of retaining the scale title. In addition, we compared the means and standard deviations of the sample with that of the larger normative sample, for the same age group, to assess the suitability of sub-scale retention.

Comparison of current data with results from the normative sample

In the last column of Table 4.3, values of Cronbach’s alpha coefficients for each of the subscales are contrasted with figures reported for the normative sample (n=247) of 15-16 year olds (Piers, 1996: WPS Test Report, Table D; p.108). Values ranged from .63 to .86 compared to the published range of .73 to .90. In each case, the alpha value was lower than the corresponding value for the normative sample. For the sixth subscale, the 10-item Happiness and Satisfaction scale, the reliability coefficient was the lowest of all the scales, as was the case in the past. For the entire 80-item scale, the reliability coefficient was again similar to the published figure.
In each of the six cases, items with the largest item-total correlations suggested a satisfactory correspondence with the original report and supported retention of the scale titles.

Means and standard deviations are also presented in Table 4.3, by comparison with the normative sample, the Irish sample scored in a similar fashion across all scales.

Table 4.3: Means and Standard Deviation (SD) scores for the present and normative samples

<table>
<thead>
<tr>
<th>Scale</th>
<th>Mean</th>
<th>SD</th>
<th>Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Score</td>
<td>58.81</td>
<td>9.20</td>
<td>.86</td>
</tr>
<tr>
<td>(80 items)</td>
<td>55.6*</td>
<td>11.9</td>
<td>.90</td>
</tr>
<tr>
<td>1. Behaviour</td>
<td>12.38</td>
<td>3.04</td>
<td>.76</td>
</tr>
<tr>
<td>(16 items)</td>
<td>12.2</td>
<td>3.3</td>
<td>.81</td>
</tr>
<tr>
<td>2. Intellectual and School Status</td>
<td>11.37</td>
<td>3.08</td>
<td>.67</td>
</tr>
<tr>
<td>(17 items)</td>
<td>10.9</td>
<td>3.5</td>
<td>.78</td>
</tr>
<tr>
<td>3. Physical Appearance and Attributes</td>
<td>8.51</td>
<td>2.97</td>
<td>.73</td>
</tr>
<tr>
<td>(13 items)</td>
<td>8.1</td>
<td>3.5</td>
<td>.76</td>
</tr>
<tr>
<td>4. Anxiety</td>
<td>9.29</td>
<td>2.98</td>
<td>.72</td>
</tr>
<tr>
<td>(14 items)</td>
<td>10.0</td>
<td>3.2</td>
<td>.77</td>
</tr>
<tr>
<td>5. Popularity</td>
<td>8.83</td>
<td>2.21</td>
<td>.67</td>
</tr>
<tr>
<td>(12 items)</td>
<td>8.7</td>
<td>2.5</td>
<td>.74</td>
</tr>
<tr>
<td>6. Happiness and Satisfaction</td>
<td>8.02</td>
<td>1.82</td>
<td>.63</td>
</tr>
<tr>
<td>(10 items)</td>
<td>8.0</td>
<td>2.1</td>
<td>.73</td>
</tr>
</tbody>
</table>

*Note: numbers in italics refer to means and standard deviations for 15-16 year olds in 1996 WPS Test Report Sample (adapted from data presented by Piers, 1996; Table D, p.108)

Dimensionality of the EAI

To explore the sub-structures within environmental hazard perception in this teenage sample we conducted a 3-factor confirmatory analysis using Maximum Likelihood extraction and VARIMAX rotation. Within the parameters set out earlier (see Chapter 2), the data was deemed suitable for the procedure. The scree analysis attested the utility of the three-factor model.

Using the established criteria for factor loading (i.e. principal factor loading of .50 and a difference of at least .20 on subsequent factor loadings) items selected for the factors are shown in Table 4.4. The first factor loaded 14 items, the second factor five, and the third factor two items.
Table 4.4: Three-factor solution for the 26-item EAI scale

<table>
<thead>
<tr>
<th>Scale item</th>
<th>Factor 1</th>
<th>Factor 2</th>
<th>Factor 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 Chemical dumps</td>
<td>.824</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Pollution from factories</td>
<td>.764</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 Change to ozone caused by pollution</td>
<td>.762</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14 Radioactivity in building materials</td>
<td>.725</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Pollution from burning rubbish</td>
<td>.711</td>
<td></td>
<td></td>
</tr>
<tr>
<td>26 Pesticides and herbicides</td>
<td>.709</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22 Radioactive fallout</td>
<td>.637</td>
<td>.417</td>
<td></td>
</tr>
<tr>
<td>9 Number of people (e.g. crowding, population explosion)</td>
<td>.635</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Acid rain</td>
<td>.629</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18 Impure drinking water</td>
<td>.605</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Water pollution</td>
<td>.576</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17 Soil erosion</td>
<td>.575</td>
<td>.304</td>
<td></td>
</tr>
<tr>
<td>23 Fumes or fibres from synthetic materials (e.g. asbestos, carpets, plastics)</td>
<td>.554</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19 Large fires</td>
<td>.470</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Storms (e.g. lightning, hurricanes, tornadoes)</td>
<td></td>
<td>.639</td>
<td></td>
</tr>
<tr>
<td>10 Fluorescent lighting</td>
<td>.596</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 Noise</td>
<td></td>
<td>.503</td>
<td></td>
</tr>
<tr>
<td>25 Video screen emissions</td>
<td></td>
<td>.481</td>
<td></td>
</tr>
<tr>
<td>8 Pollution from office equipment</td>
<td></td>
<td>.476</td>
<td></td>
</tr>
<tr>
<td>16 Earthquakes</td>
<td></td>
<td></td>
<td>.857</td>
</tr>
<tr>
<td>20 Floods or tidal waves</td>
<td></td>
<td>.383</td>
<td>.848</td>
</tr>
</tbody>
</table>

The first factor loaded the items to do with major global hazards. The second factor seems to be predominantly composed of everyday hazards, while the third factor had items to do with natural environment hazards.

Reliabilities of environmental scales and GHQ sub-scales
To examine the internal reliabilities for each of the other scales we also computed Cronbach’s Alpha statistics.
All of the total scales demonstrated impressive levels of consistency (see Table 4.5), with coefficients ranging from .77 to .92.

Table 4.5: Correlations between scale scores and internal reliabilities for each total scale.

<table>
<thead>
<tr>
<th></th>
<th>EAI</th>
<th>NEP-R</th>
<th>CHEAKS</th>
<th>Self-esteem</th>
<th>Sleep</th>
<th>Somatic</th>
</tr>
</thead>
<tbody>
<tr>
<td>EAI</td>
<td>.92#</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NEP-R</td>
<td>.207**</td>
<td>.77</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHEAKS</td>
<td>.142*</td>
<td>.501**</td>
<td>.81</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-est</td>
<td>-.068</td>
<td>-.047</td>
<td>.157</td>
<td>.86</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sleep</td>
<td>.166*</td>
<td>-.016</td>
<td>-.121</td>
<td>-.340**</td>
<td>.79</td>
<td></td>
</tr>
<tr>
<td>Somatic</td>
<td>.012</td>
<td>-.196</td>
<td>-.174*</td>
<td>-.323**</td>
<td>.484**</td>
<td>.78</td>
</tr>
</tbody>
</table>

* Correlation is significant at the 0.05 level (2-tailed).
** Correlations are significant at the 0.01 level (2-tailed).
# Cronbach's alpha coefficients for scale reliability are on the diagonal.

Internal consistency of the Sleep Disturbance scale (.79) and the Somatic Symptoms scale (.78) were higher than those reported in the first study of the project where the coefficient was .71 in both instances.

Internal consistency levels for the CHEAKS (see Table 4.6) scales were also satisfactory with all but one of the sub-scales reaching the recommended level (Bryman & Cramer, 1997). This was the 12-item CHEAKS Actual Commitment (alpha = .49).

Table 4.6: Inter-correlations between CHEAKS subscales

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>.668**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>.664**</td>
<td>.577**</td>
<td>.49</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>.649**</td>
<td>.448**</td>
<td>.697**</td>
<td>.85</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>.745**</td>
<td>.788**</td>
<td>.853**</td>
<td>.860**</td>
<td>.87</td>
</tr>
<tr>
<td>5.</td>
<td>.820**</td>
<td>.207**</td>
<td>.279**</td>
<td>.346**</td>
<td>.349**</td>
</tr>
</tbody>
</table>

* Correlation is significant at the 0.05 level (1-tailed).
** Correlations are significant at the 0.01 level (1-tailed).
# Cronbach's alpha coefficients for scale reliability are on the diagonal in bold.
Scale Correlations and Discriminant and Convergent Validity

To explore the issue of discriminant and convergent validity, correlation coefficients between the total scale scores were computed. It was expected that the scores from the EAI, NEP-R, and CHEAKS scales would be correlated with each other in line with the construct of 'environmentalism', and that the scores from the Sleep Disturbance and Somatic Symptoms would be positively related and both would show negative co-relationships with Self-concept scores. Perusal of the data presented on Table 4.5 suggests the total scores from the environmental scales were correlated with each other to a highly significant level. In addition, the EAI scores correlated significantly with the CHEAKS Attitude scores (r=. 228, p< .01), Verbal Commitment scores (r=. 290, p< .001), and Actual Commitment scores (r=. 195, p< .01). The NEP-R scores were positively related to CHEAKS Attitude scores (r=. 412, p< .001), Verbal commitment scores (r=. 477, p< .001), Actual commitment scores (r=. 342, p< .001), Affect scores (r=. 249, p< .01), and Knowledge scores (r=. 256, p< .01).

This convergent validity was also observed for the 'well-being' construct, evidenced by the strength of the association between the Sleep Disturbance and Somatic Symptom scale scores, and in turn their negative correlation with Self-esteem scores (see Table 4.8). In addition, positive significant correlations between the Piers-Harris subscales were observed (see Table 4.7).

Table 4.7: Inter-correlations between Piers-Harris subscales, with alpha values on diagonal

<table>
<thead>
<tr>
<th></th>
<th>Total scale</th>
<th>1.</th>
<th>2.</th>
<th>3.</th>
<th>4.</th>
<th>5.</th>
<th>6.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Behaviour (16-items)</td>
<td>.531**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Intellectual and School Status (17-items)</td>
<td>.585**</td>
<td>.411**</td>
<td>.67</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Physical Appearance and Attributes (13-items)</td>
<td>.536**</td>
<td>.093</td>
<td>.475**</td>
<td>.73</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Anxiety (14-items)</td>
<td>.696**</td>
<td>.206**</td>
<td>.515**</td>
<td>.489**</td>
<td>.72</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Popularity (12-items)</td>
<td>.509**</td>
<td>.059</td>
<td>.363**</td>
<td>.596**</td>
<td>.535**</td>
<td>.67</td>
<td></td>
</tr>
<tr>
<td>6. Happiness and Satisfaction (10-items)</td>
<td>.633**</td>
<td>.202*</td>
<td>.446**</td>
<td>.607**</td>
<td>.679**</td>
<td>.391**</td>
<td>.63</td>
</tr>
</tbody>
</table>
The expected divergence across scales from the two constructs was also evident with EAI and Sleep Disturbance scores being weakly correlated, and the relationship between the EAI and Somatic Symptoms failed to reach the 5% level of significance. The CHEAKS total score was related negatively to the Somatic Symptom scores.

*Links between ‘environmentalism’ and ‘well-being’*

To explore the research hypothesis of links between environmentalism and well-being, correlation coefficients across each of the scales and their constituent sub-scales were computed. At the offset (see Table 4.6 and Table 4.7), it was clear that the majority of subscales were all significantly correlated within their own domains. Of more immediate interest were the relationships that crossed domains, and those of which exceeded the 5% level of significance are tabulated in Table 4.8.

Table 4.8: Significant Pearson Correlation coefficients for all 16 scales

<table>
<thead>
<tr>
<th></th>
<th>Somatic Concept</th>
<th>Sleep</th>
<th>Self-concept</th>
<th>Behaviour</th>
<th>Intellectual &amp; School Status</th>
<th>Physical Appearance &amp; Attributes</th>
<th>Anxiety</th>
</tr>
</thead>
<tbody>
<tr>
<td>EAI</td>
<td>.166*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NEP-R</td>
<td>-.196**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.130*</td>
</tr>
<tr>
<td>Verbal Commitment</td>
<td>-.236**</td>
<td>.156*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Actual Commitment</td>
<td>.127*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attitude</td>
<td>-.163*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge</td>
<td>.154*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.149*</td>
</tr>
<tr>
<td>CHEAKS</td>
<td>.157*</td>
<td>.163*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

From the relationships depicted in Table 4.8, the EAI scores were related to Sleep Disturbance scores. The NEP-R scores were negatively related to the Somatic symptoms, and Anxiety scores. Verbal commitment scores were negatively related to the Somatic symptoms, and positively to the Behaviour scores. Actual commitment scores were positively related to Intellectual and School Status scores, and to a lesser extent to Self-concepts scores. Attitudes sub-scale scores (the sum of Verbal commitment, Actual commitment and Affect scores) were negatively related to Sleep...
disturbance scores and positively to Intellectual and School Status scores. Knowledge scale scores were positively related to Intellectual and School Status scores, Self-concept scores, and Anxiety scores. Finally, CHEAKS total scores were positively related to Self-concept, Behaviour, and Intellectual and School Status scores.

*IPECC Factorial Model variations*

To further explore the salience of the IPECC model, scores were initially computed for the scales that proved salient in the past. Then, the Self-esteem scores were entered into the model, firstly, as covariates and then to the variate of dependent scores. The constituents of the factors were next varied to combine EAI and CHEAKS scores, then NEP-R, and CHEAKS scores. The dependent variate consisted of each of the Piers Harris scores, the Sleep Disturbance scores and the log transformed Somatic Symptoms scores. For ease of reading, these log-transformed scores will be referred to as Somatic Symptoms scores.

The effects of EAI by NEP-R on Somatic Symptoms and Sleep Disturbance scores:

To explore the IPECC hypothesis, usefully applied to data from the older age group, a MANOVA was conducted with Somatic Symptoms and Sleep Disturbance scores as the dependent variables and EAI and NEP-R scores, split at the median, were entered as the independent variables. No effects emerged at either the multivariate or univariate level of testing.
Self-esteem scores as a covariate in the model

One way to explore the mediating effect of Self-esteem and CHEAKS scores on the model was to enter them as covariates. It was first necessary to assess their suitability in this regard. A covariate should be related to the dependent variable (DV) but not to the independent variable (IV).

| IV EAI: possible covariates are Attitudes, CHEAKS |
| IV NEP-R: possible covariates are Attitudes, Knowledge, CHEAKS |
| DV Sleep Disturbance: possible covariates are Self-esteem, Behaviour, Intellectual, Physical, Anxiety, Happiness |
| DV Somatic Symptoms: possible covariates are NEP-R, Attitudes, CHEAKS, Self-esteem, Behaviour, Anxiety |

Figure 4.1: Suitability of covariates for GHQ scores as dependent variables

In Figure 4.1 the combination of relationships are set out. This in effect ruled out any of the CHEAKS scales as covariates in the model. When the effect of the appropriate Self esteem scores were statistically controlled within a MANCOVA, no significant effects emerged on the dependent variables. The next step was to include the Self-concept measures in the dependent variate.

When Self-esteem scores were included in the dependent variate, no multivariate effects or univariate effects emerged in the analysis.

Substitution of CHEAKS for NEP-R

To explore the hypothesis that the CHEAKS may be a more salient operational measure of environmental view in this younger age group, the Factorial model was adapted to substitute CHEAKS scores for NEP-R scores. In this analysis, given the low internal consistency observed in the Actual commitment scale, the Attitude scale total was employed rather than using its constituent parts. The dependent variate comprised all the well-being scale scores.
Within this analysis, several significant effects emerged, and are presented, along with the associated F statistic, p value, estimate of effect size and Power in Table 4.9. Cell means and cell sizes are also given.

Table 4.9: Results of MANOVA with EAI and CHEAKS scores

<table>
<thead>
<tr>
<th>Model I vs</th>
<th>Effect</th>
<th>IV (s)</th>
<th>DV</th>
<th>F (df)</th>
<th>Sig.</th>
<th>Eta^2</th>
<th>Power</th>
<th>Mean*</th>
<th>SD</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>EAI &amp; CHEAKS</td>
<td>Main</td>
<td>CHEAKS</td>
<td>Intellectual and School Status</td>
<td>5.74 (1,136)</td>
<td>.018</td>
<td>.041</td>
<td>.66</td>
<td>10.94</td>
<td>12.10</td>
<td>2.95</td>
</tr>
<tr>
<td>Attitude</td>
<td>Main</td>
<td>Attitude</td>
<td>Intellectual and School Status</td>
<td>5.867 (1,141)</td>
<td>.017</td>
<td>.040</td>
<td>.67</td>
<td>10.96</td>
<td>12.07</td>
<td>3.00</td>
</tr>
<tr>
<td>Knowledge</td>
<td>Main</td>
<td>Knowledge</td>
<td>Anxiety</td>
<td>4.422 (1,139)</td>
<td>.037</td>
<td>.031</td>
<td>.55</td>
<td>8.76</td>
<td>9.86</td>
<td>3.01</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Happiness</td>
<td>4.778 (1,139)</td>
<td>.031</td>
<td>.033</td>
<td>.58</td>
<td>7.77</td>
<td>8.48</td>
<td>1.94</td>
</tr>
</tbody>
</table>

* Below-median scores are presented before Above-median scores
#IV = Independent variables

EAI*CHEAKS

Group sizes were all above 30. Equal covariance (Box’s M) was observed across dependent variate. No multivariate effects emerged. Unequal error variance was detected by the Levene’s Test on Popularity (F (3,136)=3.72; p< .05) and Happiness (F (3,136)= 2.73; p< .05) scales. Main effects were found for CHEAKS scores on Intellectual and School Status with higher scores for above median scorers.

EAI*Attitude

Levene’s Test showed inequality of error variance for Intellectual and School Status (F (3,141)=3.07, p= .03). Main effects emerged for Attitude on Intellectual and School Status scale scores with above median scores being higher.

EAI*Knowledge

Multivariate inequality of covariance was indicated by the Box’s M (F (135,38694)=1.33; p< .01). No multivariate effect emerged. Univariate error difference as shown by Levene’s Test was detected for Intellectual and School Status (F (3,139)=3.11; p< .05) and Happiness (F (3,139)=4.54; p< .01) scale scores.
Main effects emerged for Knowledge on Anxiety and Happiness scale scores with above median Knowledge scorers yielding higher scores on both Anxiety and Happiness scales.

IPECC model with NEP-R and CHEAKS as independent variables

The NEP-R scores, representing fundamental beliefs, and the CHEAKS scores, representing surface beliefs and attitudes, were utilized as factors in the next stage of the analysis. Once again, the dependent variate was the collection of scales measuring well-being. Effects for Model variations are described below, and Tables 4.10 and 4.11 set out each of the effects that emerged from the analysis along with the associated F statistic, p value, estimate of effect size and observed Power. Cell means and cell sizes are also given.

NEP-R by CHEAKS total score

Levene's test indicated the need to reject the null hypothesis of equal error variance across the groups F (3,138)=2.86; p< .05) on Happiness scores. Multivariate effects emerged on NEP-R scores (F (9,130)=1.95; p=. .05; Eta² =. 119, Power=. 82).

As indicated in Table 4.10, main effects were observed for NEP-R categories on Intellectual and School Status, Physical appearance, Anxiety, and Popularity scale scores.
In each of the four cases below median scorers reported higher scores (Low > High) on the self-concept scales.

Table 4.10: Results of MANOVA with NEP-R and CHEAKS total scale scores

<table>
<thead>
<tr>
<th>Model IVs</th>
<th>Effect</th>
<th>IV(s)</th>
<th>DV</th>
<th>F (df)</th>
<th>Sig.</th>
<th>Eta2</th>
<th>Power</th>
<th>Mean*</th>
<th>SD</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEP-R &amp;</td>
<td>Main</td>
<td>NEP-R</td>
<td>Intellectual</td>
<td>5.195</td>
<td>.024</td>
<td>.036</td>
<td>.619</td>
<td>11.79</td>
<td>2.83</td>
<td>66</td>
</tr>
<tr>
<td>CHEAKS</td>
<td></td>
<td>and School</td>
<td></td>
<td>(1,138)</td>
<td></td>
<td></td>
<td></td>
<td>11.20</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Status</td>
<td>Low&gt;High</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Physical</td>
<td></td>
<td>6.566</td>
<td>.011</td>
<td>.045</td>
<td>.727</td>
<td>9.17</td>
<td>2.92</td>
<td>66</td>
</tr>
<tr>
<td></td>
<td></td>
<td>appearance</td>
<td></td>
<td>(1,138)</td>
<td></td>
<td></td>
<td></td>
<td>8.18</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low&gt;High</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Anxiety</td>
<td></td>
<td>7.251</td>
<td>.008</td>
<td>.050</td>
<td>.762</td>
<td>9.79</td>
<td>2.75</td>
<td>66</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1,138)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8.87</td>
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<td>Low&gt;High</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Popularity</td>
<td></td>
<td>4.172</td>
<td>.043</td>
<td>.029</td>
<td>.527</td>
<td>9.11</td>
<td>2.18</td>
<td>66</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1,138)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8.50</td>
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<td></td>
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<td>Low&gt;High</td>
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<tr>
<td></td>
<td></td>
<td>CHEAKS Piers</td>
<td></td>
<td>7.129</td>
<td>.008</td>
<td>.049</td>
<td>.755</td>
<td>56.99</td>
<td>8.92</td>
<td>69</td>
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<tr>
<td></td>
<td></td>
<td>Harris</td>
<td></td>
<td>(1,138)</td>
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<td></td>
<td></td>
<td>60.15</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Total</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Low&lt;High</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Intellectual</td>
<td></td>
<td>9.048</td>
<td>.003</td>
<td>.062</td>
<td>.848</td>
<td>10.88</td>
<td>2.97</td>
<td>69</td>
</tr>
<tr>
<td></td>
<td></td>
<td>and School</td>
<td></td>
<td>(1,138)</td>
<td></td>
<td></td>
<td></td>
<td>12.03</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Status</td>
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<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Low&lt;High</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Anxiety</td>
<td></td>
<td>6.545</td>
<td>.012</td>
<td>.045</td>
<td>.719</td>
<td>8.87</td>
<td>2.74</td>
<td>69</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1,138)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>9.70</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low&lt;High</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Below-median scores are presented before Above-median scores

#IV = Independent variables

Main effects were also observed for the CHEAKS categories on Self-esteem, Intellectual and School Status, and Anxiety scales. In each of these three cases below median scorers reported lower scores (Low < High) on the self-concept scales.

NEP-R by CHEAKS sub-scale scores

Details of the effects that emerged when NEP-R scores with each of the CHEAKS subscale scores, in turn, constituted the factors in the model are presented in Table 4.11 below.

NEP-R by Attitudes

No multivariate effects were found. At a Uni variate level, main effects were observed for Attitudes on the Behaviour scale and Intellectual School Status scale. In
both cases below median scorers reported lower scores (Low < High) on the self-concept scales.

Table 4.11: Results of MANOVA with NEP-R and CHEAKS sub-scale scores

<table>
<thead>
<tr>
<th>Model</th>
<th>Effect IV(s)</th>
<th>DV</th>
<th>F (df)</th>
<th>Sig.</th>
<th>Eta²</th>
<th>Power</th>
<th>Mean*</th>
<th>SD</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEP-R</td>
<td>Attitude Main</td>
<td>Attitude</td>
<td>Behaviour</td>
<td>4.130 (1,144)</td>
<td>Low&lt;High</td>
<td>.044</td>
<td>.028</td>
<td>.523</td>
<td>12.07 13.03</td>
</tr>
<tr>
<td></td>
<td>Intellectual and School Status</td>
<td></td>
<td></td>
<td>7.691 (1,144)</td>
<td>Low&lt;High</td>
<td>.006</td>
<td>.051</td>
<td>.787</td>
<td>10.90 12.07</td>
</tr>
<tr>
<td>Knowledge Main</td>
<td>NEP-R</td>
<td>Physical appearance</td>
<td></td>
<td>5.45(1,142)</td>
<td>Low&lt;High</td>
<td>.021</td>
<td>.037</td>
<td>.640</td>
<td>9.07 8.10</td>
</tr>
<tr>
<td></td>
<td>Anxiety</td>
<td></td>
<td></td>
<td>5.317(1,142)</td>
<td>Low&lt;High</td>
<td>.023</td>
<td>.036</td>
<td>.629</td>
<td>9.80 8.82</td>
</tr>
<tr>
<td></td>
<td>Intellectual and School Status</td>
<td></td>
<td></td>
<td>4.178(1,142)</td>
<td>Low&lt;High</td>
<td>.043</td>
<td>.029</td>
<td>.528</td>
<td>11.09 11.94</td>
</tr>
<tr>
<td></td>
<td>Anxiety</td>
<td></td>
<td></td>
<td>5.886(1,142)</td>
<td>Low&lt;High</td>
<td>.017</td>
<td>.040</td>
<td>.674</td>
<td>8.83 9.85</td>
</tr>
<tr>
<td></td>
<td>Happiness</td>
<td></td>
<td></td>
<td>5.886(1,1)</td>
<td>Low&lt;High</td>
<td>.017</td>
<td>.040</td>
<td>.674</td>
<td>7.73 8.41</td>
</tr>
</tbody>
</table>

* Below-median scores are presented before Above-median scores

NEP-R by Knowledge

Inequality of covariance across groups was observed for the dependent variate (F (135,24345)=1.47; p<. 001). A barely significant multivariate effect emerged on the interaction between NEP-R and Knowledge (F (9,134)=1.94; p=. 05; Eta2 = .115; power = .82). Levene’s test located the inequality of error variance on the Happiness scale (F (3,142)=3.88; p< .05).

Main effects for NEP-R were observed for Physical appearance and Anxiety scales. For the Physical appearance scores below median scorers reported higher scores (Low > High) on the self-concept scales, a similar case held (Low>High) for the Anxiety scale scores.
Gender effects

Cell counts were calculated to determine the utility of including gender as a third factor in the model, particularly small cell sizes, as low as 2 in some instances, were observed for females in below median NEP-R and EAI categories.

Subsequently, mean differences across gender groups were explored within a single factor MANOVA analysis for the health scales and the environmental scales.

For the health, scales there were scores from 49 females and 99 males in the cells. Females scored higher on the Behaviour, Popularity, and Somatic scales (see Table 4.12).

Table 4.12: Mean scores for health scales categorised by Gender

<table>
<thead>
<tr>
<th></th>
<th>Female</th>
<th></th>
<th>Male</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Piers Harris Total</td>
<td>58.19</td>
<td>10.95</td>
<td>59.11</td>
<td>8.64</td>
</tr>
<tr>
<td>Behaviour</td>
<td>12.86</td>
<td>3.10</td>
<td>12.39</td>
<td>2.95</td>
</tr>
<tr>
<td>Intellectual and School Status</td>
<td>11.43</td>
<td>3.24</td>
<td>11.51</td>
<td>2.92</td>
</tr>
<tr>
<td>Physical Appearance and Attributes</td>
<td>7.96</td>
<td>3.49</td>
<td>8.82</td>
<td>2.77</td>
</tr>
<tr>
<td>Anxiety</td>
<td>8.29</td>
<td>3.38</td>
<td>9.78</td>
<td>2.76</td>
</tr>
<tr>
<td>Popularity</td>
<td>9.10</td>
<td>2.27</td>
<td>8.63</td>
<td>2.26</td>
</tr>
<tr>
<td>Happiness and Satisfaction</td>
<td>7.41</td>
<td>2.08</td>
<td>8.30</td>
<td>1.68</td>
</tr>
<tr>
<td>Sleep Disturbance</td>
<td>3.49</td>
<td>3.42</td>
<td>3.49</td>
<td>3.16</td>
</tr>
<tr>
<td>Somatic Symptoms</td>
<td>2.63</td>
<td>2.70</td>
<td>2.19</td>
<td>2.84</td>
</tr>
</tbody>
</table>

Inequality of error variance was observed at a univariate level (df=1,146) for Piers Harris total scale scores (F=5.72; p< .05), Physical appearance scale scores (F=6.41; p< .05), Anxiety scale scores (F=5.43; p< .05), and Happiness scale scores (F=7.83; p< .01).

Significant Gender differences emerged for the Anxiety scale scores (F=8.23; p< .01; Eta Square= .053; power=.813) with females scoring lower than their male counterparts, and the Happiness scale scores (F=7.90; p< .01; Eta Square= .051; power=.798), where a similar trend was observed with females scoring lower than their male counterparts.
When the environmental scale scores were examined, mean scores were from 47 females and 107 males were analysed. Higher scores were observed for females on each of the scales except the knowledge scale (see Table 4.13).

**Table 4.13: Mean scores for environmental scales divided by Gender**

<table>
<thead>
<tr>
<th></th>
<th>Female</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>CHEAKS</td>
<td>232.30</td>
<td>31.56</td>
</tr>
<tr>
<td>CHEAKS Attitude</td>
<td>100.53</td>
<td>23.79</td>
</tr>
<tr>
<td>Knowledge</td>
<td>120.98</td>
<td>18.97</td>
</tr>
<tr>
<td>EAI</td>
<td>91.40</td>
<td>28.91</td>
</tr>
<tr>
<td>NEP-R</td>
<td>54.54</td>
<td>5.73</td>
</tr>
</tbody>
</table>

When the extent of the difference was examined, multivariate inequality of covariance was observed. The Univariate error variance (df: 1,149) was unequal for both the EAI (F=8.56; p< .01) and NEP-R (F=5.86; p< .05) scale scores. A multivariate effect was observed (F (7,143)=2.60; p< .05; Eta^2 = .113; power=.881). At the Univariate level, gender effects were observed for EAI scores (F (1,149)=12.42; p< .005; Eta^2 = .077; power=.938).
4.4 DISCUSSION

Quality of the data

The utility of the OMR software came into question in the study. Not only were there human-interface problems with the equipment and software that required considerable intervention from computer experts, but also the efficiency for processing the data was poor given the high sensitivity to deviations from the stringent marking fields. In effect, given the high level of 'miss-feeds' it was necessary to: a) input a considerable number of protocols by hand, and b) check each questionnaire thoroughly to verify the data. In light of these considerations, the technique could not be endorsed for use, at least in the current formulation, in future research with this age group. It must also be noted however, that during piloting stage even older participants encountered difficulty in marking within the 'fields' specified.

The procedures adopted for dealing with missing data were effective in identifying inappropriate cases and results from the missing value analysis suggest an acceptable data set for the purposes of the study.

From the demographic details it seems that the majority of the sample came from homes where both parents were engaged in employment outside the home, although more girls in the sample had one parent in the home full-time.

On the basis of mean scores, when compared to the older sample of university students reported in the previous chapter, the teenagers reported a higher perception of threat from hazards in the environment and were less ready to endorse the ecological world-view. They also appeared to experience lower levels of sleep disturbance.

The Piers Harris Scale

Internal consistency of the total scale and each of the sub-scales, compared favourably with those of the normative sample of 247 North-American 15-16 year olds, and with the exception of the 10-item Happiness and Satisfaction scale, the reliability
coefficient reached acceptable levels for the purpose of research (Leeming et al., 1995). This could be related to the arguments presented in Veenhoven (2000) regarding inherent difficulties associated with seeking conscious affirmations of ‘happiness’. Given the results of the scale analysis it was appropriate to use the scales within the construct definitions given in the literature.

Compared with the normative sample, the Irish sample scored in a similar fashion across all scales. This might suggest that the self-concept of teenagers in Ireland and North America may be construed in a similar way, despite the different geographical locations and cultural contexts.

Dimensionality of the EAI

Analysis of sub-structures within environmental hazard perception in this teenage sample indicated the utility of the 3-factor model already established with data from an older sample (see Chapter 2 of this volume and Walsh-Daneshmandi & MacLachlan, 2000).

In this sample the first factor loads the items to do with major global hazards, the second factor seems to be predominantly everyday hazards, while the third factor has items to do with natural environment hazards. Given the factor structures however it seems these broad definitions contained quite a degree of item cross-over and that the solution lacks the cohesion, in terms of statistical definition as well as conceptual definition, found with the older sample. This may be a result of psychological differences between the age groups. For example, in their review Wylie et al. (1996) cited research showing that children have been shown to encounter difficulty in integrating concepts of environmental phenomena, and Brody’s (1994; ibid) finding that 16 year olds did not perceive human vulnerability to extinction as an issue of concern. In that case, it would be understandable that clear differentiation between types of hazards might not occur. Another possible explanation might be that the finding occurred as a function of the instrument presentation. Because of the technical limitations of the computer software employed in the study the page, margins and the font-size were small. Further, items on the EAI scale were presented on the last page of the questionnaire, with single-spacing and therefore close together leading to possible confusion between response options. Given the high internal consistency (alpha=.92) it is unlikely that random response was a problem, even
though it is possible that fatigue, due to the density of information on each page, had set in at this stage. The implication that emerged from this finding is that the factor structure may not be representative of the age group per se, rather characteristic of the sample to hand.

Reliabilities of environmental scales and GHQ sub-scales
Internal consistency levels for the CHEAKS were also satisfactory with all but one of the sub-scales reaching the recommended level (Bryman & Cramer, 1997). This was the 12-item CHEAKS Actual Commitment (alpha= .49). While the scale authors did not intend this sub-section to be used independently, the questions represented an opportunity to test the Bechtel (1997) hypothesis. Given the low level of reliability however, any findings for this subscale must be interpreted with caution.

Internal reliabilities for each of the other total scales reached impressive levels of consistency well within the required range. The question of suitability of the GHQ sub-scales in the teenage sample seemed to be resolved in association with the literature. Given the high levels of internal consistency it would seem that it was appropriate to present these two scales in the study. It remains an issue, however, that these questions are limited to specific aspects of psychological distress.

Discriminant and Convergent Validity
The results of correlation analysis between the total scale scores offered convincing evidence of Discriminant and Convergent Validity in terms of the appropriateness of the measures to explore the constructs of ‘environmentalism’, and ‘well-being’.

Links between ‘environmentalism’ and ‘well-being’
The relationships that crossed domains, depicted in Table 4.7, suggest that, in line with expectations, eco-threat perception and Sleep disturbance are positively associated in this sample, albeit rather weakly.
The NEP-R scores were negatively related to the Somatic symptoms, and Anxiety scores. The Anxiety scores were coded in such a way as high scores indicate better adjustment in terms of anxiety. This latter scale reflects general emotional disturbance and dysphoric mood (e.g. ‘I feel left out of things’, ‘I worry a lot’), with individual items tapping a variety of emotions including worry, nervousness, shyness,
sadness, fear, and general feeling of being left out of things. This suggests that those espousing ‘green’ fundamental beliefs experience less physical representations of psychological distress but they have more emotional disturbance and a poorer sense of being part of things, fits with the idea that alignment with nature is good for one’s health, to some extent, but also strikes a cautionary note.

That CHEAKS Knowledge scale scores were positively associated with Anxiety scores seems to suggest a distinction between ‘fundamental’ beliefs (as measured by the NEP-R) and concrete knowledge about environmental issues in terms of feeling included, as represented by Anxiety scale scores.

Knowledge scale scores were also positively related to Intellectual and School Status scores, and Self-concept scores.

That Verbal commitment scores were negatively related to the Somatic symptom scores, would seem to consolidate the finding with the NEP-R scores, indicating a positive relationship between well-being and eco-philosophy and verbalising such philosophical views. The positive association found between the verbal commitment and Behaviour scores would be expected, as pro-environmental attitudes are increasingly popular in this society where environmental action is highly aspirational.

The Behaviour scale represents the extent to which a child admits or denies problematic behaviours (e.g. ‘I get into a lot of fights’, ‘I often get into trouble’). If, as we have suggested, there is a shift toward a more earth-friendly lifestyle in the general population then the relationship could be interpreted in terms of adopting the social norm.

Actual commitment scores were positively related to Intellectual and School Status scores, and to a lesser extent to Self-concepts scores. Intellectual and School Status items (e.g. ‘I am smart’, ‘I am slow in finishing my school work’) reflect the self-assessment of abilities with respect to intellectual and academic tasks, including general satisfaction with school and future expectations. This relationship expands the idea of committing to the social norm and introduces the suggestion of a view to the future.

Attitudes sub-scale scores (the sum of Verbal commitment, Actual commitment and Affect scores) were negatively related to Sleep disturbance scores and associated positively with Intellectual and School Status scores.

Finally, CHEAKS total scores were positively related to Self-concept, Behaviour, and Intellectual and School Status scores.
These findings provide empirical support for the idea that those with pro-ecological attitudes and increased knowledge about environmental issues have more positive self-concept in general and in particular feel more confident in terms of their appraisal of intellectual stance, have a more positive future outlook, and report fewer behavioural problems. They also report fewer problems with sleep disturbance and somatic symptoms. A cautionary note emerges however from the finding that at a deeper level pro-ecological views are associated with greater levels of anxiety and those with heightened threat perception also report sleep disturbance.

The IPECC model and Factorial variations

Using a multivariate analysis, the interaction between eco-threat perception and eco-philosophy observed in the university sample was not apparent in this data. The effect of Self-concept, as a covariate, and as outcome measure had no impact on the model. The implication is that the IPECC phenomenon as formulated in the earlier study may not be observable in young adolescents.

There was definite support for the hypothesis that the CHEAKS might be a more salient operational measure of environmental views in this younger age group. When the IPECC factorial model for eco-philosophy, threat and well-being, was adapted to substitute CHEAKS scores for NEP-R, main effects were found for CHEAKS total scores, and Attitude sub-scale scores, on Intellectual and School Status Scale with higher scores for above median scorers. Main effects emerged for Knowledge on Anxiety and Happiness scale scores with the same trend of scores suggesting the positive effect of Knowledge.

Tempering the implications of the findings for the positive effects of Attitude scores on the Intellectual and School Status and Knowledge scores on Happiness, however, was the observed inequality of error variance across groups. The ANOVA procedure is reported to be robust to this violation of the homogeneity of variance assumption. (http://www.statsoft.com/textbook/stanman.html#multivariate), but one instance when the ANOVA is not robust to such violations however is when outliers are present in the data thereby inflating the mean and standard deviation and yielding a significant F
value erroneously. The question of outliers causing the heterogeneity of variance was ruled out by the observed closeness between the standard deviations for the below and above median groups (2.99 and 2.89 respectively on the Attitude scores and 1.94 verses 1.53 on the Knowledge scores), and plotting the standardised residuals against the standardised predicted variables.

Given the results of this enquiry the finding of a positive effect of pro-environmental attitudes and knowledge on self-appraisal of Intellectual Status, Anxiety and Happiness and Satisfaction takes on a more impressive complexion, although the low power (ranging from .55 to .67) observed in the analysis is worth noting. In light of the lack of direct (main) effects, in the factorial model, between threat perception and well-being, and given the presence of significant effects from dichotomous levels of environmental attitudes and knowledge the findings from the next stage of the analysis are interesting also.

When the NEP-R scores, representing fundamental beliefs, and the CHEAKS scores, representing surface beliefs and attitudes were utilized as independent factors, a strong multivariate effect for NEP-R scores indicated a connection between the fundamental ecological beliefs and the collective health variate. The negative main effects that were observed for NEP-R categories on Intellectual and School Status, Physical appearance, Anxiety, and Popularity scale scores (i.e. high NEP-R scores associated with lower well-being scores) were supportive of the direct negative correlation between the NEP-R and Anxiety scores reported above. This was further observed when the NEP-R and Knowledge scores served as the independent variables and above median NEP-R scorers scored lower on the Anxiety scale suggesting a greater sense of alienation.

The counter direction (Low < High) of the main effects observed for the CHEAKS categories on Self-esteem, Intellectual and School Status, and Anxiety scales is further indication of the possibility of discordance between the impact on well-being of 'surface level' environmentalism and more deeply rooted 'fundamental' beliefs. This was also the case in the model when NEP-R and Knowledge scores were utilised as the independent variables, above median scorers on the NEP-R reported more positive Physical Appearance and Attribute appraisals and greater self-confidence in general evidenced by higher Self-concept scores. Further, positive main effects were observed for Attitudes on the Behaviour scale and Intellectual School Status scale.
Gender effects
Mean differences across gender groups were explored within a single factor MANOVA analysis for the health scales and the environmental scales in turn. The variance in scores across the health scales was greater for females on Piers Harris total scale scores, Physical appearance scale scores, Anxiety scale scores, and Happiness scale scores.

Significant mean differences emerged for the Anxiety scale scores, and the Happiness and Satisfaction scale scores. In each case, females scored lower than their male counterparts. The effect size was moderate in each case at 5% and the observed power was considerable at approximately .80. The Happiness and Satisfaction items (e.g. ‘I have a pleasant face’, I wish I were different’) tap a general feeling of being a happy person and easy to get along with, feeling generally satisfied with life. Low scores are associated with general dissatisfaction, feelings of negative self-worth, and a longing for things to be different. Notwithstanding the low internal consistency of the Happiness and Satisfaction scale, the implication here is that in general females felt less happy and experienced more anxiety than did their male counterparts.

From the analysis of the environmental measures we found that a statistically significant 11.3% of the variance was explained by gender, an effect observed with impressive statistical power. Higher mean scores were observed for females on each of the scales except the knowledge scale, and significantly higher mean scores on the EAI. Females also displayed more variable threat perception and more cohesive eco-connectedness than males.

4.5 CONCLUSION

The first aim of the study was to develop a methodology for the research theme to hand.
The questionnaire itself was quite impressive in terms of psychometric quality, however, the technological innovation proved less than satisfactory. The technology
employed was neither easy to master, nor reliable. This represented substantial investment of resources with a less than satisfactory level of return. Questionnaires developed with this technology lacked face validity and were difficult to complete. Score sheets had to be re-checked and input by hand in many cases. Given these findings it would be necessary to re-design the protocol for the next data collection phase.

Feedback sessions were very useful both from a research point of view and from a de-briefing point of view. The findings from the IPECC analysis indicated a lack of transfer across age groups, although the factorial design offered an effective method to identify the contrasting effects on well-being of the ‘surface-level’ and ‘fundamental’ aspects of environmental consciousness.

While it would have been desirable to confirm the construct definitions of the Piers-Harris scale within the sample data by means of a procedure like factor analysis, the sample size was insufficient. While some authors have defended the use of factor analysis when the sample size:variable ratio is low provided the factor loadings are high (Gallagher & MacLachlan, 2000; Guadagnoli & Velicer, 1988), given the ratio here (2:1) and the specified loading criteria (Piers, 1996), it was inappropriate to conduct factor analysis on the sample.

This study was an important step in the validation of these research instruments for use with a younger sample. Despite the technical difficulties outlined above the psychometric properties of the scales were impressive, certainly validating further use.
CHAPTER FIVE: Measures For Prospective Study with a Teenage Sample

5.1 INTRODUCTION

This chapter is presented in eight sections. Following a brief introduction specifying the aim of the chapter and outlining its constituent parts, a self-contained section dealing with each of the operational measures of the constructs to be examined in the prospective study (Chapter 6) are presented. Finally, an overall conclusion section draws on the findings with respect to the psychometric properties of these measures and makes recommendations with regard to their suitability for use in study three.

In this chapter we explored the validity of the operational measures for Environmental and Health measures employed in the prospective study reported in the next chapter. The constructs measured were Eco-threat perception, Eco-philosophy, Environmental Self, Self-concept, Positive emotion, and Psychological Distress. The measures used to explore these constructs were the EAI, NEP-R, CHEAKS, Piers Harris, Affect Balance Scale, and the GHQ-12. The constructs of Eco-threat perception, Eco-philosophy, Environmental Self, and Self-concept have already been elaborated in the previous chapters. In the current chapter it remains to introduce the concept of positive emotion. The principal aim of this chapter was to examine the psychometric properties of various scales when administered to this younger sample with an average age of 16 years.

While a pervading parameter for selection of operational measures in this project has been the choice of scales with established psychometric lineage, nonetheless each sample of participants represents a new picture with variations from the normative samples that may be of importance. The only way to explore such possibilities is by thorough psychometric examination of the scales. In this study of transition year students the sample sizes were large enough to facilitate such examinations.
In this regard we first present an investigation of the validity of the Piers-Harris measure of Self-Concept, comparing data from the Dublin sample with that of a comparable normative sample. We then present the CHEAKS measure of Environmental Self, once again comparing the findings from the Dublin sample with those of the normative sample. Thirdly, we explore the constituent dimensions of Eco-threat measured by the EAI comparing their salience in this younger sample with that already established for an older sample in the second chapter. Fourthly, the reliability of the NEP-R, including an exploration of its dimensionality is presented. Fifthly, we present the operational measure for positive emotion. Psychological well-being has been described in various ways in the literature but one consistent model has been concerned with the notion of positive emotion or happiness. Happiness has been described as a balance between positive and negative feelings about one’s life situation (Veenhoven, 2000). From a review of the literature, the Affect Balance Scale (ABS) was chosen as an operational measure suited to our needs in the present context. The scale is concise, has been widely used, and has been shown to be correlated with personality characteristics that have an impact on self-reports of stress and well-being. In this chapter we present this scale and examine its performance in the current data set, paying particular attention to the contrast between two alternative coding mechanisms previously employed in the literature on affective well-being. Next we consider the psychometric characteristics of the GHQ-12 in this sample of teenagers, seeking confirmation of its uni-dimensionality and internal consistency. Finally, in a brief conclusion we assess the suitability of the measures for use in the current context on the basis of the findings.
5.2 METHOD

Participants
In this third study the analysis was based on protocols from 559 students with an average age of 16 years. In total 315 males and 244 females participated in the survey. The complete demographic characteristics of the sample, along with selection procedures are given in detail in the next Chapter. The sample was divided into two groups, Experimental (n=96) and Control (n=463). The Experimental group participated in a pilot study for an eco-enterprise project, whereby students were involved in an environmental audit, at both an instructional and experiential level. The experiential level was encountered during the weeklong ‘work-experience’ of the students. The matched-control group also participated in a weeklong ‘work-experience’ exercise but received no formulated instruction regarding ecological aspects of enterprise and were not required to conduct the audit in the work place. A sub-sample (n=338) participated in the survey on two separate occasions.

Procedures
In the present study we administered the protocol ‘Person and Environment Health Questionnaire’ (PEHQ) which encompassed the EAI, NEP-R, CHEAKS, Piers-Harris, ABS, and the GHQ-12 (see Appendix H). The same researcher systematically administered the protocols during regular school hours to groups of intact classes in the presence of a teacher. Administration procedures are presented in detail in the next Chapter of this volume.
5.3 RESULTS

Section A: Validity of the Piers Harris

This 80-item dichotomous measure of self-concept has been introduced in the previous chapter. The scale has the reputation of being sound in terms of its psychometric properties; indeed the limited exploration presented in Chapter 3 seems to support its use in this current project. The small sample size in that study, however, precluded a thorough examination of the sub-components of the scale, an exploration made possible in this current sample. There appears to be considerable evidence for the use of the six ‘clusters’ described by the scale authors, nevertheless, it is always useful to confirm the fit of the standard model in any sample in order to extrapolate from the findings.

The Piers Harris Self Concept Scale is presented as an eighty item scale that can be used as a total score and/or six sub-scales. Three parallel measures have been incorporated into the scale to examine its validity and reliability. These constitute a specified cut-off point of 70 for extreme scores, a response bias index, and an inconsistency index (an indication of random responses).

As a check for validity, in line with the scale manual, cases with total scores for self-esteem above 70 were seen as extreme - subsequently, response bias scores below 24 or over 52 were also seen as suspicious. All cases were examined and no case was found to satisfy both of these conditions. A further check of the data was run to include the inconsistency index and found no matches on the three variables that fell outside the valid range. Visual inspection of the data suggested the possibility that the high scores on the inconsistency index (x>6) might be related to low scores on the Piers-Harris totals. Bivariate correlation analysis showed no relationship between these two total scale scores.
Reliability analysis

To examine the internal consistency of the scale Cronbach’s alpha coefficients were computed and compared to those for the normative sample. Means and standard deviations were also compared.

Reliability analysis for Time 1 total-scores (n=407) for the 80-item Self-Esteem was impressive at alpha = .89. This is close to the published figure for the normative sample (α=.90). Likewise the mean and standard deviation values were close to those for the normative sample, given here in parentheses, Mean = 57.18 (55.6) SD=10.62 (11.9). We observed the same trends for the Time 2 scores (n=366) with alpha = .91, Mean=58.46, and Standard deviation =11.71.

Validity of Cluster Scores
The dimensionality analysis in the validation studies employed Principal Component analysis with VARIMAX rotation, and was therefore applied here. The data suitability analysis was satisfactory, within established criteria (Walsh-Daneshmandi & MacLachlan, 2000) set out in Chapter 2 of this volume. With 25 eigenvalues above the value of 1.00 this was considerably greater than the 10 in the original analysis.

While these factors explained 61.5% of the total variance, scree analysis indicated a six-factor solution would be most appropriate, and these factors were interpretable. The six factors accounted for 29.9% of the common variance in item responses, much lower than the 42% in the validation study. The distribution of items across the factors represented a good overall match (56.67%) with that of the validation report. It should be noted that the sixth factor failed to match any of the sub-scales and the 'Happiness & Satisfaction' sub-scale was not represented in the solution for this sample. However, given the otherwise consistency in matching items across sub-scales for the 'Behaviour' (60%), 'Intellectual and School Status' (56%), 'Physical Appearance and Attributes' (86%), 'Anxiety' (92%), and 'Popularity' (46%) subscales, alongside the observation that the sixth factor accounted for only 2.6% of the variance explained by the six factors, the 'Happiness & Satisfaction' sub-scale was adopted as
previously specified in the manual. Reliability analysis on each of the scales, as specified in the manual was subsequently conducted. This consisted of computation of alpha coefficients, and item-total correlation coefficients. In all cases, figures are rounded to two decimal places.

The scale means and standard deviations for the present sample are given alongside those for the 15-16 year old normative sample (n=247) (Piers, 1996), given in parentheses in Table 5.1.

Table 5.1: Piers-Harris means (T-Scores) for normative* and current samples

<table>
<thead>
<tr>
<th>Scale</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Score</td>
<td>55.6 (52.7)</td>
<td>11.9 (9.3)</td>
</tr>
<tr>
<td>1. Behaviour</td>
<td>57.18 (53)</td>
<td>10.62</td>
</tr>
<tr>
<td>2. Intellectual and School Status</td>
<td>12.2 (50.5)</td>
<td>3.3 (10.0)</td>
</tr>
<tr>
<td>3. Physical Appearance and Attributes</td>
<td>12.33 (47)</td>
<td>3.26</td>
</tr>
<tr>
<td>4. Anxiety</td>
<td>10.9 (48.1)</td>
<td>3.5 (9.5)</td>
</tr>
<tr>
<td>5. Popularity</td>
<td>11.40 (47)</td>
<td>3.30</td>
</tr>
<tr>
<td>6. Happiness and Satisfaction</td>
<td>8.1 (50.5)</td>
<td>3.5 (11.9)</td>
</tr>
</tbody>
</table>

*Scores of 15-16 year olds in 1996 WPS Test Report Sample (adapted from Table D p.108; in Piers, 1996)

Alpha for the 16-item Behaviour subscale, was satisfactory (alpha = .80), and compared well with the reported value (alpha = .81) and item-total correlations ranged from .24 to .66. This compared well to the reported range of .26 to .57. Likewise the mean and standard deviation values were close to those for the normative sample, given here in parentheses, Mean = 12.33 (12.2), SD=3.26 (3.3), N of cases = 458. Items with the largest item-total correlations suggested a correspondence with the original report and warrant retention of the scale title.

For the second subscale, the 17-item Intellectual and School Status, the reliability coefficient was lower (alpha = .73), but reflected the figure reported in the manual on Table 20 (alpha = .78) with item-total correlation range of .17 to .45, considerably
lower than the range of .38 to .60 for the original reports on the scale. Likewise the mean and standard deviation values were close to those for the normative sample, given here in parentheses, Mean = 11.40 (11.5) SD=3.30 (4.0), N of cases = 457. Items with the largest item-total correlations suggested a correspondence with the original report and warrant retention of the scale title.

For the third subscale, the 13-item Physical Appearance and Attributes, the reliability coefficient was a little higher, and the same as that reported in the manual (alpha = .76) with item-total correlation range of .20 to .55, considerably lower than the range of .38 to .66 for the original reports on the scale. Likewise the mean and standard deviation values were close to those for the normative sample, given here in parentheses, Mean = 8.72 (8.1) SD=3.01 (3.5), N of cases = 446. Items with the largest item-total correlations suggested a correspondence with the original report that warrants retention of the scale title.

For the fourth subscale, the 14-item Anxiety Scale, the reliability coefficient was a little higher than the reported value (alpha = .80 versus alpha = .77) with item-total correlation range of .24 to .56, considerably lower than the range of .35 to .58 for the original reports on the scale. Likewise the mean and standard deviation values were close to those for the normative sample, given here in parentheses, Mean = 9.72 (10.0) SD=3.33 (3.2), N of cases = 466. Items with the largest item-total correlations suggest a correspondence with the original report and warrant retention of the scale title.

For the fifth subscale, the 12-item Popularity Scale, the reliability coefficient was (alpha = .73) close to the reported value (alpha = .74), with item-total correlation range of .10 to .51, considerably lower than the range of .28 to .66 for the original reports on the scale. Likewise the mean and standard deviation values were close to those for the normative sample, given here in parentheses, Mean = 8.94 (8.7) SD=2.39 (2.5), N of cases = 457. Items with the largest item-total correlations suggested a correspondence with the original report and warrant retention of the scale title.
For the sixth subscale, the 10-item Happiness and Satisfaction Scale, the reliability coefficient was the lowest of all the scales (alpha = .70) as was the case in the past (alpha = .73). With item-total correlation range of .17 to .53, considerably lower than the range of .33 to .56 for the original reports on the scale. Likewise the mean and standard deviation values were close to those for the normative sample, given here in parentheses, Mean = 7.95 (8.0) SD=1.97 (2.1), N of cases = 459. Items with the largest item-total correlations suggested a correspondence with the original report and warrant retention of the scale title.

The degree of relationship between the six subscales and the total scale is disclosed by interpretation of the inter-correlation coefficients in Table 5.2, with the internal consistency estimates appearing in the diagonal. Correlations, which are all significant above the 1% level, ranged from .14 to .76 with the majority of scores indicating moderate to strong relationships between the scales. These findings concur with published findings, presented in parentheses, and confirm that all the scales are, to some extent, reflecting a global self-concept along with specific dimensions of the construct.

Table 5.2: Correlations between subscales on Piers-Harris.

<table>
<thead>
<tr>
<th></th>
<th>Behaviour</th>
<th>Intellectual and School Status</th>
<th>Appearance</th>
<th>Anxiety</th>
<th>Popularity</th>
<th>Happiness and Satisfaction</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behaviour</td>
<td>.80 (.81)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intellectual and School Status</td>
<td>.54** (.51)</td>
<td>.73 (.78)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Appearance</td>
<td>.14** (.21)</td>
<td>.53** (.59)</td>
<td>.76 (.76)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anxiety</td>
<td>.19** (.24)</td>
<td>.39** (.43)</td>
<td>.56** (.40)</td>
<td>.80 (.77)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Popularity</td>
<td>.14** (.31)</td>
<td>.36** (.48)</td>
<td>.58** (.53)</td>
<td>.56** (.53)</td>
<td>.71 (.74)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Happiness and Satisfaction</td>
<td>.27** (.28)</td>
<td>.43** (.28)</td>
<td>.71** (.53)</td>
<td>.72** (.58)</td>
<td>.48** (.45)</td>
<td>.69 (.73)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>.61** (.67)</td>
<td>.74** (.78)</td>
<td>.74** (.70)</td>
<td>.74** (.68)</td>
<td>.65** (.72)</td>
<td>.76** (.63)</td>
<td>.88 (.90)</td>
</tr>
</tbody>
</table>

Note: N=478 * p<. 05; ** p<. 01(1-tailed); internal consistency estimates appear in the diagonal; figures enclosed within parentheses are the relevant coefficients reported on Table 20 of the scale manual (Piers, 1996) when the sample size was 485
From this analysis we glean support for use of both an overall total score for the scale along with scores for each of the six subscales.

Section B: Validity analysis of the CHEAKS

In response to the lack of scales with robust psychometric properties (Gray, Borden & Weigel, 1985), and in an effort to produce a scale to assess the effectiveness of environmental education, CHEAKS the Children’s Environmental Attitude and Knowledge Scale (Leeming, Dwyer & Bracken, 1995), was developed. In this initial work the scale was reported to have impressive psychometric properties and appears to fill an important gap in this area of research. In the present study, we analysed the properties of the scale when administered to a sample of Irish teenagers. This scale has not been validated with an Irish sample before now. In addition, the psychometric properties of the sub-sections of the Attitudes Scale were examined here.

Research Lineage

In acknowledgement of the recommendation of Gray et al. (1985) that research techniques should “benefit from the prior measurement of efforts of others” (p.30), the CHEAKS was modelled on the structure and content of an adult scale (Maloney, Ward, and Braucht, 1975) developed to measure ecological knowledge and attitudes. The best example of a scale intended to measure multiple attitudinal components (Gray et al. 1985). Subsequently, the CHEAKS, in addition to assessing ecological knowledge, is constructed to encompass items that relate to major attitudinal components of commitment (verbal and actual), behaviour and affect.

Local application

As in other spheres of environmental enquiry, the research into environmental education in Ireland lags behind that in the USA. Indeed, the provision of environmental education within the curriculum in Irish schools has been structured only in recent times, and tends to be delivered in a cross-discipline manner. While this method of delivery has merits it tends to create a difficulty when it comes to examining levels of environmental awareness in students. Therefore, the provision of
a reliable instrument that can assess the effects of cross-disciplinary education can have many applications. In the next chapter of this volume we describe the findings from an evaluation of the effect of an experiential education module, the CHEAKS was seminal to the assessment of change in attitudes and knowledge in the student sample.

Instrument

The CHEAKS (Leeming et al., 1995) has been described in detail in the previous chapter of this volume, but for clarification we recall that the instrument measures, in addition to a global construct of Environmentalism, two separate constructs, Attitude and Knowledge. The Attitude sub-scale comprises 36 items that measure students' attitudes towards environmental issues reflecting verbal commitment, actual commitment, and affect (12 items for each dimension). The Knowledge sub-scale comprises 30 items. The total scale score is derived from a combination of the scores obtained on the attitude and knowledge scales.

The attitude scale items are presented in a 5-point Likert-type response format (very true, mostly true, not sure, mostly false or very false). Nine of the attitude items, three in each section, are negatively connotated and reverse scored to reduce the likelihood of student response set. The most pro-environmental response to each item is awarded 5 points, whereas the least environmental response is given a 1-point credit. Possible scores on the Attitude sub-scale range between 36 and 180, inclusive. For the 30 knowledge questions, correct responses receive a 6-point credit; therefore, possible scores range from zero to 180. Subsequently, possible scores on the CHEAKS Total Scale range from 36 to 360, with higher scores indicating combined positive attitudes and increased knowledge.

Analyses

In an attempt to consolidate previous findings we examined two forms of reliability (i.e. stability and internal consistency) and several forms of validity, including content, convergent and discriminant, contrasted groups and factor analysis.

Stability: To assess stability, we administered the first CHEAKS during January and February and the second CHEAKS between March and May of the same year.
Pearson product moment correlations were calculated for these pre- and post-test CHEAKS subscale and the total Scale scores.

**Internal Consistency:** We assessed this form of reliability by computing alpha coefficients for each of the CHEAKS sub-scale and total score for each administration.

**Content Validity:** Consideration of the principal elements of content validity underpinned the construction of the scale and is explained well by the scale authors (Leeming, Dwyer & Bracken, 1995). In addition, the scale was independently reviewed by four educators in Ireland and found to be a comprehensive measure of the topic.

**Convergent and Discriminant Validity:** The central tenet of this form of validity lies in the expectation that scales assessing different constructs produce lower correlations than scales that assess similar constructs. We examined this aspect of validity by computing inter-correlations between the CHEAKS sub-scales, and comparing the first and second administrations of the Attitude and Knowledge sub-scales. The prediction was that correlation coefficients for the pre- and post-test scores would be larger than those for the Attitude and Knowledge sub-scales. If low to moderate correlations exist between the sub-scales, we would interpret this as an indication that they measure independent constructs.

**Contrasted-Groups Validity:** Unlike the earlier studies, conducted by the scale authors, where the teacher selected students for membership of the different groups based on environmental awareness, in our study the students themselves drew the distinction in relation to their level of environmental awareness. This self-assessment was adopted as each school delivered the Transition Year curriculum in different ways and the situation may have arisen where teachers did not know the students well enough to offer such an assessment. Secondly, given the age of these students (15-17 years) we felt that they could consider such a task with an ease that younger children, in the original study, may not have had. Students were asked to rate themselves within a range of 1 to 10, with respect to their environmental attitudes, knowledge, and behaviour.

**Factor Analysis:** Factor Analysis of the total scores was conducted to examine the constructs of attitude and knowledge in the scale. We applied the procedures published by the authors, and subsequently expected to find single factor solutions for each of the sub-scales and a two-factor solution for the combined scale.
Results of CHEAKS analysis

Descriptive Statistics
We present the means and standard deviations for both administrations of the Attitude and Knowledge sub-scales along with the CHEAKS Total Scale score for the longitudinal sample (n=338) in Table 5.3.

These data are presented separately for the control and experimental groups. The trend in the means appeared to indicate higher scores for the control group on each scale across administrations.

Table 5.3: Descriptive Statistics for the CHEAKS Total Scale and Subscales

<table>
<thead>
<tr>
<th>Scale</th>
<th>Group</th>
<th>First Administration</th>
<th>Second Administration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td><strong>Dublin Study</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total scale</strong></td>
<td>NSW</td>
<td>194.92</td>
<td>46.11</td>
</tr>
<tr>
<td></td>
<td>Experimental</td>
<td>185.94</td>
<td>44.87</td>
</tr>
<tr>
<td></td>
<td></td>
<td>197.00</td>
<td>46.23</td>
</tr>
<tr>
<td></td>
<td></td>
<td>187.12</td>
<td>30.69</td>
</tr>
<tr>
<td></td>
<td></td>
<td>208.11</td>
<td>38.79</td>
</tr>
<tr>
<td><strong>Memphis Study</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Attitude questions</strong></td>
<td>All participants</td>
<td>100.88</td>
<td>25.73</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>102.23</td>
<td>25.78</td>
</tr>
<tr>
<td></td>
<td>Experimental</td>
<td>94.97</td>
<td>24.83</td>
</tr>
<tr>
<td></td>
<td></td>
<td>136.80</td>
<td>20.06</td>
</tr>
<tr>
<td></td>
<td></td>
<td>131.65</td>
<td>22.05</td>
</tr>
<tr>
<td><strong>Knowledge questions</strong></td>
<td>All participants</td>
<td>100.95</td>
<td>25.25</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>94.62</td>
<td>31.13</td>
</tr>
<tr>
<td></td>
<td>Experimental</td>
<td>90.95</td>
<td>31.40</td>
</tr>
<tr>
<td></td>
<td></td>
<td>51.34</td>
<td>19.53</td>
</tr>
<tr>
<td></td>
<td></td>
<td>76.45</td>
<td>27.26</td>
</tr>
</tbody>
</table>

Multivariate analysis of the CHEAKS scale scores by membership of intervention group was conducted to explore the substance of the mean difference. Results for time 1 data showed no overall group effect on the dependent variate, and a barely significant effect for Attitude Scale (F (1,329)=4.20; p=. 04). At time 2, at the...
multivariate level of analysis, there was a group effect at the 5% level of significance (Wilks' Lambda = .982; F = 3.01; df 2, 328; p = .05; Eta^2 = .018; power = .582).

Significant differences emerged for the Knowledge scores (F (1,329) = 5.21; p = .02), and the Total Scale scores (F (1,329) = 5.80; p = .02).

When we compared the means of the present sample with those in the Memphis sample (Leeming, Dwyer & Bracken, 1995; Table 1), we found significant differences on all scores except three. There was no significant difference between the Total scores of the younger Memphis students, at both first and second administration times, and those of the experimental group in Dublin. Further, while the scores from grade 1-3 Memphis students were different to the Dublin Control group scores for the Total scale at first administration (p < .001) and second administration (p < .05) there was no difference between scores of the younger Memphis students and the overall group score for the Total scale at the second administration.

**Stability**

This validity analysis has been conducted on the sub-sample of 338 participants who completed the survey at both Time 1 and Time 2.

We present the correlations between scores on the two administrations of the Total Scale along with the Attitude and Knowledge sub-scales in Table 5.4, where details of both of the sub-groups, Control and Experimental are given.

<table>
<thead>
<tr>
<th>Group</th>
<th>Total 1 With Total 2 (n)</th>
<th>Total 1 With Attitude 2 (n)</th>
<th>Total 1 With Knowledge 2 (n)</th>
<th>Attitude 1 With Knowledge 2 (n)</th>
<th>Knowledge 1 With Attitude 2 (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All participants</td>
<td>.77**(296)</td>
<td>.74**(298)</td>
<td>.71**(299)</td>
<td>.27**(298)</td>
<td>.20**(299)</td>
</tr>
<tr>
<td>Control</td>
<td>.79**(234)</td>
<td>.78**(236)</td>
<td>.72**(236)</td>
<td>.27**(236)</td>
<td>.24**(236)</td>
</tr>
<tr>
<td>Experimental</td>
<td>.68**(62)</td>
<td>.57**(62)</td>
<td>.70**(63)</td>
<td>.19(62)</td>
<td>.03(63)</td>
</tr>
</tbody>
</table>

The values for the test-retest correlations all reached statistical significance and were substantial enough to support earlier claims for the stability of environmental attitudes and knowledge. We can see, however, that the correlation for the experimental group
is somewhat lower, in particular on the Attitude scale. Perhaps this is to be expected if the experimental group were influenced by the manipulation.

Convergent and Discriminant Validity
When we examined the correlations of the Attitude and Knowledge sub-scales (see Table 5.4), we found values considerably lower than the test-retest correlations. This is the case on analysis of the scores for both the entire sample and when the students were separated as a function of participation in the environmental programme. In distinct contrast to the strength of the test-related correlations, the values for the inter-correlations between the knowledge and attitude sub-scales were particularly low ($r = .03$) for the experimental group. The highest value was observed in the control group ($r = .27$) for the first administration of attitude and second administration of knowledge. As expected, these results support the presence of independent constructs within the two sub-scales.
Internal Consistency

Reliabilities are presented in Table 5.5 for the CHEAKS Total Scale along with the Attitude and Knowledge sub-scales. Variation in sample size between the two scales is due to individual instances of invalid test protocols (marking several options, creating new options, failing to complete at least on half of the questions on a scale) as specified by the scale authors.

Table 5.5: Cronbach’s Alpha Coefficients for the CHEAKS Scales

<table>
<thead>
<tr>
<th></th>
<th>Time 1</th>
<th></th>
<th>Time 2</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Group</td>
<td>Alpha</td>
<td>N</td>
<td>Alpha</td>
</tr>
<tr>
<td>Total scale</td>
<td></td>
<td>.860</td>
<td>287</td>
<td>.870</td>
</tr>
<tr>
<td>66 items</td>
<td>All participants</td>
<td>.863</td>
<td>239</td>
<td>.876</td>
</tr>
<tr>
<td>36 items</td>
<td>Control</td>
<td>.835</td>
<td>48</td>
<td>.842</td>
</tr>
<tr>
<td>30 items</td>
<td>Experimental</td>
<td>.908</td>
<td>395</td>
<td>.915</td>
</tr>
<tr>
<td>Attitude questions</td>
<td></td>
<td>.907</td>
<td>329</td>
<td>.918</td>
</tr>
<tr>
<td>36 items</td>
<td>Control</td>
<td>.910</td>
<td>66</td>
<td>.898</td>
</tr>
<tr>
<td>Knowledge questions</td>
<td></td>
<td>.771</td>
<td>335</td>
<td>.813</td>
</tr>
<tr>
<td>30 items</td>
<td>All participants</td>
<td>.768</td>
<td>279</td>
<td>.802</td>
</tr>
<tr>
<td>30 items</td>
<td>Experimental</td>
<td>.789</td>
<td>56</td>
<td>.838</td>
</tr>
</tbody>
</table>

Alpha coefficients for the CHEAKS Total Scale, Attitude, and the Knowledge sub-scales were consistently high (ranging from .77 to .92) for each group across administrations. The lowest values were observed for the Knowledge sub-scale at the first administration, however improvement occurred at the time of the follow-up study. These analyses provide evidence of internal consistency on the CHEAKS scales that support its use for research (Bryman & Cramer, 1977) and screening purposes (Salvia & Ysseldyke, 1988).

When the ability of the CHEAKS to discriminate levels of knowledge was examined, via mean scores, we saw that the respondents answered approximately 50% of the items correctly. Given the chance expectation of 20% on this five-option response format, this finding suggests a reasonable level knowledge among this group of students. This is even more salient given the discrimination aim of the scale without the danger of a ceiling effect occurring. When we examined the distribution of mean
scores we saw that guessing was a strategy employed by at least some of the students, however, this was not the general trend. As alpha coefficients approach zero to the degree that responses reflect random guessing (Leeming, Dwyer & Bracken, 1995), given the consistently high reliabilities, we can surmise that random guessing was not a strategy generally adopted by the participants in the study.

Contrasted-Groups Validity

Given the nature of the study, students were in their mid teens and the level of teacher involvement was minimal, participants were asked to rate themselves on a ‘Green-Self’ rating (a combination of their knowledge, attitudes and actions), on a scale of 0-10 with a score of 10 indicating very strong commitment to the environment. These data were then compared with scale scores as a basis for the contrasted-groups validity check. These ‘Green-Self’ scores were re-coded into above and below median scores to represent categories of ‘Low Environmentalists’ and ‘High Environmentalists’ (see Table 5.6).

Table 5.6: CHEAKS Descriptive statistics for categories of ‘environmentalism’

<table>
<thead>
<tr>
<th></th>
<th>Low Environmentalism</th>
<th>High Environmentalism</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Total scale</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All participants</td>
<td>190.50</td>
<td>43.75</td>
</tr>
<tr>
<td>Control</td>
<td>194.55</td>
<td>44.06</td>
</tr>
<tr>
<td>Experimental</td>
<td>173.70</td>
<td>38.68</td>
</tr>
<tr>
<td>Attitude questions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All participants</td>
<td>96.94</td>
<td>24.26</td>
</tr>
<tr>
<td>Control</td>
<td>99.16</td>
<td>24.88</td>
</tr>
<tr>
<td>Experimental</td>
<td>87.70</td>
<td>19.16</td>
</tr>
<tr>
<td>Knowledge questions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All participants</td>
<td>93.56</td>
<td>31.58</td>
</tr>
<tr>
<td>Control</td>
<td>95.39</td>
<td>31.19</td>
</tr>
<tr>
<td>Experimental</td>
<td>86.00</td>
<td>32.58</td>
</tr>
</tbody>
</table>

As we can see from perusal of Table 5.6, those students who rated themselves more environmentally committed scored consistently higher on both the Attitude and Knowledge sub-scales as well as the total scale of the CHEAKS.
To explore the substance of this difference we conducted multivariate analysis of variance with environmental commitment as the independent variable. This analysis indicated that the trends we saw in the mean scores were substantive.

A multivariate difference emerged (Wilks’ Lambda=. 922; F (2,275)=11.628; p<.001) and at a univariate level significant mean differences emerged on the Total Scale score (F (1,276)=18.32; p<.001), the Attitude score (F (1,276)=22.08; p<.001), and the Knowledge score (F (1,276)=5.412; p<.05).

We further examined the data as a function of a group, and found a multivariate effect for Eco-level (Wilks’ Lambda=. 934; F (2,273)=9.658; p<.01) and Intervention Group (Wilks’ Lambda=. 961; F (2,273)=5.521; p<.01). This effect was confirmed at the univariate level of analysis with main effects, significant at the 5% level, for the Knowledge scores, and main effects, significant at the 1% level, for the Attitudes and Total Scale scores. No interactions between the factors of Eco-level and Intervention Group emerged in the data.

Factor analysis of the CHEAKS

Factor analysis was conducted in line with the criteria published by the scale authors.

![Scree Plot Image](image)

Figure 5.1: Scree Plot for all 66 CHEAKS items

The scree analysis, illustrated in Figure 5.1, indicated the utility of a two-factor solution for this data set.
The subsequent two-factor solution, after VARIMAX rotation, resulted in the first factor with an eigenvalue of 9.9, close enough to the value of 8.3 reported by the scale authors (Leeming, Dwyer & Bracken, 1995).

Table 5.7: Results of 2-Factor model analysis on the CHEAKS scale

<table>
<thead>
<tr>
<th>Present findings</th>
<th>Published findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Items</td>
<td>Factors</td>
</tr>
<tr>
<td>Total Scale</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Attitude Scale</td>
<td>1</td>
</tr>
<tr>
<td>Knowledge Scale</td>
<td>1</td>
</tr>
</tbody>
</table>

Once again, similar to the finding of previous analysis, the first factor explained 15.03% of the variance. This first factor was predominantly composed of attitude questions. Three knowledge items (items 20, 13 and 30) loaded onto this factor but none had a loading greater than .185. The second factor explained a further 8.2% of the variance and comprised knowledge questions predominantly. The one attitude item loading onto this factor (CHEAKS Verbal Commitment item 1) had a loading of -.134.

Separate analysis of the two sub-scales, both the scree analysis and distribution of variance (see Table 5.7), supported the contention of a single dominant factor in each case.

Discussion of CHEAKS findings

The benefits of having a psychometrically robust scale to measure children’s global environmental attitudes have been eloquently described previously (Leeming, Dwyer & Bracken, 1995) and need only be concurred with here. The question of interest here is whether this CHEAKS scale is applicable to a different sample in a different country.
Comparison of mean scores on the CHEAKS scales (see Table 5.3), for both administrations, show that Attitude scale scores for the students in the US were significantly higher (p<.001), but the Irish students recorded higher (p<.001) knowledge scale scores. This finding is interesting in light of the comparatively low level of knowledge reported in the EU survey for Irish participants (Faughnan, 1998), where Ireland ranked 6th on mean scores from 7 countries. It must be remembered that the measures in the two studies were quite different however, this study sampled responses to 36 items presented with six possible answers, one correct and five false; while the EU study reported on only 7 items. Some of the statements were worded so that the correct answer was true (e.g. 'some radioactive waste from nuclear power stations will be dangerous for thousands of years', 'Human beings are the main cause of plant and animal species dying out') and others so that the correct answer was false (e.g. 'If someone is exposed to any amount of radioactivity, they are certain to die as a result', 'Cars are not really an important cause of air pollution'). These statements were presented with the response options 'definitely true', 'probably true', 'probably not true' or definitely not true', and correct responses were interpreted from either of the appropriately directed definitely ... or probably ... response options. In addition no between-country differentiation was made on the basis of age or education level despite a distinct variation in knowledge scores in the Irish data on this basis.

Thirdly, the present sample was two years younger than the lowest aged participant in the EU study. Nonetheless, this observation may have implications for cross-cultural application of educational materials or intervention strategies. The relative positions of the Irish and U.S. respondents switched when scores for the total scale were examined, the older Memphis students scored higher than the Dublin students at both administration times.

In their initial validation study, the scale authors found the CHEAKS to be highly reliable and valid for children up to grade 7 (12-13 year olds). One of the issues for future research identified by the authors was the question of how reliable the scale would be with older children. In this present work we present data from an older group of students living in a geographic location different to the participants in the original study. We have employed, where possible, the same administration and analysis procedures in order to maximize comparability across the studies. Findings
support the original validation study to the extent that the instrument retains its validity to a degree that is quite impressive.

Three approaches were adopted to assess the reliability of each of the scales. The first line of investigation demonstrated the stability of scores between the first and second administration of protocols (see Table 5.4). The significant (p<.001) test-retest correlations ranged from a low of .57 for the experimental group’s Attitude sub-scale scores to a maximum value of .79 on the Total scale scores for the control group. The relevance of lower values for the experimental group must be tempered by the observation that the sample size was smaller than comparison groups in both the present and previous studies. When we consider the overall group scores the range of test-retest correlation values varied between .71 and .77. Secondly, results of internal consistency analysis (see Table 5.5) corroborate the stability of results. Alpha coefficients for the CHEAKS total Scale, Attitude and Knowledge sub-scales were consistently high (.77 to .92) for all groups at both administration times. The lowest values were observed for the Knowledge sub-scale at the first administration, however an improvement had occurred at the time of the follow-up study. These findings concur with previous results and add to the body of evidence for internal consistency on the CHEAKS scales that support it’s use for research purposes (Bryman & Cramer, 1977) and screening purposes (Leeming, Dwyer & Bracken, 1995). The third approach adopted in examining the consistency of participant’s responses to the CHEAKS was to examine the strength of the floor to discriminate levels of knowledge. By contrast to the average 44% correct responses previously recorded (ibid), in this present study respondents answered approximately 50% of the items correctly. Given the chance expectation of 20% on this five-option response format, this finding suggests a reasonable level of knowledge among this group of students. This is even more salient given the desire to provide a scale with a strong discriminative floor without the danger of a ceiling effect occurring. When we examine the distribution of mean scores we can see that some of the students did employ guessing as a strategy for answering the knowledge items, however, this was not the general trend. As alpha coefficients approach zero to the degree that responses reflect random guessing (Leeming, Dwyer & Bracken, 1995), given the consistently high reliabilities, we can surmise that random guessing was not the overall strategy adopted by participants in the study.
Results from the contrasted-groups validity analysis lent further weight to the assertion that the CHEAKS is an impressive instrument. The ability of the CHEAKS to discriminate between self-rated environmental scores was observed not only in trends that emerged in the mean scores (see Table 5.6) but were also confirmed by the analysis of variance of scores from the overall group. Those students who rated themselves more environmentally committed scored consistently higher on both the Attitude and Knowledge sub-scales as well as the total scale scores of the CHEAKS. When the effect of group membership was included in the analysis, the same discriminative pattern was observed for the control group, for the experimental group however discrimination occurred on the Attitude and Total Scale scores but not on the Knowledge sub-scale scores. So, while the knowledge sub-scale scores failed to discriminate between highly committed and less committed students, in the smaller experimental group, this was an exception in the overall trend.

The final analysis conducted involved replicated factor analysis. The model proposed in the Tennessee study (see Figure 5.1 and Table 5.7) adequately represented the Dublin data, and the results were quite similar. Once again, two factors emerged in the CHEAKS items and the attitude and knowledge items loaded appropriately onto each of these factors.

In this section we have reported current results of an initial validity study of the Children's Environmental Attitude and Knowledge Scale, developed just a few years ago (Leeming, Dwyer & Bracken, 1995). The average age of the children in the present study, at 16 years, was higher that that of the original validation study and findings support the confidence placed in the reliability of this measure. Leeming and colleagues have shown an age effect on knowledge scores but not attitude scores. Given the level of difficulty in the knowledge items, it seems reasonable to suggest that the CHEAKS may be just as appropriate for use with an older population.
Section C: Factor analysis of the EAI

The first study in this volume established the presence of three distinct subscales within the construct of Environmental Hazards operationalised by the 26-item EAI scale. The conceptual meanings of the sub-scales in this sample of teenagers are expected to differ from those established in the older sample. Data from three different groups were employed in analysis: the ‘Attrition’ group comprising those participants who completed the survey at Time One only, and the Time One and Time Two data from the ‘Longitudinal’ group.

Given the presence of three distinct dimensions within the Eco-Threat construct demonstrated in earlier studies, in this project we applied a replicated factor analysis approach in the current sample. Using Maximum Likelihood as an extraction method and a VARIMAX rotation procedure we applied the criteria for data suitability and factor selection, outlined in the second chapter of this volume. In each case the scree analysis indicated the utility of a three-factor solution. The factor solution for each of the samples is presented on Table 5.8. For the first sample nine items loaded onto the first factor, three items loaded onto the second factor and four items onto the third factor.
When the same analysis was applied to the Time 1 data for the longitudinal sample (n=338) the results were very similar.

Table 5.8: 3-Factor solution for samples A, B (time 1), and B (time 2)

<table>
<thead>
<tr>
<th>Scale Item (number and wording)</th>
<th>Sample A (N=139)</th>
<th>Sample B (time 1) (n=338)</th>
<th>Sample B (time 2) (n=338)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20. Floods or tidal waves</td>
<td>.839</td>
<td>.766</td>
<td>.825</td>
</tr>
<tr>
<td>16. Earthquakes</td>
<td>.806</td>
<td>.734</td>
<td>.796</td>
</tr>
<tr>
<td>19. Large fires</td>
<td>.747</td>
<td>.657</td>
<td>.769</td>
</tr>
<tr>
<td>17. Soil erosion</td>
<td>.679</td>
<td>.313</td>
<td>.653</td>
</tr>
<tr>
<td>22. Radioactive fallout</td>
<td>.651</td>
<td>.668</td>
<td>.368</td>
</tr>
<tr>
<td>14. Radioactivity in buildings</td>
<td>.622</td>
<td>.645</td>
<td>.394</td>
</tr>
<tr>
<td>11. Water shortage</td>
<td>.581</td>
<td>.497</td>
<td>.534</td>
</tr>
<tr>
<td>23. Fumes or fibres from</td>
<td>.556</td>
<td></td>
<td></td>
</tr>
<tr>
<td>synthetic materials (e.g.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asbestos, carpets, plastics)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24. Chemical dumps</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Pollution from factories</td>
<td>.893</td>
<td>.863</td>
<td>.836</td>
</tr>
<tr>
<td>3. Pollution from cars</td>
<td>.863</td>
<td>.810</td>
<td>.785</td>
</tr>
<tr>
<td>5. Pollution from burning</td>
<td>.733</td>
<td>.698</td>
<td>.352</td>
</tr>
<tr>
<td>rubbish</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Visual pollution (e.g.</td>
<td>.732</td>
<td>.493</td>
<td>.491</td>
</tr>
<tr>
<td>billboards, ugly buildings,</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>litter)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Noise</td>
<td>.726</td>
<td></td>
<td>.465</td>
</tr>
<tr>
<td>25. Video screen emissions</td>
<td>.301</td>
<td>.650</td>
<td>.528</td>
</tr>
<tr>
<td>10. Fluorescent lighting</td>
<td>.499</td>
<td>.589</td>
<td>.631</td>
</tr>
<tr>
<td>8. Pollution from office</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>equipment</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

There was some variation in the items loading onto the first factor but the items loading onto the second and third factors were identical to the solution for the smaller attrition sample. The solution for Time 2 data was strikingly similar.

The items from the first factor common to all three samples were items 20, 16, 19, 22, 18, and 11. The first factor seems to be to do with global hazards of a catastrophic nature. These issues also have a sense of being ‘out-there’ in the sense that they are more often witnessed in countries outside Ireland and therefore are most likely to be witnessed vicariously, perhaps through the media. The common items on the second factor were items 3, 4, and 5. The second factor seems to be about pollution from heavy industry or technological development. These issues are probably more present.
in the ambient environment of the students. The third factor, across the three samples, loaded the items (13, 12, 10) that seem to define hazards in the everyday built environment.

The differences across the samples were centred on three items on the first factor, item 14 selected only by the solution for the B sample time 1, and item 23, selected only by the A sample, and item 24 selected only by the B sample at Time Two. The third factor also differed with item 8 selected by the B sample on both testing occasions but not selected by the A sample, and item 25, selected by Sample A and Sample B at Time Two. Minimal differences also occurred across samples in terms of secondary loadings, and these are depicted in Table 5.8.

Reliability analysis of the items common on all the three samples for each of the three scales was conducted on the Time One data for the combined A and B sample. Results of these procedures are presented in Table 5.9, including the means and standard deviations for each scale.

Table 5.9: Reliability coefficients and descriptive statistics for the EAI sub-scales

<table>
<thead>
<tr>
<th>Scale (number of items)</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Sample N</th>
<th>Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (n=6)</td>
<td>23.20</td>
<td>9.57</td>
<td>457</td>
<td>.86</td>
</tr>
<tr>
<td>2 (n=3)</td>
<td>12.23</td>
<td>4.72</td>
<td>469</td>
<td>.89</td>
</tr>
<tr>
<td>3 (n=3)</td>
<td>6.81</td>
<td>3.55</td>
<td>461</td>
<td>.66</td>
</tr>
</tbody>
</table>

By including the extra variables in the first and third scales a small increase in internal consistency was achieved. Inclusion of items 14, 23, and 24, results in a .04 increase in the coefficient for the 9-item first scale (alpha=. 90, mean=35.41, std. dev.=13.47), and including items 8 and 25, effects a .07 increase in the coefficient for the 5-item third scale (alpha=. 73, mean=11.37, std. dev.= 5.23)

When we compare the relative salience of the three scales, the first scale representing large scale global hazards, elicits most threat perception within the range of ‘minimal’ to ‘strong’ threat with an average rating of ‘moderate threat’. This is similar to salience of the second scale, representing hazards from ‘dirty’ technology. These items also elicit average responses in the range of ‘minimal’ to ‘strong’ threat with an
average rating of 'moderate threat'. The least threatening of the three scales are the hazards from Everyday-Life situations, eliciting an average rating of 'minimal threat' ranging from 'no threat' to 'mild threat' perceptions.

Section D: Validity of the NEP-R

The development and research lineage of this 15-item scale representing an operational measure of pro-ecological ideology has been described in detail in Chapter 2 of this volume. In the current context the aim was to confirm the utility of a single dimension within the scale and examine the internal consistency of the scale in this younger teenage sample. Replicated factor analysis using Maximum Likelihood extraction supported the view of a single factor in the data. The scree plot indicated no break in the factors subsequent to the first, and while four significant factors (eigenvalues 3.14, 1.36, 1.24, and 1.06) explained 45.34% of the variance the first factor explained 20.92% of the total variation in scores for the data set. Reliability analysis indicated a moderate level of consistency (Alpha=.70; Mean=52.48; Std Dev=8.06; N=439), and scores for central tendency and dispersion close to those found in the first sample of teenagers in the present project (Alpha=.77; Mean=52.99; Std Dev=8.35; N=159). Just like that sample, this second sample of teenagers displayed, once again, average scores slightly lower than those observed in the older sample reported in chapter 3 (Alpha=.75; Mean=55.88; Std Dev=7.60; N=154).

Section E: Validity of the Affect Balance Scale (ABS)

Psychological well-being has been described in various ways in the literature but one consistent model has been concerned with the notion of positive emotion or happiness. Happiness can been described as a balance between positive and negative feelings about one's life situation. The scale used here was derived from an adapted version of the Affect Balance Scale (Majodina, 1998) originally devised by Bradburn (1969). The scale has a test-retest reliability, of 0.90, assessed over three days for 174 respondents. Adequate validity
was interpreted from extensive agreement between the questions and other indices of self-reported well-being (McDowell & Newell, 1987; cited in Majodina, 1998). The ABS represents an operational measure of Bradburn’s (1969) two-dimensional model of psychological well-being with separate factors of positive and negative affect. Positive affect was assessed by five questions: feeling pleased about having accomplished something, feeling that things were going your way, feeling proud because someone complimented you on something you had done, feeling particularly excited or interested in something, feeling on top of the world.

Negative affect was also assessed by five questions: feeling so restless that you could not sit long in a chair, feeling bored feeling depressed or very unhappy, feeling lonely or remote from other people, feeling upset because someone criticised you.

According to Bradburn the best indicator of overall feelings of well-being would be the difference between the two scores, giving a notion of balance in affect:

“...we would expect that someone who was high on positive feelings and low on negative feelings would be likely to be ‘very happy’, while someone who was low on positive feelings and high on negative feelings would be unlikely to be ‘very happy’.” (Bradburn 1969, p 65)

The 10-item scale has been widely used over the past 40 years and enjoys a reputation of being particularly suited to cross-cultural surveys of happiness and life satisfaction (Veenhoven, 2000).

Balanced affect and Personality Factors
George (1978) administered the Bradburn scale alongside Form C of the Cattell 16PF and found that positive scores on the balanced affect score were associated with individuals scoring as relatively more outgoing, conscientious, tender-minded, practical, group dependent, relaxed and high in arousal in a sample of 197 white males and 183 white females aged 50-76 years (cited in Francis & Bolger, 1997). Francis & Bolger also reported a study, of 50 (6 males and 44 females) retired civil servants aged 55-85, employing the Bradburn ABS and a 24-item abbreviated form of the Revised Eysenck Personality Questionnaire, (Francis, Brown & Philipchalk, 1992), containing four six-item indices of extraversion, neuroticism, psychoticism and a lie scale. Scoring was dichotomous for 'yes' and 'no' responses. High scores of balanced affect were associated with extraversion and stability, while low scores of
balanced affect were associated with introversion and neuroticism. No relationship was found between scores of balanced affect and psychoticism.

In the same paper, they cite research with sixth formers that found balanced affect scores were correlated positively with extraversion and correlated negatively with neuroticism, but uncorrelated with psychoticism (Francis, Wilcox & Jones, 1997).

These authors interpret these findings as being consistent with the view that ‘happiness is a thing called stable extraversion’ (Eysenck’s, 1983) and the association of high scores of positive affect with general happiness (Bradburn’s, 1969). They recommend that research employing the Bradburn ABS to assess the effectiveness of different treatments or environments in later life should control for these personality variables.

Scoring mechanisms

According to Bradburn the best indicator of overall feelings of well-being would be the difference between the two scores, giving a notion of balanced affect. To effect this coding a score of one is given to instances of positive well-being, and a score of one is given to instances of negative well-being.

Then, to compute the total-score, first compute the negative and positive sub scales then compute the difference between them.

An alternative method yields a total score where responses to items are coded yes=one and no=zero, to give a score of one to instances of positive well-being, and to give a score of one to absence of negative well-being. The total-score is simply the sum of the items.

Contrasting the two methods

Little difference emerged in the distribution of the two coding methods although the means differ (Bradburn mean=1.183, alternative mean=6.807). The internal consistency of the Bradburn method is very low (alpha=. 40), compared to the more acceptable (alpha=.70) alternative method.
Correlation analysis with the other scales (Self Esteem, GHQ and NEP-R scores) also shows no real difference (the magnitudes change ever so slightly) as a function of coding method.

Factor analysis of the scale was conducted using the procedure set on in Majodina (1998). Item 9 loaded onto both factors in the factor analysis, while all the other items loaded appropriately onto the two separate factors as predicted. Removal of item 9 yielded an essentially unchanged distribution with a marginally better (.40 to .44) reliability coefficient. In the interest of comparability this item was retained.

Given all of the above findings, it was decided most prudent to adopt the scoring method given in Majodina. So, the well being scale is a 10 item scale with five positive and five negative oriented items. A higher score is indicative of better well-being, with endorsement (a yes answer) of positive items coded as 1 and a choice of ‘no’ for the negative items, indicative of absence of negative well-being, also getting a score of 1. The range of scores is therefore from 0-10.

Section F: Validity of the GHQ-12

The General Health Questionnaire (GHQ) is a self-administered screening test, designed to identify short-term changes in mental health (depression, anxiety, social dysfunction, and somatic symptoms). It is a pure state measure, responding to how much a subject feels that their present state "over the past few weeks" is unlike their usual state. It does not make clinical diagnoses and should not be used to measure long-standing attributes. The GHQ focuses on the client's ability to carry out "normal" functions and the appearance of any new disturbing phenomena.

This 12-item version of the GHQ is very quick to administer and score as it contains only 12 questions. It is just as reliable, valid, and sensitive as the longer versions even though it only takes around two minutes to complete. Given its speed of administration, it is often used in research studies where it is impractical to administer a longer form. The GHQ-12 was prepared by removing the items endorsed by 'physically ill' respondents from the GHQ-60. Items were then divided into those in which agreement indicated either health or illness. Within each group, items were
selected which had the highest slopes in the original item analysis. For further information on the design of the GHQ-12, please refer to the User’s Guide (Goldberg, 1988: p. 21; Goldberg & Williams, 1991), and the website http://www.nfer-nelson.co.uk/ghq/faq.htm#6. Given the impressive credentials it was expected that the current data would support earlier findings.

Using a one-factor specification with ML extraction the scree plot confirmed the utility of the model. There were three significant factors (eigenvalues 4.07, 1.26, and 1.04 respectively) explaining 53.15% of the total variance. The first factor explained 33.95% of the total variance. Reliability analysis yielded a satisfactory solution with the Cronbach’s alpha value being the same (Alpha = .82; mean=10.08; SD=5.39; n=432) as that reported by Banks et al. (1980; cited in Goldberg & Williams, 1991) for a sample of 512 school-leavers.

5.4 CONCLUSIONS

In this chapter we set out to establish five principle aims, namely to answer questions about validity aspects of five of the scales to be used in the following chapter of this work.

The first of these questions concerned the appropriate application of the Self-concept dimensions, established elsewhere, to the present data. Through a series of investigations it seems apparent that the existing descriptions of the sub-scales are appropriate for the current data. Measures of central tendency and dispersion presented in Table 5.1 suggest a close approximation to the profile of the normative sample. In addition, the results indicate the appropriate usage of both total score and sub-scale scores as measures of aspects of self-concept that can be reliably described within the framework set out the in the scale manual (Piers, 1996).

The second concern of the chapter was to conduct an extensive examination of the CHEAKS measure to expand on the indication of its psychometric strength suggested in the smaller sample of 160 teenagers described in the last chapter. We also contrast the measure in North American and Irish students.
The following implications arise from the findings:

1. It seems that the North American students report higher levels of integrated environmentalism, indicated by higher total scores on the scale, however the Irish students indicate a greater level of environmental knowledge. This is not too surprising given the slightly older age of the Irish students, and is consistent with the developmental sensitivity (established by the authors) of the scale for knowledge. The results of the analysis of scores on the Knowledge Scale seem to indicate a strong discriminative floor without the danger of a ceiling effects occurring. When we examined the distribution of mean scores we can see that some of the students did employ guessing as a strategy for answering the knowledge items, however, this was not the general trend. Given the consistently high levels of internal consistency, we can surmise that random guessing was not the overall strategy adopted by the participants study.

2. The validity of the scale was impressive with this older population.

3. The reliability of the scale in terms of stability and internal consistency once again indicate the soundness of this instrument in the current data.

4. These findings concur with previous results and add to the body of evidence for internal consistency on the CHEAKS scales that support its use for research purposes and screening purposes.

5. Results from the contrasted-groups validity analysis lent further weight to the assertion that the CHEAKS is an impressive instrument. The ability of the CHEAKS to discriminate between self-rated environmental scores was observed in trends that emerged in the mean scores and confirmed by the analysis of variance of scores. Those students who rated themselves more environmentally committed scored consistently higher on sub-scales as well as the total scale scores of the CHEAKS.

6. The final analysis conducted involved replicated factor analysis. Once again, two factors emerged in the CHEAKS items and the attitude and knowledge items loaded appropriately onto each of these factors. The use of sub-components of the Attitude scale to represent Affect, Verbal commitment, and Actual commitment was not supported by the analysis and therefore it seems most appropriate to compute only two sub-scale scores.
Overall, this scale retains the impressive psychometric properties reported in the literature, and the evidence from the current sample suggests that the CHEAKS may be just as appropriate for use with an older population.

The third matter of interest in this chapter was the dimensionality of the sub-scales of the EAI. In the sample of university students (see Chapter 2), three factors emerged pertaining to Techno-human hazards, Natural hazards and Everyday-Life hazards, while results from this teenage sample confirmed a three-factor model of the scale the composition of the structures of hazard perception was somewhat different. There remained a distinct separation of items pertaining to Everyday-Life hazards, but the Techno-human and Natural hazard concepts were unclear in this sample, rather there was a merging of the two to form two different factors, one representing large scale catastrophic hazards and the other concerning ‘dirty’ pollution emanating from heavy industry. While there was distinct consistency of this interpretation across three samples of data, the resulting solution should be viewed with caution. This is particularly pertinent to the second factor, pertaining to ‘dirty’ pollution, given the low number of items on the factor. Notwithstanding, the results of the factor analysis indicate the psychometric utility of describing gradation of hazards on the EAI Scale. This approach would be useful when adopting a descriptive approach, however, in the context of the current work it was considered precarious to depend on the sub-scale measures given the factorial design employed to explore the IPECC phenomenon. We therefore chose to exclude the sub-scales of the EAI from further analyses.

Fourthly, regarding the NEP-R, we found further evidence of the uni-dimensional structure of the scale. This adds to the body of support both in the literature and in the two samples previously examined in the current project. Once again, the internal consistency of the scale was moderate but reaching a level high enough to warrant its inclusion in the study.

Further, we addressed the issue of coding the Affect Balance Scale, comparing the two mechanisms reported in the literature. Results indicate the superiority of the computation of total scores by summing item scores that have been coded to yield a score of one on both instances of positive well-being and absence of negative well-
being. The psychometric properties of the scale were found to be satisfactory for the purpose of this research.

Finally, we explored the characteristics of the GHQ-12. Both the factor structure and the internal reliability of the scale in this sample followed the trends in the literature and attest the robust nature of the scale.

In summary, each of the questions addressed in the chapter have been decisively answered by the analysis. The Piers-Harris total score and each of the six sub-scale scores are appropriate for the study. The CHEAKS total score and sub-scale scores for the Attitude and Knowledge components are appropriate for use, but the results do not support use of the sub-components (Affect, Verbal Commitment, and Actual Commitment) of the Attitude scale. The EAI scale dimensionality appears to be greater than unity, however the findings suggest caution in interpreting findings from the computation of sub-scale scores in the sample of teenagers. The ABS represents a good measure of the emotional aspect of the construct of psychological well-being. The issue of which scoring method to use was decisively resolved in favour of that presented in Majodina (1998). Finally, the GHQ-12 emerged as an impressive measure retaining all of the credentials outlined in the literature.

The conclusion emerging from this chapter was that each of the validated sections of the PEHQ, designed for the third study, demonstrated impressive psychometric qualities thereby reducing concerns about measurement error.
CHAPTER SIX: Causal Models of Eco-Wellness in a Teenage Sample

6.1 INTRODUCTION

The problems we face are vast and complex, but come down to this: 5.5 billion people are breeding exponentially. The process of fulfilling their wants and needs is stripping the earth of its biotic capacity to produce life: a climactic burst of consumption by a single species is overwhelming the skies, earth waters and fauna. As Lester Brown patiently explains in his annual survey, State of the World, every living system on earth is in decline. Making matters worse, we are in the middle of a once-in-a-billion-year blow-out sale of hydrocarbons. They are being combusted into the atmosphere at a rate that will effectively double-glaze the planet within the next fifty years, with unknown climatic results. The planet cornucopia of resources that are being extracted, mined and harvested are so poorly distributed that 20 percent of the population, largely in the Northern Hemisphere, control and consume 80 percent of the world’s wealth. Since business in its myriad forms is primarily responsible for this plunder, it is appropriate that a growing number of companies ask themselves, how do we conduct business honourably in the latter days of industrialism and the beginning of an ecological age?

(Hawken, 1993; cited in Eco-friendly Enterprise, 1997; p. 5)

This quotation is taken from the opening section of a resource manual for teachers and students of environmental considerations in business. The author of the passage is Paul Hawken and the original source was his book entitled The Ecology of Commerce. The material in this resource manual makes it quite clear that the level of awareness in the general media does not adequately portray the ‘depth of the crisis, or the complexity of the issues concerned’. Outlined in this education document, Eco-Friendly Enterprise: Linking Environmental Education and community enterprise programmes (Eco-friendly Enterprise, 1997), is the rationale for the design and delivery of environmental education programs. Emanating from the Earth Summit meeting in Rio de Janeiro in 1992 dawned a realisation that environmental education must form a central part of the change of social and economic approaches away from linear models and toward cyclical models of development. In 1996, the Eco-friendly
Enterprise project was initiated within the context of the Rio message of sustainability. The aim was to facilitate links between practical environmental literacy and more environmentally sustainable enterprises. This was an attempt to 'produce and test the use of an educational manual aimed at guiding young people in education and training programmes in the undertaking of practical projects concerned with the environmental impacts of new enterprises being developed with support from national and EU programmes in local or regional areas.' A second aim of the project was to 'establish a network of schools and centres which could be used for environmental studies' (Eco-friendly Enterprise, 1997).

Aim of the study

It was within the context of this pilot study that the current project developed. This administrative framework served as a recruitment basis for participants in the final phase of Eco-philosophy, threat, and well-being study. The symbiotic relationship between the two research parties was structured in such a way that the psychologist would provide feedback to the Eco-enterprise team on the basis of pertinent data collected from the experimental group in the project. The data for this report was qualitative in nature and since the focus of this thesis is on quantitative data, that report is not discussed here.

Given the nature of the education project an opportunity for a natural study design arose that could address the internal validity issues extant in the Eco-philosophy, threat and well-being study to date. Namely, these involved necessary conditions for drawing causal inference (Shaughnessy & Zechmeister 1990), that have also been specified as important requirements in the study of mediating variables between stress and health (Stroebe & Stroebe, 1995). With this in mind a series of research questions were formulated. These questions addressed not only a more in-depth enquiry into the IPECC phenomenon established in the earlier studies in the project, but also enquired into the impact of exposure to environmental education material that was experiential in nature.
Research questions

1. Does the IPECC remain a robust framework, when validity of the design has been improved by: introducing a time order, controlling for confounding variables, and controlling for personality factors?

2. Does the introduction of CHEAKS scores (a measure of environmental Attitudes and Knowledge) into the IPECC model increase its explanatory power?

3. Does environmental knowledge mediate the effect of threat on health?

4. What impact does Knowledge have on the relationship between NEP-R and health?

5. Does engaging in environmental behaviours improve health over time?

6. Does availability of recycling facilities make a difference to eco behaviour or happiness?

7. What were the effects of engaging in the Eco-Enterprise Audit?

8. What, if any, Gender effects occur on ‘health’ and ‘environmentalism’ in this teenage sample?

9. Does personal environmental threat predict environmental behaviour?

10. What is the relative contribution of the variables in the Eco-Wellness model of the relationship between ‘environmentalism’ and ‘well-being’?
6.2 METHOD

Participants

Participants in this study were transition year students from 13 schools in the Dun Laoighre Rathdown Electoral District of South County Dublin, Ireland. Schools were all non-fee paying schools and were drawn from the Voluntary Secondary, Comprehensive, and Community sectors. Five schools were mixed-sex schools, five were single-sex male schools, and three were single-sex female schools. The total number of participants in the study was 559, with an average age of sixteen years (range 14-17 years), 56.4% of the sample was male and 43.6% female. Collected in two separate phases, with an average interval of nine weeks (SD=2.6; range 6-16) between administrations, data from 897 completed protocols were entered into SPSS for analysis.

Selection of participants

Participants formed the sample for the pilot study of an environmental education program, and a matched control group. The intervention group were participants in a field study selected by the project director at the Blackrock Education Centre (BEC), the control group, also identified by the education specialist, were selected from the secondary schools in the same electoral district to match the intervention group on SES, school structure and school sex-type.

A list of contact names for the participating schools was compiled by the BEC, then the researcher made initial contact with the transition year co-ordinator in each of the schools by telephone. The initial contact was followed by: a written statement of the aims of the research project (Appendix H), and an invitation to participate directed to the school Principal, the teacher co-ordinator and or the appropriate teacher in each school. Over the following three weeks, those teachers who had not responded were once again contacted by telephone, to establish their position. All agreed to partake in the survey. Given the nature of the questionnaire, and the provision of de-briefing
sessions the research was considered to be of minimal risk to the students, within the guidelines set out by the Psychological Society of Ireland. Therefore, the school principal, in locus parentis, signed consent forms. Teachers in the experimental group were asked to arrange dates before the students were introduced to the content of the education program and after they had completed their work experience. Teachers in the control group were also requested to provide dates for survey administration before and after work experience.

Composition of experimental groups
Nine schools were assigned to each of the experimental groups. Of the eighteen schools selected for the study, thirteen schools agreed to partake in the study, twelve schools participating at both completion times (see Table 6.3). Of these, nine were in the control group (n=463) and four schools (n=96) participated in the experimental condition.

Reasons for non-participation
Of the eighteen schools selected to take part in the study, five schools in the experimental condition failed to follow through to the first sampling phase and therefore did not partake in the experiential programme. Reasons given by the project co-ordinators, based on feed-back from the teachers who participated in the training program, centred mainly on lack of resources and time. All schools in the control group followed through to the first sampling phase, one withdrew from the second phase due to time pressures. The transition year is designed by each individual school to meet the needs of the students at the school within the resources available. Some schools have many projects for students, and sometimes project scheduling proves incompatible. In the case of the school that chose not to follow through at second phase, this was the situation.

Of the sample of 559 students in the study, 85% of participants were present at Time 1, and 60% completed the survey both times. This resulted in an attrition rate of 25%, exact figures are presented in Table 6.3 below.
Design

This study was designed around an environmental education model fielded as a pilot for a curriculum unit designed for transition year at secondary school level in Ireland. In part, it aimed to link academic research with educational practice.

A double level design was adopted with repeated measures matched controls and quasi-experimental natural groups designs. Participants completed the Person and Environment Health Questionnaire (PEHQ - see Appendix H) on two occasions in the same year, between January and February on the first occasion and between March and May on the second.

A multi-method analysis approach was used to explore the research questions. Descriptive statistics yielded an overview of the data and facilitated comparison with previous samples. Empirical properties of the research instrument were examined within the framework already established in previous studies (including validity and reliability checks which encompassed factor analysis) in this project. Correlation analysis was employed within and across the constructs of environmentalism and well-being. Multivariate analysis of variance was employed to examine the interactive effects of environmental variables on well-being measures using an IPECC methodology with increased internal validity. This involved the introduction of time-ordering and statistical control for likely extraneous variables. Structural equation modelling was used to examine the processes linking environmentalism and health.

Operational definitions

The operational definitions of the independent and dependent variables, within the survey, retained the essence of those described in chapters three, four and five of this volume.

Procedures used to form groups

Groups were formed within two parameters, environmental education, (two levels) and environmental scores (two levels).

At the education level a matched groups design was employed where groups were distinguished by membership of an environmental education group.
The intervention group comprised students whose transition year teacher had participated in a series of training workshops. These took place at the headquarters of the Blackrock Education Centre (BEC) over a period of two weekends. The research psychologist was not present at any of these sessions. Students in the intervention group subsequently received specific instruction, from their teachers, on the principles of sustainability in enterprise as defined by the Eco-friendly Enterprise resource manual and the training course devised for their instructors. They then conducted an Enterprise-Audit, with sections on Energy, Water, Chain-of-Supply, Transport, Solid Waste, and Wastewater, during their work experience placement, which took place as part of the Transition Year Program.

The control group received no co-ordinated instruction regarding sustainability, did not complete an audit, and were not taught by teachers attending the training course. The students in the control group all completed work experience placement as part of their Transition Year Program and no student’s placement was associated with environmental issues.

At the environmental scores, level a quasi-experimental design was adopted within a 2 X 2 factorial design. The independent variables were scores on environmental scales divided into high and low categories, as a function of median scores. The dependent variables were the health-scale scores from the PEHQ.

Agreements and payments made
No incentives were offered or given to the schools or participants. A presentation was given to groups in each of the schools following collection of the second phase of the survey. These presentations summarized the data collected from the students in the first phase and compared them with other schools in the research project. These presentations were followed by group discussions focusing on the nature of scientific research, the students’ experience of completing this particular survey, their work experience, and their future aspirations. In addition, at two of the schools, at the request of the school Principal, a formal presentation of career options in Psychology was given to all the senior students in the school.
Testing procedure
At the beginning of each session, the teacher introduced the researcher to the students. The researcher then introduced the survey using standard statements (see Appendix C). Students were advised that their participation was voluntary and of the right to withdraw at any stage. The same procedure was followed during testing of participants in each group. Surveys were administered to intact groups of transition year students in the school. In some cases, this was one class but in other larger schools, with more than one transition year class, the groups were amalgamated for the purpose of the survey. In these larger groups, a teacher was present during testing in a supervisory capacity. The duration of the survey was approximately 25 minutes but a double class period of 40 minutes was set aside for the purpose. Following the second administration, after a short interval, an extra class period was allocated for feed-back and debriefing.

Materials
The PEHQ was devised for this study. Graphics were incorporated into the instrument to increase the appeal for the 16 year-old samples. Response formats were varied within the instrument to reduce boredom. The PEHQ constituted a 219-item questionnaire with 11 separate sections, presented in two booklets. The questions were presented in one six page booklet and the answer sheets, containing matched response sections, were presented in a separate five page booklet. This dual-booklet format represented a considerable saving in resources as the question-booklet could be re-used at the second phase of the study. Answer sheets were presented in a format to facilitate the use of Optimal Character Recognition (OCR) software for ‘reading’ the responses. This entailed responses being indicated by ‘filling-in’ a circle in the appropriate column. Samples of the answering mechanisms were first presented to the group using overhead projectors or posters, depending on the facilities available in the school. In addition, in the ‘Directions’, of the answer sheet, presented at the top of the first page, specific instructions were given on how to complete the survey. A sample answer was also given in the first response section. Identity number lists were completed during the administration, each student was asked to write their name beside a number on the list in a sequential fashion. This was necessary as a cross-
validation measure for the second sampling as the possibility of two students in a
class having the same name could not be ignored.

On the first page of the answer, sheet seven questions regarding demographic and
administrative details of the participant were presented. These were followed by 10
sections, labelled A to J, separated by text boxes containing section titles and specific
instructions relating to the particular section. A cartoon character referred the reader
to the corresponding section in the question booklet. The same character was used at
the top of each of the booklets, adopting appropriate positions. At the end of the
booklets, a graphic of a hand-shake was placed alongside a statement thanking the
participant for their contribution.

The ten sections of the PEHQ were:

Section A: ‘The way I feel about myself’ contained 80-items, corresponding to the
self-esteem items adapted in study two of the project. Dichotomous Yes / No response
options were presented.

Section B: ‘How well I’ve been feeling recently’, contained 10-items with
dichotomous Yes / No response options. These were the items from the Bradburn
Affect scale, presented in the order followed by Majodina (1998).

Section C: ‘People and the environment’ contained the 15-item NEP-R scale (Dunlap
et al., 1992) with 5-point Likert type response options. A statement was included to
advise participants to avoid the ‘undecided’ option and give a ‘definite opinion’.

Section D: ‘Hazards in the Environment’ contained the 26-item EAI scale already
described in the previous studies of this project.

Section E: ‘What I would be willing to do’ contained the 12-items from the verbal
commitment section of the CHEAKS already described in earlier chapters. Of the
five options available, participants were asked to avoid the ‘not sure’ option.

Section F: ‘What I have done’ contained the 12-items from the actual commitment
section of the CHEAKS already described in earlier chapters. Of the five options
available, participants were asked to avoid the ‘not sure’ option.

Section G: ‘How I feel about the environment’ contained the 12-items from the affect
section of the CHEAKS already described in earlier chapters. Of the five options
available, participants were asked to avoid the ‘not sure’ option.

Section H: ‘Environmental Knowledge Quiz’ contained the 30-items from the
knowledge section of the CHEAKS already described in earlier chapters.

Section I: ‘My general health’ contained the 12-items from the GHQ-12 scale.
Section J: ‘My comments’ contained three questions. The first filter item offered a dichotomous Yes / No response option to the question ‘Have you completed work experience yet?’ Those who had responded positively were next asked for a brief description of the work experience, and then to list the three best and worst aspects of the work placement. The next question asked for a self-rating on ‘Environmentalism’ (i.e. the extent to which one is concerned about the environment and acts in an ecologically friendly manner). Finally, participants were presented with an open-ended statement ‘Please write any other comments that you might care to make, regardless of how you answered question 1.’ A statement acknowledging the student’s contribution and thanking them for their participation ended the survey.
6.3 RESULTS

Missing Data analysis

No case had data missing on more than 50% of the variables. For the purpose of the present analysis, we conducted the MVA procedure (SPSS 10) on two samples, all participants present at Time 1, and those who completed the survey on both occasions. Preliminary examination of the data indicated relatively few incidences of missing data. Consequently, we adopted the more liberal approach recommended by the authors of one of the scales included in the questionnaire (CHEAKS) and computed Total scores for all cases with at least 50% of data on a scale. This was effected using the appropriate suffix for each scale with the SUM function in SPSS. Results are presented below in Table 6.1 and Table 6.2.

Table 6.1: Details of Missing Data and Descriptive statistics for Time 1 sample.

<table>
<thead>
<tr>
<th></th>
<th>Missing</th>
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<th>Mean</th>
<th>SD</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
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<td>90.98</td>
<td>27.30</td>
<td>3</td>
<td>.6</td>
</tr>
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<td>Eco-Philosophy</td>
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<td>8.06</td>
<td>2</td>
<td>.4</td>
</tr>
<tr>
<td>3.</td>
<td>Eco-Affect</td>
<td>472</td>
<td>36.82</td>
<td>11.40</td>
<td>5</td>
<td>1.0</td>
</tr>
<tr>
<td>4.</td>
<td>Eco-Actions</td>
<td>473</td>
<td>29.70</td>
<td>9.00</td>
<td>4</td>
<td>.8</td>
</tr>
<tr>
<td>5.</td>
<td>Eco-Promise</td>
<td>473</td>
<td>35.72</td>
<td>9.89</td>
<td>4</td>
<td>.8</td>
</tr>
<tr>
<td>6.</td>
<td>Eco-Knowledge</td>
<td>464</td>
<td>94.67</td>
<td>30.80</td>
<td>13</td>
<td>2.7</td>
</tr>
<tr>
<td>7.</td>
<td>Eco-Attitude</td>
<td>472</td>
<td>102.30</td>
<td>25.93</td>
<td>5</td>
<td>1.0</td>
</tr>
<tr>
<td>8.</td>
<td>Eco-Self</td>
<td>463</td>
<td>196.77</td>
<td>45.71</td>
<td>14</td>
<td>2.9</td>
</tr>
<tr>
<td>9.</td>
<td>Behaviour</td>
<td>477</td>
<td>12.27</td>
<td>3.27</td>
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<td>.0</td>
</tr>
<tr>
<td>10.</td>
<td>Intellect and School Status</td>
<td>477</td>
<td>11.29</td>
<td>3.32</td>
<td>0</td>
<td>.0</td>
</tr>
<tr>
<td>11.</td>
<td>Physical Appearance</td>
<td>477</td>
<td>8.59</td>
<td>3.11</td>
<td>0</td>
<td>.0</td>
</tr>
<tr>
<td>12.</td>
<td>Anxiety</td>
<td>477</td>
<td>9.65</td>
<td>3.35</td>
<td>0</td>
<td>.0</td>
</tr>
<tr>
<td>13.</td>
<td>Popularity</td>
<td>477</td>
<td>8.88</td>
<td>2.39</td>
<td>0</td>
<td>.0</td>
</tr>
<tr>
<td>14.</td>
<td>Happiness and Satisfaction</td>
<td>477</td>
<td>7.91</td>
<td>2.00</td>
<td>0</td>
<td>.0</td>
</tr>
<tr>
<td>15.</td>
<td>Self-Esteem</td>
<td>477</td>
<td>56.67</td>
<td>10.77</td>
<td>0</td>
<td>.0</td>
</tr>
<tr>
<td>16.</td>
<td>Well-Being</td>
<td>476</td>
<td>6.81</td>
<td>2.25</td>
<td>1</td>
<td>.2</td>
</tr>
<tr>
<td>17.</td>
<td>Mental Distress</td>
<td>462</td>
<td>9.96</td>
<td>5.34</td>
<td>15</td>
<td>3.1</td>
</tr>
</tbody>
</table>
As we can see from the last two columns in Table 6.1, depicting the spread of missing data, the extent of the problem never reached more than three percent of the sample.

As can be seen in Table 6.2, a similar profile emerged from analysis of missing data in the longitudinal sample, for both Time 1 and Time 2 protocols.

Table 6.2: Details of Missing data and Descriptive statistics for longitudinal sample

<table>
<thead>
<tr>
<th></th>
<th>Time One Data</th>
<th>Missing</th>
<th>Time Two Data</th>
<th>Missing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean</td>
<td>SD</td>
<td>n</td>
</tr>
<tr>
<td>Eco-Threat</td>
<td>335</td>
<td>90.65</td>
<td>26.77</td>
<td>3</td>
</tr>
<tr>
<td>Eco-Philosophy</td>
<td>336</td>
<td>51.83</td>
<td>7.88</td>
<td>2</td>
</tr>
<tr>
<td>Eco-Affect</td>
<td>334</td>
<td>36.01</td>
<td>11.43</td>
<td>4</td>
</tr>
<tr>
<td>Eco-Actions</td>
<td>335</td>
<td>29.32</td>
<td>9.02</td>
<td>3</td>
</tr>
<tr>
<td>Eco-Promise</td>
<td>335</td>
<td>35.49</td>
<td>9.83</td>
<td>3</td>
</tr>
<tr>
<td>Eco-Knowledge</td>
<td>332</td>
<td>93.92</td>
<td>31.17</td>
<td>6</td>
</tr>
<tr>
<td>Eco-Attitude</td>
<td>334</td>
<td>100.88</td>
<td>25.73</td>
<td>4</td>
</tr>
<tr>
<td>Eco-Self</td>
<td>331</td>
<td>194.92</td>
<td>46.11</td>
<td>7</td>
</tr>
<tr>
<td>Behaviour</td>
<td>338</td>
<td>12.21</td>
<td>3.32</td>
<td>0</td>
</tr>
<tr>
<td>Intellect and School Status</td>
<td>338</td>
<td>11.30</td>
<td>3.40</td>
<td>0</td>
</tr>
<tr>
<td>Physical Appearance</td>
<td>338</td>
<td>8.65</td>
<td>3.19</td>
<td>0</td>
</tr>
<tr>
<td>Anxiety</td>
<td>338</td>
<td>9.87</td>
<td>3.30</td>
<td>0</td>
</tr>
<tr>
<td>Popularity</td>
<td>338</td>
<td>8.85</td>
<td>2.41</td>
<td>0</td>
</tr>
<tr>
<td>Happiness and Satisfaction</td>
<td>338</td>
<td>7.94</td>
<td>2.01</td>
<td>0</td>
</tr>
<tr>
<td>Self-Esteem</td>
<td>338</td>
<td>56.86</td>
<td>10.99</td>
<td>0</td>
</tr>
<tr>
<td>Well-Being</td>
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<td>6.87</td>
<td>2.22</td>
<td>1</td>
</tr>
<tr>
<td>Mental Distress</td>
<td>334</td>
<td>9.77</td>
<td>5.22</td>
<td>4</td>
</tr>
</tbody>
</table>

Given the results of the missing data analysis these protocols were retained for subsequent analysis.

Sample Characteristics

The total number of participants in the sample was therefore 559, and when examined as a function of when protocols were completed, the sub-samples ranged from 447 present at Time One to 81 participants present only at Time Two. The exact breakdown is presented in Table 6.3 below.
Of the eighteen schools selected for inclusion in the study, thirteen schools agreed to participate, and twelve schools took part at both completion times.

Table 6.3: Sample distribution by School, Intervention group and Administration

<table>
<thead>
<tr>
<th>School number</th>
<th>Intervention group</th>
<th>School Type</th>
<th>Postal code</th>
<th>SES</th>
<th>School Sex</th>
<th>N (M+F)</th>
<th>1</th>
<th>2</th>
<th>1&amp;2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Control</td>
<td>Vol. Sec.</td>
<td>13</td>
<td>Mixed</td>
<td>F</td>
<td>50</td>
<td>13</td>
<td>7</td>
<td>30</td>
</tr>
<tr>
<td>2</td>
<td>Control</td>
<td>Vol. Sec.</td>
<td>4</td>
<td>Mixed</td>
<td>M</td>
<td>22</td>
<td>3</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Control</td>
<td>Vol. Sec.</td>
<td>4</td>
<td>Middle</td>
<td>F</td>
<td>55</td>
<td>6</td>
<td>3</td>
<td>46</td>
</tr>
<tr>
<td>5</td>
<td>Control</td>
<td>Community</td>
<td>20</td>
<td>Deprived</td>
<td>M/F</td>
<td>40+41 =81</td>
<td>10</td>
<td>23</td>
<td>48</td>
</tr>
<tr>
<td>6</td>
<td>Control</td>
<td>Community</td>
<td>24</td>
<td>Middle</td>
<td>M/F</td>
<td>20+1 =37</td>
<td>3</td>
<td>13</td>
<td>21</td>
</tr>
<tr>
<td>7</td>
<td>Control</td>
<td>Community</td>
<td>13</td>
<td>Middle</td>
<td>M/F</td>
<td>63+29 =92</td>
<td>43</td>
<td>13</td>
<td>36</td>
</tr>
<tr>
<td>10</td>
<td>Control</td>
<td>Community</td>
<td>22</td>
<td>Low / Middle</td>
<td>M</td>
<td>40</td>
<td>5</td>
<td>3</td>
<td>32</td>
</tr>
<tr>
<td>11</td>
<td>Control</td>
<td>Vol. Sec.</td>
<td>5</td>
<td>Middle</td>
<td>M</td>
<td>47</td>
<td>5</td>
<td>42</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Control</td>
<td>Vol. Sec.</td>
<td>14</td>
<td>Middle / Upper</td>
<td>F</td>
<td>39</td>
<td>39</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subtotal</td>
<td>Control</td>
<td>Vol. Sec.</td>
<td>13</td>
<td>Middle / Upper</td>
<td>F</td>
<td>232+231 =463</td>
<td>124</td>
<td>65</td>
<td>274</td>
</tr>
<tr>
<td>4</td>
<td>Experimental</td>
<td>Vol. Sec.</td>
<td>Stillorgan</td>
<td>Middle / Upper</td>
<td>M</td>
<td>50</td>
<td>11</td>
<td>10</td>
<td>29</td>
</tr>
<tr>
<td>8</td>
<td>Experimental</td>
<td>Community</td>
<td>16</td>
<td>Middle</td>
<td>M/F</td>
<td>10+4 =14</td>
<td>2</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Experimental</td>
<td>Community</td>
<td>14</td>
<td>Low / Middle</td>
<td>M/F</td>
<td>8+9=17</td>
<td>2</td>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td>12</td>
<td>Experimental</td>
<td>Glasthule</td>
<td>M</td>
<td>Middle</td>
<td>M/F</td>
<td>15</td>
<td>2</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>Subtotal</td>
<td>Experimental</td>
<td>Glasthule</td>
<td>M</td>
<td>Middle</td>
<td>M/F</td>
<td>83+13 =96</td>
<td>15</td>
<td>17</td>
<td>64</td>
</tr>
<tr>
<td>Sample Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>315+244 =559</td>
<td>139</td>
<td>82</td>
<td>338</td>
</tr>
</tbody>
</table>

Of these schools, nine were in the control group and four schools participated in the experimental condition. One further difference between the groups occurred with respect to group size. The intervention group had fewer pupils in the school participating in the Transition Year Programme, than did the control group.
Income level of the participants was measured by a single question ("Given the categories Low, Middle, and Upper, how would you rate the average income of the families from which the students in the school come") put to the liaison teacher in each school.

As indicated in Figure 6.1, the majority of students were classed within middle-income bracket. When the experimental group were contrasted with the control group, however, more students were classified as middle to upper income.

**Gender distribution for the initial and follow-up samples**

The total number of protocols in Time 1 sample was 477, there were 58.5% (n=279) male and 41.5% (n=198) female participants. Significantly, more (Chi sq.(1)= 11.4; p<0.001) males than females constituted the sample.

Of these participants, 70.9% (n=338) were followed up at Time 2. In this sub-sample, formed by 218 (64.5%) males and 120 (36.5%) females, there were significantly more males (Chi sq.(1)= 28.4; p<0.001) in the longitudinal sample.
Was there a selection effect for sex?
When we examined the proportion of sexes in the attrition group (i.e. Time One only), females outnumbered males (56.1% versus 43.9%). Attrition rate and gender were not significantly (Chi sq.(1)= 2.08; p>0.05) related.

Were attrition rate and intervention condition related?
After the first session, a number of participants (n=139) did not continue with the study. The difference in this rate of attrition across intervention condition was significant (Chi sq.(1)= 85.5; p <0.001). More participants from the control group opted out of the study (89.2%) than those in the experimental group (10.8%).

What was the ‘intervention’ distribution within the longitudinal sample?
Within the follow-up sample, of the 338 participants, 81.1% were in the control group, 161 males, and 113 females. Fifty-seven males and seven females formed the experimental group, constituting 18.9% of the sample. Gender effects were apparent at both the control (Chi sq.(1)= 8.4; p <0.005) and experimental (Chi sq.(1)= 39.1; p <0.001) conditions.

Descriptive statistics
To examine the appropriateness of parametric statistical procedures planned for the analysis, data was examined with respect the fit of the normal model. The most important deviations from normality assumptions are found in the form of outliers and non-symmetrical distribution. Subsequent graphical analysis of box-plots, histograms and normal probability plots suggested an approximation toward normality for responses to all of the scales, on each testing occasion, except the Well-Being and Mental Health measures.
From perusal of the data on Table 6.4, one can examine the shape of the distribution of data on all of the scales at both Time 1 (t1) and Time 2 (t2).

Table 6.4: Descriptive statistics for all Participants on Scale Totals (t1 & t2)

<table>
<thead>
<tr>
<th></th>
<th>Time One Data</th>
<th></th>
<th></th>
<th></th>
<th>Time Two Data</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean</td>
<td>SD</td>
<td>Median</td>
<td>Skew</td>
<td>N</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Eco-Threat</td>
<td>335</td>
<td>90.65</td>
<td>26.77</td>
<td>92.00</td>
<td>-.05</td>
<td>335</td>
<td>88.83</td>
<td>26.79</td>
</tr>
<tr>
<td>Eco-Philosophy</td>
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<td>51.83</td>
<td>7.88</td>
<td>52.00</td>
<td>-.14</td>
<td>336</td>
<td>50.96</td>
<td>7.95</td>
</tr>
<tr>
<td>Eco-Affect</td>
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<td>36.01</td>
<td>11.43</td>
<td>36.00</td>
<td>-.13</td>
<td>335</td>
<td>36.11</td>
<td>10.56</td>
</tr>
<tr>
<td>Eco-Actions</td>
<td>335</td>
<td>29.32</td>
<td>9.02</td>
<td>28.00</td>
<td>.35</td>
<td>334</td>
<td>29.55</td>
<td>9.56</td>
</tr>
<tr>
<td>Eco-Promise</td>
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<td>35.49</td>
<td>9.83</td>
<td>34.00</td>
<td>.14</td>
<td>336</td>
<td>35.37</td>
<td>9.18</td>
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<td>-.44</td>
<td>333</td>
<td>94.72</td>
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<td>25.73</td>
<td>100.00</td>
<td>.03</td>
<td>333</td>
<td>100.95</td>
<td>25.25</td>
</tr>
<tr>
<td>Eco-Self</td>
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<td>194.92</td>
<td>46.11</td>
<td>196.00</td>
<td>-.19</td>
<td>331</td>
<td>195.79</td>
<td>45.68</td>
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<tr>
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<td>12.57</td>
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</tr>
<tr>
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<td>3.40</td>
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<td>-.53</td>
<td>338</td>
<td>11.93</td>
<td>3.57</td>
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<td>-.56</td>
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<td>8.84</td>
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</tr>
<tr>
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<td>9.87</td>
<td>3.30</td>
<td>10.00</td>
<td>-.65</td>
<td>338</td>
<td>10.21</td>
<td>3.25</td>
</tr>
<tr>
<td>Anxiety</td>
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<td>-.82</td>
<td>338</td>
<td>8.88</td>
<td>2.45</td>
</tr>
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<td>2.01</td>
<td>9.00</td>
<td>-1.03</td>
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<td>7.93</td>
<td>2.15</td>
</tr>
<tr>
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<td>56.86</td>
<td>10.99</td>
<td>58.00</td>
<td>-.47</td>
<td>337</td>
<td>58.45</td>
<td>11.64</td>
</tr>
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<td>7.00</td>
<td>-.55</td>
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<td>7.07</td>
<td>2.32</td>
</tr>
<tr>
<td>Mental Distress</td>
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<td>9.77</td>
<td>5.22</td>
<td>9.00</td>
<td>1.28</td>
<td>332</td>
<td>9.23</td>
<td>5.05</td>
</tr>
</tbody>
</table>

Two of the measures for personal health, self-concept (Piers Harris) and psychological distress (GHQ), were the most highly skewed, however even these values were close to 1.00 and were therefore deemed to approximate a symmetrical distribution (SPSS 10.0 online help file) for the purpose of the current analysis.
Associations between ‘Health’ and ‘Environmentalism’

Firstly, by computing 1-tailed Pearson correlation coefficients, we examined the pattern of relationships within health measures (Table 6.5) and environmentalism measures (Table 6.6) on first and second administrations. With regard to the health measures, we found a strong positive correlation, all highly significant (p< .01), between Self-Esteem and Well-Being. Further, we found the expected negative relationships between the Psychological Distress (GHQ) and Self-Esteem and Well Being measures, at both administration times.

The weakest correlations (r< 0.20) were observed between the Behaviour and Popularity and the Behaviour and Physical Appearance & Attributes scales at Time 1.

Table 6.5: Pearson Correlations (1-tailed*) within ‘Health’ Scales

<table>
<thead>
<tr>
<th></th>
<th>BEH</th>
<th>INT</th>
<th>APPEAR</th>
<th>ANX</th>
<th>POP</th>
<th>HAPPY</th>
<th>Self Esteem</th>
<th>GHQ</th>
<th>Well Being</th>
</tr>
</thead>
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<tr>
<td>1.BEH</td>
<td></td>
<td>.330</td>
<td>.199</td>
<td>.292</td>
<td>.189</td>
<td>.360</td>
<td>.629</td>
<td>.291</td>
<td>.298</td>
</tr>
<tr>
<td>2.INT</td>
<td>.548</td>
<td></td>
<td>.616</td>
<td>.464</td>
<td>.424</td>
<td>.491</td>
<td>.780</td>
<td>.438</td>
<td>.460</td>
</tr>
<tr>
<td>3.APPEAR</td>
<td>.144</td>
<td>.543</td>
<td></td>
<td>.613</td>
<td>.615</td>
<td>.688</td>
<td>.765</td>
<td>.461</td>
<td>.521</td>
</tr>
<tr>
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<td>.400</td>
<td>.553</td>
<td>.643</td>
<td>.728</td>
<td>.780</td>
<td>.516</td>
<td>.508</td>
<td></td>
</tr>
<tr>
<td>5.POP</td>
<td>.134</td>
<td>.367</td>
<td>.627</td>
<td>.595</td>
<td>.545</td>
<td>.685</td>
<td>.438</td>
<td>.456</td>
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<tr>
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<td>.717</td>
<td>.709</td>
<td>.524</td>
<td></td>
<td>.786</td>
<td>.508</td>
<td>.523</td>
</tr>
<tr>
<td>7.Self Esteem</td>
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<td>.754</td>
<td>.739</td>
<td>.738</td>
<td>.678</td>
<td>.756</td>
<td>.518</td>
<td></td>
<td>.578</td>
</tr>
<tr>
<td>8.GHQ</td>
<td>-.262</td>
<td>-.358</td>
<td>-.396</td>
<td>-.480</td>
<td>-.350</td>
<td>-.462</td>
<td>-.518</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.Well Being</td>
<td>.266</td>
<td>.417</td>
<td>.484</td>
<td>.538</td>
<td>.434</td>
<td>.540</td>
<td>.604</td>
<td>-.578</td>
<td></td>
</tr>
</tbody>
</table>

* All correlations were significant at the 1% level of probability. Time 1 below the diagonal and Time 2 above the diagonal

The GHQ scores were least associated with the Behaviour Scale scores of all the other health scales.

The relationships within the Environmental scales were somewhat more complex when compared across administration times. Various changes occurred in the strength of correlations within measures of environmentalism across administration times.
Of particular note are those where the change in magnitude effected a corresponding change in statistical significance.

Table 6.6: Pearson Correlations (1-tailed) within ‘Environmental’ Scales

<table>
<thead>
<tr>
<th>Scales#</th>
<th>CHEA KS</th>
<th>CHEA KS</th>
<th>CHEA KS</th>
<th>CHEA KS</th>
<th>CHEA KS</th>
<th>CHEA KS</th>
<th>CHEA KS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Verbal Comm.</td>
<td>Actual Comm.</td>
<td>Affect</td>
<td>Attitudes</td>
<td>Knowledge</td>
<td>Total</td>
<td>EAI</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>.585**</td>
<td>.622**</td>
<td>.846**</td>
<td>.157**</td>
<td>.594**</td>
<td>.149**</td>
</tr>
<tr>
<td>Verbal Comm.</td>
<td>.511**</td>
<td>-</td>
<td>.626**</td>
<td>.854**</td>
<td>.122*</td>
<td>.566**</td>
<td>.150**</td>
</tr>
<tr>
<td>Actual Comm.</td>
<td>.613**</td>
<td>.607**</td>
<td>-</td>
<td>.882**</td>
<td>.153**</td>
<td>.605**</td>
<td>.291**</td>
</tr>
<tr>
<td>Attitudes</td>
<td>.834**</td>
<td>.815**</td>
<td>.891**</td>
<td>-</td>
<td>.174**</td>
<td>.683**</td>
<td>.233**</td>
</tr>
<tr>
<td>Knowledge</td>
<td>.263**</td>
<td>.246**</td>
<td>.261**</td>
<td>.302**</td>
<td>-</td>
<td>.838**</td>
<td>-.116*</td>
</tr>
<tr>
<td>Total</td>
<td>.645**</td>
<td>.623**</td>
<td>.676**</td>
<td>.764**</td>
<td>.846**</td>
<td>-</td>
<td>.042</td>
</tr>
<tr>
<td>EAI</td>
<td>.191**</td>
<td>.132**</td>
<td>.324**</td>
<td>.269**</td>
<td>-.063</td>
<td>.109*</td>
<td>-</td>
</tr>
<tr>
<td>NEP-R</td>
<td>.366**</td>
<td>.277**</td>
<td>.381**</td>
<td>.404**</td>
<td>.223**</td>
<td>.377**</td>
<td>.144**</td>
</tr>
</tbody>
</table>

*Comm=Commitment;  
*p<.05; **p<.01 Time 1 below the diagonal and Time 2 above the diagonal

These was evidence of decreased association between the Knowledge and Actual Commitment scores (t1 r=. 246**, t2 r=. 122*), the CHEA KS total and EAI scores (t1 r=. 109*, t2 r=. 042), and the EAI and NEP-R scores (t1 r=. 144**, t2 r=. 105*). An increase in the negative association between the Knowledge and EAI scores was observed (t1 r=-.063, t2 r=-.116*) also.
When we examined the data from the analysis between constructs of ‘Health’ and ‘Environmentalism’ (see Table 6.7), in general, the magnitude of the relationships across constructs was weaker at the time of the second administration.

Table 6.7: Pearson Correlation coefficients ‘Health’ and ‘Environmental’ Scales

<table>
<thead>
<tr>
<th>Scales*</th>
<th>Health</th>
<th>EAI</th>
<th>NEP-R</th>
<th>CHEAKS-Total</th>
<th>CHEAKS Affect</th>
<th>Actual Commitment</th>
<th>Verbal Commitment</th>
<th>Knowledge</th>
<th>Attitudes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>T1</td>
<td>T2</td>
<td>T1</td>
<td>T2</td>
<td>T1</td>
<td>T2</td>
<td>T1</td>
<td>T2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

We found consistent evidence of statistically significant relationships that were weak to moderate in magnitude for the Behaviour and Intellectual & School Status Scales, and the CHEAKS total, and sub scale scores. The magnitude of the coefficients for the Behaviour scores was greater, in many cases, than those observed between this and some of the other ‘Health’ measures (see Table 6.5). This was the case for data from both administrations of the PEHQ. In general, the other relationships between the two constructs were weak, although statistically significant at times.
Answers to Research Questions

At this juncture each of the research, questions formulated for the study, and presented in the introduction of the chapter are addressed in turn.

1. **Does the IPECC remain a robust finding in this sample of Transition Year students when design validity has been improved by: introducing a time order, controlling for confounding variables, and controlling for personality factors?**

Given the inconsistent findings for health outcome across the adult and first teenage sample in this project, using cross-sectional data, we conducted the IPECC analysis on Time 1 data in the first instance, and controlled the influence of emotionality (ABS scores) in the second instance.

The results of the first analysis indicate interpretable main effects for Philosophy on three of the Self-Esteem sub-scales: Behaviour (F (1,329) = 12.690; p = .000; $E^2 = .037$; Power = .944); Intellectual & School Status (F (1,329) = 7.963; p = .005; $E^2 = .024$; Power = .803); Popularity (F (1,329) = 4.154; p = .042; $E^2 = .012$; Power = .529). Of particular interest is the finding for the Intellectual & School Status scale, a main effect confounded by the interactive effect of Philosophy and Threat perception. The interactive effect, although statistically significant (F (1,329) = 4.415; p = .036; $E^2 = .013$; Power = .554) was observed with a relatively low level of Power.

When the effect of the ABS scores was included in the analysis, similar main effects emerged for Philosophy on three of the Self-Esteem sub-scales: Behaviour (F (1,329) = 12.866; p = .000; $E^2 = .038$; Power = .947); Intellectual & School Status (F (1,329) = 8.619; p = .004; $E^2 = .026$; Power = .833); Popularity (F (1,329) = 5.866; p = .016; $E^2 = .018$; Power = .675). No interactive effect emerged as being statistically significant (p<.05).

Having established the similarity in this second sample of teenagers with that of the last study and the subsequent difference in health outcome observed in the adult...
sample reported in the first study, we next adapted model to address the question specified above.

To incorporate the observations of Stroebe & Stroebe (1995) outlined above, a multivariate analysis of covariance was conducted. On the longitudinal data (n=338) the time 2 health variables (GHQ and Piers Harris total and subscale scores) served as dependent variables, time 1 EAI, and NEP-R categories as the predictor variables and time 1 Health variables and Well-Being scores as the covariates.

Box’s M Test indicated inequality of covariance on the dependent variate. A multivariate effect emerged for **NEP-R** (F(8,314)=3.15; p<.005; Eta^2=.074; Power=.965). Levene’s test showed equality of error variance, and univariate main effects emerged for NEP-R on Behaviour, Physical appearance and attributes, and Happiness and Satisfaction Scales. The effect size was greatest for the Happiness and Satisfaction scale, as indicated in Table 6.8.

Compared to their ‘non-green’ cohorts (i.e. below median scorers), ‘Greens’ reported higher mean scores with less variation on the Behaviour Scale, while the converse was observed for the Physical appearance & attribute and Happiness & Satisfaction scales.

Table 6.8  EAI*NEP-R(t1) predicting Health (t2), controlling Health & Well-being (t1)

<table>
<thead>
<tr>
<th>Source*</th>
<th>Dependent Variable</th>
<th>F (1,321)</th>
<th>Sig.</th>
<th>Eta^2</th>
<th>Observed Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEP-R</td>
<td>Behaviour</td>
<td><strong>12.15</strong></td>
<td>3.38</td>
<td>.013</td>
<td>.019 .705</td>
</tr>
<tr>
<td></td>
<td><strong>#13.11</strong></td>
<td>2.90</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Physical appearance &amp; Attributes</td>
<td><strong>9.00</strong></td>
<td>3.13</td>
<td>.046</td>
<td>.012 .514</td>
</tr>
<tr>
<td></td>
<td><strong>#8.75</strong></td>
<td>3.40</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Happiness &amp; Satisfaction</td>
<td><strong>8.18</strong></td>
<td>1.94</td>
<td>.000</td>
<td>.038 .946</td>
</tr>
<tr>
<td></td>
<td><strong>#7.75</strong></td>
<td>2.29</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EAI * NEP-r</td>
<td>Intellectual &amp; School Status</td>
<td>5.847</td>
<td>.016</td>
<td>.018</td>
<td>.674</td>
</tr>
<tr>
<td></td>
<td>Self Esteem</td>
<td>9.640</td>
<td>.002</td>
<td>.029</td>
<td>.872</td>
</tr>
<tr>
<td></td>
<td>GHQ</td>
<td>6.362</td>
<td>.012</td>
<td>.019</td>
<td>.711</td>
</tr>
</tbody>
</table>

*Covariates in the model were scores at time 1 for Piers Harris total, GHQ, and Well-being scales

** Below Median group mean #Above Median group mean
Line graphs for the interactive effects in the model are presented in Figure 6.2.

![Figure 6.2: IPECC model with refined covariate design](image)

Once again, the amplifying effect of eco-philosophy in determining the effects of eco-threat perception on health was robust and consistent with the results of the first study. This time however, the internal validity of the study design was stronger i.e. necessary conditions for drawing causal inferences (Shaughnessy & Zechmeister, 1990) were met. In Figure 6.2, it is clear that ‘greens’ (represented by the black line) reported mean scores consistent with poorer outcome in the high threat condition, when compared to both low threat conditions and their ‘non-green’ cohorts.

2. Does the introduction of CHEAKS scores into the factorial model increase its explanatory power?

When the total scores for the CHEAKS were included as a third factor in the model, unequal covariance emerged on the dependent variate. Multivariate effects were observed for NEP-R and CHEAKS with 6.2% and 13.8% of the variance explained respectively (power .91 and 1.00 respectively). Interactive effects for EAI and CHEAKS were also observed explaining 5.9% of the variance with an associated power of .89.
Levene's test showed inequality of error variance on Behaviour (p< .01) and Self-Esteem (p< .05).

At a univariate level several effects occurred, complete details of these effects are tabulated in Table 6.9.

Table 6.9: Effects in the 3-way factorial model with EAI, NEP-R, and CHEAKS

<table>
<thead>
<tr>
<th>Source</th>
<th>Dependent Variable</th>
<th>Mean</th>
<th>Std. Dev</th>
<th>F</th>
<th>Sig.</th>
<th>Eta²</th>
<th>Observed Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEP-R</td>
<td>Happiness &amp; Satisfaction</td>
<td>8.16</td>
<td>1.95</td>
<td>10.332</td>
<td>.001</td>
<td>.032</td>
<td>.893</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7.75</td>
<td>2.29</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHEAKS</td>
<td>Behaviour</td>
<td>11.73</td>
<td>3.45</td>
<td>24.051</td>
<td>.000</td>
<td>.071</td>
<td>.998</td>
</tr>
<tr>
<td></td>
<td></td>
<td>13.68</td>
<td>2.42</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Intellectual &amp; School Status</td>
<td>11.20</td>
<td>3.66</td>
<td>11.106</td>
<td>.001</td>
<td>.034</td>
<td>.913</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12.91</td>
<td>3.12</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Physical appearance &amp; Attributes</td>
<td>8.99</td>
<td>3.15</td>
<td>6.940</td>
<td>.009</td>
<td>.022</td>
<td>.747</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8.67</td>
<td>3.39</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Anxiety</td>
<td>10.35</td>
<td>3.32</td>
<td>5.450</td>
<td>.020</td>
<td>.017</td>
<td>.643</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10.14</td>
<td>3.12</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EAI * NEP-R</td>
<td>Self Esteem</td>
<td>4.018</td>
<td></td>
<td>4.231</td>
<td>.046</td>
<td>.013</td>
<td>.515</td>
</tr>
<tr>
<td></td>
<td>GHQ</td>
<td>5.396</td>
<td></td>
<td></td>
<td>.021</td>
<td>.017</td>
<td>.639</td>
</tr>
<tr>
<td>EAI * CHEAKS</td>
<td>Intellectual &amp; School Status</td>
<td>5.118</td>
<td></td>
<td></td>
<td>.024</td>
<td>.016</td>
<td>.616</td>
</tr>
<tr>
<td></td>
<td>Popularity</td>
<td>4.724</td>
<td></td>
<td></td>
<td>.030</td>
<td>.015</td>
<td>.582</td>
</tr>
<tr>
<td></td>
<td>Happiness &amp; Satisfaction</td>
<td>6.293</td>
<td></td>
<td></td>
<td>.013</td>
<td>.020</td>
<td>.706</td>
</tr>
<tr>
<td></td>
<td>Self Esteem</td>
<td>5.328</td>
<td></td>
<td></td>
<td>.022</td>
<td>.017</td>
<td>.634</td>
</tr>
</tbody>
</table>

* Covariates in the model were scores at Time 1 for Piers Harris total, GHQ, and Well-being scales

* Below Median group mean

* Above Median group mean

No 3-way interactions between EAI, NEP-R, and CHEAKS were observed (the closest being for GHQ at the 10% level of probability). No 2-way interactions between NEP-R and CHEAKS emerged. As tabulated in Table 6.9, four effects of 2-way interactions between EAI and CHEAKS, on Intellectual & School Status, Popularity, Happiness & Satisfaction, and Self-Esteem Scales, were observed. In addition, 2-way interaction between EAI and NEP-R explained 1.7% of the variance in GHQ scores and 1.3% of the Self-esteem scores. These effects are presented in Figure 6.3.
The amplification effect of 'green' beliefs on the negative impact of high threat perception on psychological distress and self-concept remained consistent when the effect of environmental attitudes and knowledge were accounted for.

These constructs reduced the IPECC phenomenon for the Intellectual and School Status scores (see Figure 6.3).

Figure 6.3: Interactive effects of MANCOVA for EAI, NEP-R, CHEAKS

More ecological attitudes and knowledge were associated with increased outcome in terms of Intellectual Status, for those with low threat perception, however this
advantage in not so apparent in the high threat condition. The ‘switch’ in terms of relative positions for levels of ecological attitudes was amplified for the Popularity, Happiness, and Self-concept scales.

In light of the interactions, main effects for NEP-R were interpretable for the Happiness & Satisfaction scores, as were main effects for CHEAKS on the Behaviour, Physical Appearance & Attributes, and Anxiety Scale scores. When mean scores (presented in Table 6.9) were compared, on average ‘Greens’ reported lower Happiness & Satisfaction scores than their ‘non-Green’ cohorts. This observation is consistent with the lower scores on Physical appearance and Anxiety Scales for the above median group on the CHEAKS. In contrast, those with above median scores on CHEAKS reported better adjustment on the Behaviour measure.

3. Does environmental knowledge mediate the effect of threat on health?

When EAI*KNOWLEDGE (t1) predicted health at t2, controlling for Self-esteem, Psychological Distress and Well-being (t1), a multivariate effect for knowledge emerged. In addition, at the univariate level, an interaction for between Knowledge and EAI occurred on Popularity (F (1,319)=6.31; p<.05; Eta^2=.019; power=.71) scores.

![Figure 6.4: Plot of (t1) EAI*Knowledge on Popularity (t2)
The configuration of scores is depicted in Figure 6.4 and appears to be remarkably aligned with that for the interaction between CHEAKS and EAI depicted in Figure 6.3 (d).

4. What impact does Knowledge have on the relationship between NEP-R and health?

By using the model specified above, substituting NEP-R for EAI we can determine whether knowledge changes the health outcome of ‘greens’ in any way that does not apply to less ecologically oriented thinkers. In the IPECC model, we observed an interaction between EAI and NEP-R scores in terms of health. The following effects occurred from the procedure, tabulated in Table 6.10. Main effects for both Knowledge and NEP-R were observed at the multivariate level at the 1% and 5% level of probability respectively. At the univariate level, main effects of Knowledge emerged for Behaviour, Intellectual & School Status, and Physical Appearance & Attributes, all at the 5% level of probability.

Table 6.10: Main effect Factor means for Knowledge and NEP-R

<table>
<thead>
<tr>
<th>Source</th>
<th>Median split</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge</td>
<td>Behaviour</td>
<td>Below</td>
<td>12.0123</td>
<td>3.2893</td>
</tr>
<tr>
<td></td>
<td>Above</td>
<td>13.3598</td>
<td>2.8368</td>
<td>164</td>
</tr>
<tr>
<td></td>
<td>Intellect</td>
<td>Below</td>
<td>11.3827</td>
<td>3.5177</td>
</tr>
<tr>
<td></td>
<td>Above</td>
<td>12.6951</td>
<td>3.3860</td>
<td>164</td>
</tr>
<tr>
<td></td>
<td>Appearance</td>
<td>Below</td>
<td>9.0062</td>
<td>3.2100</td>
</tr>
<tr>
<td></td>
<td>Above</td>
<td>8.6951</td>
<td>3.3404</td>
<td>164</td>
</tr>
<tr>
<td>NEP-R</td>
<td>Happiness</td>
<td>Below</td>
<td>8.1757</td>
<td>1.9508</td>
</tr>
<tr>
<td></td>
<td>Above</td>
<td>7.7472</td>
<td>2.2942</td>
<td>178</td>
</tr>
</tbody>
</table>

The main effect for NEP-R occurred on Happiness at the 1% level. Above median Knowledge scorers reported higher average scores on Behaviour and Intellectual & School Status scores, while below median scorers on Knowledge reported higher average scores on the Physical Appearance & Attribute scale.
The below median scorers on NEP-R reported a greater average level of Happiness & Satisfaction, with less variation than the above median scorers.

No significant interactions occurred, although there was a trend toward interaction between Knowledge and NEP-R on the popularity scale (p=. 06), depicted in Figure 6.5.

![Estimated Marginal Means](image)

Figure 6.5: Plot of NEP-R*Knowledge (t1) on Popularity (t2)

The depiction here implied increased popularity for those with low levels of knowledge but this was dampened by their ecological beliefs with a sharp decrease for those with high eco-beliefs. Those with high levels of environmental knowledge reported less popularity particularly when they were ‘green’ with only a slight advantage over those who were not ‘green’.

5. Does engaging in environmental behaviours improve health?

If eschewing green beliefs reduces distress then it follows, that engaging in behaviours might also make them feel bad. However, an alternative position might be that by doing something about the environmental degradation situation makes people feel better (e.g. Bechtel, 1997). To test the proposition we employed the actual commitment scores and threat scores as the independent variables. We first checked the reliability of the actual commitment scale.

For Time 1 the Actual Commitment Scale had an alpha value of .71, for Time 2 the alpha value was slightly higher at .76. Therefore, internal consistency of the scale was acceptable for the purposes here. Remember however, that the factor analysis of
the attitude scale did not support the separation of these items from the other 24 items on the attitude scale.

In the MANCOVA procedure levels of Time 1 EAI and Actual Commitment (Acts) were the independent variables. Time 2 Piers-Harris, total and sub-scale scores, as well as the GHQ scores were dependent variables; and Time 1 Well-being, Piers Harris total, and GHQ scores were covariates. For this model, the following results emerged. A Multivariate effect emerged for Acts (p< .05), and a trend toward interaction (p=. 06) between the factors. Univariate (df 1,321) main effects occurred for Actual commitment on Behaviour (Low; Mean=12.3067, Std. Deviation=3.3689; High; Mean= 13.0364, Std. Deviation= 2.9048), and Intellectual and School Status (Low; Mean=11.6871, Std. Deviation=3.7160; High; Mean= 12.3879, Std. Deviation= 3.2658) scales at 5% level of probability. Interaction effects, shown in Figure 6.6, emerged on Intellectual and School Status scores at 1% level, and Happiness & Satisfaction, and Self-Esteem scales at 5% level of probability.

Engaging in environmental behaviours, it seems, increased scores on the Behaviour aspect of self-concept, Intellectual and School Status scales, Happiness & Satisfaction
and Self-Esteem scores in low stress condition but not in the high stress condition. In the high stress condition, those who reported more pro-environmental acts had lower scores than their counterparts who perceived low levels of personal threat. For those who engage in less pro-environmental behaviour, their self-concept appraisal was more positive in the presence of higher levels of personal threat perception. Indeed, on all but the Behaviour Scale, the non-engaged participants reported higher scores in self-appraisal than their cohorts who reported more environmental behaviours.

So, put another way, those who perceived more threat and did not engage in environmental behaviours enjoyed better health scores than those who perceived less threat and did not perform pro-environmental behaviours. Those who perceived low levels of threat did better (in terms of health outcome) when they engaged in environmental behaviours.

We next examined the interplay between eco-philosophy and pro-environmental behaviours. The NEP-R*ACTS model yielded a significant multivariate effect for NEP-R at the 5% level of probability (F (8,314)=2.40; p=.016; Eta^2=.058; power=.895). At the univariate level, an inequality of error variance was observed for Behaviour (F (3,324)=3.128; p<.05). A main effect on Happiness (F (1,321)=9.91; p=.002; Eta^2=.030; power=.881) emerged from the difference between low (Mean=8.1800; Std. Dev.=1.9389; n=150) and high (Mean=7.7472; Std. Dev.=2.2942; n=178) NEP-R group means.
No direct effects for actual commitment levels were observed but an interaction between the two factors emerged for the Intellectual and School Status scores. \((F(1,321)=7.65; p=0.006; \text{Eta}^2=0.023; \text{power}=0.778)\) and the relative positions are illustrated in Figure 6.7.

![Estimated Marginal Means](image)

**Figure 6.7: Interaction between NEP-R and Actual Commitment on Intellectual Scale**

Those who rejected ecological belief systems did not benefit from engaging in pro-environmental acts while the opposite was true for those espousing ‘green’ beliefs.

6. Does availability of recycling facilities make a difference to eco behaviour or happiness?

In the experimental group, 30 participants responded to an item asking about recycling facilities in their area. Approximately equal numbers reported ‘present’ / ‘in-use’ (46.7%) as ‘absent’ / ‘not used’ (53.3%). Chi square analysis showed no relationship between re-cycling facility availability and either Actual Commitment scores or Well-Being scores.
7. What were the effects of the intervention?

This was a doubly multivariate repeated measures design with Intervention group and sex as factors and controlling for interval between testing time. In this model the Between-Subjects factors divide the sample into discrete subgroups. Each subject has only one value for a between-subjects variable. The between subjects factors were, sex (Male n=203, Female n=116), and intervention condition (Group: Control n=258, Experimental n=61). Within subjects factor was Test with the measures of Self-concept (Piers Harris total/Self-esteem), distress (GHQ), threat (EAI), belief (NEP-R), ecology (CHEAKS), and affect (Well-being/ABS). At the multivariate level of between subjects factors there were effects for group (F (6,309) = 2.524; p=.021; $\eta^2 = .047$; Power = .838) and sex*group (F (6,309) = 3.287; p=.004; $\eta^2 = .06$; Power = .931).

Tests of between subject effects showed a barely significant covariate effect of interval on Threat (F (1,314) = 3.962; p=.047; $\eta^2 = .012$; power=.51). No effect for sex alone, a significant group effect on CHEAKS (F (1,314) = 8.636; p=.004; $\eta^2 = .027$; power=.834) and interactive effects for sex and group on CHEAKS (F (1,314) = 7.479; p=.007; $\eta^2 = .023$; power=.778), Well-Being (F (1,314) = 6.587; p=.011; $\eta^2 = .021$; power=.725), and GHQ (F (1,314) = 4.337; p=.038; $\eta^2 = .014$; power=.546).
When examining the meaning of these effects it is important to remember that there were only seven females in the experimental group.

Figure 6.8: Interaction between Sex, Group, and Time on CHEAKS totals

In Figure 6.8 the plots indicate that the Control group members had higher mean scores on CHEAKS and showed little change across intervention, while the Experimental group showed an increase after participation in the experiment. When sex differences are accounted for however, it is clear that the increase at Time 2 was apparent for females only, the opposite effect occurred for the males in the group.
The graphs depicted in Figure 6.9 depict how Control group members had lower mean scores on Well-being and showed little change across the intervention.

Figure 6.9: Interaction between sex, group, and time on Emotional Well-being totals

The Experimental group, showed an increase in emotional well-being after participation in the experiment. When sex differences are accounted for however, it is clear that a different picture emerges for the groups. For females, there was a slight increase at Time 2 for the Control group and a slight decrease for the Experimental group. For the males however, the Experimental group showed a marked increase after participating in the program.

The next step was to examine the effect of the intervention on psychological distress. As depicted in Figure 6.10, the Control group members had higher mean scores on GHQ at Time 1 and reported a decrease in psychological distress at Time 2.
By contrast, the Experimental group showed an increase in psychological distress after participation in the experiment.

Figure 6.10: Effect of Gender across Time on GHQ scores.

When sex differences are accounted for however, it is clear that the increase at time 2 was apparent for females only, the opposite effect occurred for the males in the group. The decrease in GHQ scores was more marked for the males than the females in the control group.

8. Gender effects on ‘health’ and ‘environmentalism’?

Two one-way MANOVA procedures were conducted on all variables (Time 2) to examine the effect of gender on ‘health’ (see Table 6.11) and ‘environmentalism’ (see Table 6.12) in turn.
On the health variables, females scored higher on Behaviour and GHQ scales. In all other instances of gender effects, the significant difference indicated higher scores for males on each of the Appearance, Anxiety, Happiness, and Self-concept scales.

Table 6.11: Gender differences on Health scales

<table>
<thead>
<tr>
<th>Source</th>
<th>Dependent Variable</th>
<th>F (1, 407)</th>
<th>Sig.</th>
<th>Direction</th>
<th>Eta²</th>
<th>Observed Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>*Gender</td>
<td>Behaviour</td>
<td>6.595</td>
<td>.011</td>
<td>F&gt;M</td>
<td>.016</td>
<td>.726</td>
</tr>
<tr>
<td></td>
<td>Appearance</td>
<td>23.363</td>
<td>.000</td>
<td>F&lt;M</td>
<td>.054</td>
<td>.998</td>
</tr>
<tr>
<td></td>
<td>Anxiety</td>
<td>34.529</td>
<td>.000</td>
<td>F&lt;M</td>
<td>.078</td>
<td>1.000</td>
</tr>
<tr>
<td></td>
<td>Happiness</td>
<td>13.255</td>
<td>.000</td>
<td>F&lt;M</td>
<td>.032</td>
<td>.953</td>
</tr>
<tr>
<td></td>
<td>Self-concept</td>
<td>7.361</td>
<td>.007</td>
<td>F&lt;M</td>
<td>.018</td>
<td>.772</td>
</tr>
<tr>
<td></td>
<td>GHQ</td>
<td>12.904</td>
<td>.000</td>
<td>F&gt;M</td>
<td>.031</td>
<td>.948</td>
</tr>
</tbody>
</table>

*N=409; Female n=163; Male n=246

While no gender difference was observed on average scores for Intellectual and School Status, or Well-being scales, over a range of measures females reported poorer levels of well-being. Perusal of the last two columns in Table 6.11 indicate strong gender effects for four of the scales and slightly lower effect size and Power for the Behaviour and Self-concept scale scores.

Gender differences were also apparent on the environmental scales. While females reported higher levels of ‘environmentalism’ in terms of their CHEAKS scores, both in general and at each sub-level, no gender effects emerged for the EAI or NEP-R scales.
The magnitude of the effect that gender had was substantial in terms of statistical and practical significance.

Table 6.12: Gender differences on Environmental scales

<table>
<thead>
<tr>
<th>Source</th>
<th>Dependent Variable</th>
<th>F</th>
<th>Sig.</th>
<th>Direction</th>
<th>Eta²</th>
<th>Observed Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>*Gender</td>
<td>Verbal Commitment</td>
<td>46.358</td>
<td>.000</td>
<td>F&gt;M</td>
<td>.102</td>
<td>1.000</td>
</tr>
<tr>
<td></td>
<td>Actual Commitment</td>
<td>20.332</td>
<td>.000</td>
<td>F&gt;M</td>
<td>.048</td>
<td>.994</td>
</tr>
<tr>
<td></td>
<td>Affect</td>
<td>17.879</td>
<td>.000</td>
<td>F&gt;M</td>
<td>.042</td>
<td>.988</td>
</tr>
<tr>
<td></td>
<td>Attitudes</td>
<td>35.827</td>
<td>.000</td>
<td>F&gt;M</td>
<td>.081</td>
<td>1.000</td>
</tr>
<tr>
<td></td>
<td>Knowledge</td>
<td>11.036</td>
<td>.001</td>
<td>F&gt;M</td>
<td>.026</td>
<td>.912</td>
</tr>
<tr>
<td></td>
<td>CHEAKS</td>
<td>35.245</td>
<td>.000</td>
<td>F&gt;M</td>
<td>.080</td>
<td>1.000</td>
</tr>
</tbody>
</table>

*N=409; Female n=161; Male n=248

So, while gender had a strong influence on environmental attitudes, at the deeper more fundamental level of ‘beliefs’ females were no different to their male cohorts in their average scores. In a similar fashion, no evidence of increased eco-threat perception was observed for females in the sample.
9. Does threat predict environmental behaviour?

A scatter plot of the two variables, EAI and Acts, is presented in Figure 6.11, the implication of this graph is that Eco-threat holds little predictive power on Actual commitment scores.

![Figure 6.11: Plot of EAI (t1) predicting Actual Commitment (t2)](image)

Employing a linear regression model confirmed this deduction. While EAI (t1) scores predicted time 2 Actual commitment scores to a statistically significant extent (F (1,331)=6.99; p<.01), however, given the large residual sum of squares (29794.71) compared to the residual value (629.28), the standard Beta of .144 and a relatively small t-value (t=2.64), it is unlikely that this would serve as a good predictor variable.

To examine the influence of gender, given the gender difference observed on Actual commitment scores, a two-way ANOVA was conducted to examine this question. No significant effect for levels of Eco-threat (t1) emerged on Actual Commitment scores (t2). While there was a main effect for gender, as anticipated, no interaction between gender and EAI scores occurred.
10. What is the relative contribution of the variables in the relationship between ‘environmentalism’ and ‘well-being’?

The theoretical proposition that failing to engage in pro-active behaviours will have negative health consequences highlighted by Bechtel (1997) is extended here to include the proposition that engaging in pro-ecological activities (beliefs, attitudes and actions) will be positively associated with psychological well-being. In this regard, a model whereby causal ordering could be facilitated would enhance the test of the hypothesis.

As we have indicated in the Chapter 1 (see Figure 1.1), Stern and colleagues (Stern, Dietz & Guagnano, 1995) presented a socio-cultural model of environmental concern. At the top of this sequential model, they placed environmental influences - Position in social structure, institutional constraints, and incentive structure. They placed Values next, followed by General beliefs, Worldview, and Folk ecological theory. Next in the chain came Specific beliefs and attitudes, followed by Behavioural commitments and intentions, and finally Behaviour.

The major flow of causation, assumed “… the factors at the top tend to be less mutable by the individual or over the life course than those near the bottom” (Stern et al. 1995; p. 727), with adjacent variables having the strongest causal effects and non-adjacent variables also having the ability to directly influence each other. No provision for feedbacks was made in the model and the authors await experimental and quasi-experimental evidence (e.g. the influence of behaviour on future beliefs and attitudes) for their specification.

The approach taken by such socio-ecological models is that individuals are embedded in a social structure that influences psychological variables in two ways. Early experience is shaped by the social structure and thus an individual’s values and general beliefs or worldview is influenced. A second mechanism is the provision of opportunities and constraints that shape behaviour and the perceived response to behaviour (Guagnano, Stern, & Dietz, 1995). Stern and colleagues (1995) argue that values and worldview are causally antecedent to more specific beliefs, which in turn are antecedent to personally held norms, intentions, and other proximate causes of particular actions.
The thesis presented here is that one’s perspective on the environment has an impact on personal psychological outcome. What one knows and feels about the environment is moderated by one’s philosophical view of the biosphere. However one’s philosophy also impacts on threat perception experienced as a consequence of evaluating risk associated with environmental hazards. Given the nature of the hypothesis (X predicts Y predicts Z) an appropriate method would be to specify a path analysis model.

The Path Analysis Model has been described as an extension of multiple regressions whereby theory of causal ordering among a set of variables can be evaluated (Klien, 1995). This technique presents a means whereby the direct and indirect paths between variables in a model can be assessed. The traditional method of calculating the path coefficients is to specify a series of multiple regression models based on the causal ordering in the model (e.g. Widegren, 1998). An alternative approach is to employ a Structural Equation Model (SEM) technique, which affords a detailed analysis of model fit and incorporates covariance between variables in the model (using the maximum likelihood solution based on the normal distribution theory). In utilizing this method we are conscious however of its attendant limitations and fundamental reliance of theoretical specification of any given model.

In this regard, we have paid particular attention to reporting the details of model fit. In doing so, we attempt to address some of the criticisms levelled by reviewers of the use of this method. For example, Breckler’s (1990) contention that many ‘sub optical’ uses of SEM methods are to be found in the area of personality and social psychology, with many not reporting on multivariate normality and providing inadequate information on model fit. We have already addressed the issue of multivariate normality in the data set in earlier chapters, and here we present details of the model fit.

In the path model specified here (see Figure 6.12), the causal ordering goes from Eco-threat to Psychological Distress via Eco-Beliefs, Eco-Attitudes and Knowledge and Self-Concept. The model was examined using the EQS software package. While social factors are not specified in the model it is implicit that the person operates in a
social context, with several layers of influence including family, political and economic systems, which provides a framework for formulation of values (see Figure 1.2).

The path model presented in Figure 6.12 contains the standardised path coefficients. This depiction illustrates how while no direct path (statistically significant Beta value) exists between Eco-threat and Psychological Distress there is a distinct route between the two variables through the mediating variables of Eco-philosophy, Eco-Attitudes and Knowledge, through Self-concept and Emotional Stability. Threat is a mild predictor of environmental beliefs, which in turn is a moderately strong indicator of environmental attitudes and knowledge.
The positive relationship between self-concept and environmental attitudes and knowledge suggests that increased pro-ecological orientation can act as a buffer against psychological distress.

![Path model of links between 'environmentalism' and 'wellness'](image)

Figure 6.12: Path model of links between ‘environmentalism’ and ‘wellness’

Interpretation of $R^2$ values indicate the standardised solution presented here explains 36% of the variance in Self-Concept, 36% of the variance in Psychological Distress, 15% of the variance in Eco-Attitudes & Knowledge, and 3% of the variance in Eco-Philosophy.

Model Fit
Assessment of Model fit was initially defined by examination of the Residual Covariance Matrix and the Standardised residuals. Small residuals with even distributions are an indication of good fit (Maruyama, 1998) and this was the case here with average small values for both absolute (0.02) and off-diagonal (0.03) residuals. In addition, review of the frequency distribution indicated that residual
values fell between -0.09 and 0.00. Therefore, on the basis of the standardised residuals we surmised that the global fit of the model was satisfactory.

Goodness of fit Summary
The Independence Chi-Square statistic for the likelihood ratio test of the Bentler & Bonnet (1980) null model is widely employed in this regard. This model is one of complete independence of all variables in the model (i.e. all correlations among variables are zero). In large samples, this null model serves as a good baseline against which alternative models can be gauged in order to examine and gain in improved fit. If the hypothesised model is sound then the Chi-Square for the null model should be extremely high, thereby indicating a large degree of misfit. In this case the Independence Model Chi-Square with 15 degrees of freedom was 501.74 supporting rejection of the null model.

The next step was to examine the hypothesised model. The Chi-Square value in this case (with 8 degrees of freedom) was substantially lower at 7.09 and the associated probability value of 0.53 suggested the hypothesised model was adequate.

The achievement of parsimony in assessment of model fit involves statistical goodness of fit and review of the number of estimated parameters. The Bentler & Bonnet (1980) Normed Fit Index (NFI) has been widely adopted alongside the revised (Bentler, 1990) Comparative Fit Index (CFI). Both are given in EQS output but Bentler asserts that the CFI should be the index of choice as it accounts for sample size. Values for both NFI and CFI range from zero to one and are a function of comparison between the null model and the hypothesised model. Each yields an indication of complete variation in the data, a value greater than 0.90 is synonymous with an acceptable fit to the data. In this model the NFI of 0.99 and the CFI of 1.00, were further indications that the hypothesised model represented an adequate fit to the data.

The Iterative Summary was the last piece of information relating to overall fit of the model. The best case is where only a few iterations are needed for convergence; only seven iterations were required here.
Statement of Fit Function

In general EQS minimizes fit function, when iterations stop this value should be at the minimum value. In this case, the function, derived from the equation \(((\text{sample size}-1) \times \text{Function} = \text{Chi-Square})\) was: \((454 \times 0.0156=7.09)\).

Individual parameter fit

The statistical significance of the parameter estimates was satisfactory \((z >1.96)\) in all cases except the parameter between Eco-threat and Psychological distress \((z=.98)\). In all other instances, the null hypothesis was rejected at the 5% level of probability.

Therefore, the satisfactory overall model fit was tempered by the lack of the parameter fit between two of the variables. This may be best interpreted in light of certain associated critiques of the structural equation modelling (Maruyama, 1998) procedures. Maruyama devotes several pages to this topic including critical views from those within and outside the SEM fraternity, ‘Internal’, and ‘External’ critics. Four central principles, related to statistical inference, articulated there, are concerned with issues of causal ordering, operationalisation, model disconfirmation, and model modification.

The first of these issues, causal ordering, is open to alternative perspectives in the present model. The weak link between Eco-threat and Psychological distress is consistent with the differentiation between Eco-threat perception in ‘normal’ and ‘psychiatric’ populations. Unlike the observation of the inclusion of ecological threat into the fabric of cognitive disordering reported in the psychiatric literature, this is not apparent in the non-psychiatric population data reported here. Nonetheless, given the factorial analyses reported earlier in this work it remained defensible to include this parameter in the model specification.

The second area for discussion regarding causal ordering in the model is the link between Eco-threat and Eco-philosophy. Whether reference to beliefs or worldviews is necessary for making valued judgements about environmental hazards is a contentious issue in the literature, however, within the social psychological framework for causal ordering in ecological behaviour (Stern et al., 1995) it is arguable that the causal ordering here is appropriate. In Stern’s framework, Eco-philosophy provides a link between social structural forces and socialisation processes.
that influences worldviews, and specific attitudes and behaviour that flow from them. In this thesis Eco-threat has been operationalised as a general construct covering a broad range of issues (26-items in all) and the valued judgements made regarding the health effects of such hazards are formulated within a social psychological context.

The second point for attention is the operational process adopted for construct definitions. We have paid particular attention to this issue throughout this manuscript providing adequate support, by way of validity and reliability examinations, for our variable definitions thereby ameliorating the consequences of Cliff's (1983) nominalistic fallacy (giving something a name does not necessarily make it what we call it) in model specification. Notwithstanding the attention to detail in selection of operational measures, it remains quite possible that the results within the model could indeed vary if different measures were used.

That no confirmatory data set was utilised to re-test the model is a limitation in the current design. This principle of replication within the domain of scientific inference is particularly important with the structural modelling method. The absence of a separate data set had further implications with respect to the pitfalls referred to in the final principle for model modification. While the temptation was there to 'tinker around' with the paths to improve the fit, for example removing the path between Eco-threat and psychological distress, the theoretical basis of the model acted as a restraining factor from post-hoc model variations.

The conclusion emerging from this analysis was that while the global model adequately represented the data, the fit of individual parameter was poor in the link between Eco-threat and Psychological distress. While this supports the hypothesis that the links between eco-threat and well-being are complex, this finding should be interpreted however within the context that no model can be 'proven'. Nonetheless, the model does provide an empirical test of the hypothesis linking personal environmentalism to personal well-being. Indeed, the results indicate the presence of a link between the two constructs in the hypothesised direction. Engagement with pro-ecological orientations has a discernible positive impact on self-concept, which in turn has a diminishing effect of psychological distress.
6.4 DISCUSSION

The nine principal goals of the chapter were to examine the following questions

1. Does the IPECC remain a robust finding in the sample of Transition Year students when design validity has been improved by?
   • Introducing a time order
   • Controlling for confounding variables
   • Controlling for personality factors?

These three routes to a more valid study of factors mediating the relationship between stress and health (Stroebe & Stroebe, 1995) are essentially principles for increasing internal validity (Shaughnessy & Zechmeister, 1995). Given the nature of the data in the current study it was possible to apply each of these procedures when examining the IPECC phenomenon in this group of 16 year olds. Findings from the data support earlier evidence for the utility of this approach to examining the relationships between the constructs of environmentalism and health.

The direct negative effect of eco-philosophy on aspects of self-concept was demonstrated most significantly for the Happiness & Satisfaction scale, where 4% of the variance was explained. Compared to their ‘non-green’ cohorts, ‘Greens’ reported higher mean scores with less variation on the Behaviour Scale, while the converse was observed for the Physical Appearance & Attribute and Happiness & Satisfaction scales. With respect to the first finding, the implication is that espousing a ‘green’ philosophy has a positive effect on social behaviour. This 16-item scale reflects the extent to which the child admits or denies problematic behaviours, with statements ranging from specific behaviours (e.g. Item 56 ‘I get into a lot of fights’) to more general statements concerning problem situations in the home or at school. In the present context, social behaviour was positively influenced by pro-ecological views. This finding is of particular import in the context of problem behaviours in teenagers, and concurs with anecdotal findings from interventions with younger school children attending primary school. Reports from educators and pupils involved in the ‘School Garden Project GORT’ have observed positive changes in social interactions of
children involved in the programmes whereby a school garden is created and maintained by the teachers and pupils in the school (Madden, 2002). This finding is also consistent with Ulrich's (1993; cited in Kahn, 1999) evidence regarding the propensity of destructive acts being directed toward pieces of abstract art when compared to representations of nature art in a psychiatric setting. The importance of having good relationships with others at home and at school has consequences beyond school performance. Research examining the impact of social support on health (see Stroebe & Stroebe, 1995) suggests consistent modest effect sizes (1-4%) and implies that large social networks provide people with regular positive experiences and a set of stable, socially rewarding roles in the community (Cohen & Wills, 1985; cited in Stroebe & Stroebe, 1995). The present finding is all the more significant in that we have introduced a control measure for personality characteristics, and introduced time-ordering to address the design limits observed in earlier work.

The negative impact of NEP-R scores on the Physical Appearance & Attributes scale implies a deleterious effect on perceived self-concept in terms of attitudes concerning body image, as well as attributes such as leadership and ability to express ideas. Perhaps by espousing a pro-ecological viewpoint, one is more aware of the ugliness of environmental pollution and this is reflected in the image of the self. In addition, as this is a new paradigm, moving away from the more socially acceptable position of espousing a HEP philosophy, one is left without strong role models. Perhaps this effect might be reversed in social settings that actively support 'green' ideologies. There is also the possibility that the result may be confounded by extraneous variables however. This scale is particularly sensitive to sex differences given the content of items. For example, girls more often endorse Item 29: 'I have pretty eyes', and boys more often endorse Item 15: 'I am strong'. Therefore, scores should be interpreted in the light of traditional sex role stereotypes. This finding must also be tempered by the small effect size (.012) however and the low power (.514), nonetheless in the context of large samples (e.g. nationwide education campaigns) this may be an important finding, but requires further exploration.

This dissatisfaction with physical self-image is consistent with the negative association between eco-philosophy and happiness and satisfaction. The Happiness and Satisfaction scale, is a cluster of 10 items eliciting opinions about the feeling of being a happy person and easy to get along with, and feeling generally satisfied with
life. Low scores are associated with general dissatisfaction, feelings of negative self-worth, and a longing for things to be different. Perhaps this is reflective of the dilemma of living in a society wherein social barriers to ecological behaviours are profuse yet the education content advocates an urgent need for change toward more sustainable lifestyles.

In terms of the interactive effect of EAI and NEP-R scores, the implication is that once again the amplifying effect of Eco-Philosophy in determining the effects of Eco-Threat perception on Health is robust and consistent with the results of the earlier studies in the project. This time however, the internal validity of the study design was stronger i.e. necessary conditions for drawing causal inferences (Shaughnessy & Zechmeister, 1990) were met. In Figure 6.2, it is clear that 'greens’ reported mean scores consistent with poorer outcome in the high threat condition, when compared to both cohorts in low threat conditions and their ‘non-green’ counterparts. However, these participants reported better health outcomes in the low stress condition. In interpreting this finding, it is useful to recall that the Intellectual and School Status cluster of 17 items reflects general satisfaction with school and future expectations related to intellectual and academic tasks.

In assessing the practical implication of the approximate one point difference between the mean scores in the low and high threat condition, in terms of percentile scores a raw score of 11 places a profile at the 38\textsuperscript{th} percentile while a one point increase relates to the 49\textsuperscript{th} percentile (Piers, 1996: p.103). In this regard given the importance of this type of appraisal for school performance, it seems important to increase the opportunity for the construction of pro-ecological beliefs within a context of minimizing the perception of personal threat from hazards in the environment. This conclusion is reinforced by the findings in the data for overall self-concept and psychological distress symptoms. Indeed, not only does increasing personal threat perception appear to result in poorer health outcomes for those who are orientated toward more sustainable lifestyle ideologies, but also active benefits occur in this situation for those who espouse a more utilitarian worldview that has been the dominant paradigm during this phase of technological development so damaging to the global ecology.
This finding represents an important point indicating the counter-intuitive negative association between ‘green’ philosophy and high levels of threat perception. This concurs with the finding from the cross-sectional data from adults reported in Study one of the project. The curiosity is why this effect did not emerge in the cross-sectional data from the first teenage sample. It appears that the health consequences of interaction between ecological values and threat perception, apparent in cross-sectional studies of adults, may only emerge over time in the younger teenage samples.

2. Does the introduction of CHEAKS scores into the factorial model increase its explanatory power?

That the CHEAKS scores interacted in similar ways to re-constitute the IPECC effect suggests that this phenomenon is observed not only across various health measures but also across different measures of environmentalism. The consideration of attitudes (affect, verbal commitment, actual commitment), and knowledge toward environmental issues suggests that attitudes serve as a more powerful predictor of health outcome when compared to fundamental beliefs. In addition, the interactive effects of environmental attitudes and personal threat perception explain variance in aspects of self-concept while beliefs are also implicated in manifestation of psychological distress. This differentiation between the more superficial and the deeper levels of perception seems plausible. An important effect in this analysis was the implication for Popularity. In the high threat condition, the high CHEAKS scorers reported an average score of 8.4, placing them between the 38th and 52nd percentile. By contrast, low CHEAKS scorers, with an approximate increase of 0.8 points, are placed between the 52nd and 69th percentile of the normative population. This is a considerable difference considering the close proximity (a difference of only 0.2) of the scores for the two groups in the low threat condition. Given the importance of peer relations for younger people (Berger, 1994), this observation has important implications.

The direct effect of reduced happiness for those espousing the NEP-R was consistent with the dissatisfaction with body concept and increased anxiety reported by those with high scores on the CHEAKS. The anxiety cluster of 14 items reflects general
emotional disturbance and dysphoric mood with individual items tapping various specific emotions including worry, nervousness, shyness, sadness, fear, and a general feeling of being left out of things. It must be said however, that there was a small difference between the two groups (0.21 points), both group means placed them between the raw score range of 10-11 corresponding to the 58th and 78th percentile range. In effect, this suggests that while a statistically sound (in terms of probability and effect size) the percentile difference between the groups was small. This contrasts sharply with the 1.9-point difference observed on the Behaviour Scale, where above median CHEAKS scorers were in the upper range of the 51st-65th percentile and low scorers on the CHEAKS scale were placed in the 32nd-40th percentile.

Overall, there is a suggestion of a differential effect on internal and external aspects of self-esteem. Espousing pro-ecological attitudes and behaviour enhanced students Behaviour scores but contributed to lower scores associated with general happiness, contentment with physical characteristics and increased levels of anxiety.

3. Does environmental knowledge mediate the effect of threat on health?

The interaction between Knowledge and Threat perception on the Popularity scale is an interesting finding, suggesting the importance of environmental knowledge as a mediating variable. Why is it that those with lower levels of knowledge felt more popular when personally threatened? Could it be that they are simply ‘joining the gang’ so to speak. If this is a possibility then it could well be a reactive issue to be considered in the delivery of materials designed to increase environmental knowledge, particularly in the light of the reduction in popularity scores for those with higher levels of knowledge and attitudes in the high threat condition. The social context within which these young people operate represents a defining milieu for their construction of a worldview and personal behaviour patterns.

4. What impact does Knowledge have on the relationship between NEP-R and health?

In this analysis, the interactive trend for Popularity implies that it is more acceptable to have little environmental knowledge when one doesn’t espouse a ‘green’ worldview than when one does, in terms of popularity with classmates, being chosen
for games, and the ability to make friends. Low scores on the Popularity measure may reflect shyness, lack of interpersonal skills, or personality traits that tend to isolate the child from others, or they may be related to some third factor. Another implication of the finding however is that those with more accurate environmental knowledge are less popular in general.

The specific contribution of environmental knowledge was also apparent in the results. Above median, CHEAKS Knowledge scorers reported higher average scores on Behaviour and Intellectual & School Status scores, while below median scorers on Knowledge reported higher average scores on the Physical Appearance & Attribute scale. This implies that in terms of fostering scholastic achievement and adaptive social behaviour increasing environmental knowledge may have a positive impact. However, at first glance the finding of a negative impact of knowledge on self attributions to do with body image is worrying. The below median knowledge group mean would place them at the 60\textsuperscript{th} percentile (raw score =9) while the above median group mean would be placed at the upper end of the 48\textsuperscript{th}-60\textsuperscript{th} (raw score =8) percentile, however, the difference of 0.31 points must be interpreted in this context.

5. Does engaging in environmental behaviours improve health?

The results of this analysis suggest that engaging in environmental acts does influence a composite measure of health, but the direction of that influence depended on the level of personal threat perception. This was apparent for the measures of Intellectual and School status, Happiness and Satisfaction, and Self-esteem scores. Those who perceived more threat and did not engage in environmental behaviours enjoyed better health scores than those who perceived less threat and did not perform pro-environmental behaviours. Those who perceived low levels of threat did better when they engaged in environmental behaviours.

The one exception was the influence of actual commitment on Behaviour scores where engaging in pro-environmental behaviours increased scores, albeit more sharply for those with lower levels of threat perception. This is partial support for Robert Bechtel’s hypothesis that ‘in the long term engaging in pro-environmental behaviours is psychologically beneficial.

In terms of the relationship between worldview and the benefit of engaging in pro-environmental acts, those espousing ‘green’ beliefs enjoyed a distinct improvement in
perceptions of Intellectual and School Status, but the opposite effect occurred, to a lesser degree, for those with less ecological worldviews.

6. Does availability of recycling facilities make a difference to eco behaviour or well-being?

No measurable association emerged between the availability, or use, of recycling facilities and reported levels of environmental actions or sense of general well-being. This finding says little to explain the underlying dynamics here, given the limitations in the data, and must be interpreted in this light. Firstly, only 30 respondents responded to the item regarding community recycling facilities ('What are the ‘green facilities’ in your area’ and ‘Are they used’). So, the sample size was perhaps too small to detect any statistically significant effect. Secondly, the 12-Actual Commitment scale contained only two items relating to recycling (Item 6: ‘I have asked my family to recycle some of the things we use’, and Item 12: ‘I do not separate things at home for recycling’), therefore, issues of specificity may be important here and provide a possible explanation for the lack of association. In addition possible confounds, such as: size of residential area, type of dwelling, education, and income (Berger, 1997); were not addressed in this study. Another issue for further consideration was the finding of Berger that having convenient access to a recycling program mediates the relationship between socio-economic factors and recycling practice. From the higher rates of recycling materials collected in Kerbside recycling facility, compared to matched areas with just bring-centres or bottle banks (ENFO, 1997) it appears that type of service may also be a significant moderator variable for inclusion in further research on this topic.

7. What were the effects of Intervention?

As a group, those who participated in the Eco-Audit exercise experienced positive effects, in terms of Environmental Attitudes (CHEAKS), and Well-being, but also showed an increase in psychological distress (GHQ) at Time 2. The effect of the sex of group participants however influenced the dynamic. Males reported slightly less distress substantially better well-being and slightly lower average scores on the Environmental Attitude scale. Females on the other hand, increased knowledge,
reported slightly less well-being, and substantially higher distress scores. This gender
difference within the current data provides limited explanatory power however, as the
number of female participants in the Experimental group would result in serious
questions about any conclusions.

The difference between control and experimental groups also evokes questions about
the design of the experiment, in terms of program evaluation. The large difference in
sample sizes is one consideration. A second would come from the association of the
environmental exercise with the work-experience program. The variety of type of
placement is something that is generally beyond control but may be a potentially
confounding variable in this study and others designed around the work experience
program.

8. What Gender effects occur on ‘health’ and ‘environmentalism’?

In general, males fared better in terms of health measures in the study with higher
scores on the Physical Appearance and Attributes, Anxiety, Happiness & Satisfaction
and Self-Esteem scales, and lower GHQ scores. Females scored higher on the
Behaviour scale. These findings are consistent with an accumulating body of
evidence for higher anxiety scores and lower behaviour scores in males (cf. Piers,
1996), and higher GHQ scores (particularly related to questions tapping stereotypes),

Females also reported higher levels of ‘environmentalism’ in terms of Attitudes
(including self-reported behaviour), Knowledge, and the combination of the two. No
differences in EAI or NEP-R scores were observed. These findings, juxtaposed with
findings from the previous studies in the thesis underline the inconsistency in results
from gender based environmental questions. Together, given the consistency in
measures used across the three studies, they imply the need for more detailed
investigation into these issues paying particular attention to age-related variations.

9. Does threat predict environmental behaviour?

The data in the current study suggest that Eco-threat holds little predictive power on
Actual commitment scores. This was also the case when gender differences were
accounted for. This finding is in contrast with the finding of Baldassare & Katz (1992) who suggest that personal environmental threat is a better predictor of environmental behaviour than demographic variables. One explanation for the disparity may lie within the type of measures used, while sample differences in terms of culture, age, and motivation are also considerations. The data in this project came from 16 year old school students while Baldassare and Katz collected data from adults phoning a help line seeking advice on environmental clean-up. These issues require further investigation before any decisive conclusions can be arrived at regarding the utility of personal environmental threat perception as a predictor of environmental behaviour.

10. What is the relative contribution of the environmental aspects in determining health?

The structural equation model indicated that while ecological belief has no direct effect on psychological distress, when mediated through other variables in the model, the link between the two becomes more important.
6.5 CONCLUSION

Consistent with the extant links between nature and health, in terms of evidence for the positive health effects that accrue from exposure to visual representations of nature and working in natural environments, we have shown that espousing pro-ecological values and beliefs are also predictive of better adjustment in terms of social behaviours across different settings of school and home environments. That espousing such beliefs may have a larger effect than simply the propensity toward environmentally protective behaviours is important in terms of social adjustment. However, such a belief system is not conducive to contentment with physical aspects of the self and general satisfaction and happiness. This finding is also important in the quest for ways to increase individual pro-ecological behaviour repertoires. The insights to be gained from the observed interaction between environmental values/attitudes and threat perception go some way in specifying the need for careful consideration of these concepts when education material is being designed, be it for young people or adults.
CHAPTER SEVEN: Empirical aspects of Eco-Wellness

7.1 INTRODUCTION

The quality-of-life literature has drawn clear links between economic growth and enhancement of human lifestyles. The nature of this relationship however is proving to be more complex than a simple linear equation with evidence of diminishing returns in terms of quality of life directly associated with environmental degradation. The same phenomenon in public health is apparent in the proposal for a shift in emphasis in public health goals away from issues pertaining to quantity of life and toward a focus on quality of life. At the same time, the environmental literature is crystal clear on the need to address the issues pertaining to environmental destruction with all possible haste. Given the role that humans have played in the destruction so far, it is imperative to include psychological phenomena in the derivation of an equation to ameliorate or solve the problems.

The existing evidence from the social sciences means that such a formulaic solution need not be derived from first principles, rather, an eclectic approach is required to draw the best from each and any area that has focused attention on the topic.

Much has been learned also from the classic work within environmental psychology where the focus has been on environment-behaviour change mechanisms in terms of barriers to adoption of specific environmental behaviours. Indeed there is a rich body of research indicating support for a multilevel approach to institutionalised green practice at a national level. However, there appears to be a gap yawning between environmental consciousness and environmental change.

Even in communities where institutions facilitate pro-environmental behaviours, there is resistance at an individual level. One colleague from Germany expressed a longing for placing ‘clean white paper’ in his printer when his psychology department only
permitted the use of the most ecologically sound grey paper to be used. In contrast to this ‘green’ philosophy in some European countries, the active systemic resistance to the adoption of ecological practices in Ireland is an issue that came to my attention many years ago. The ensuing stress from this institutionalised resistance appeared to be incremental with levels of increased consciousness. This presented a quandary. If green is good for you, why is it also stressful. What did the literature have to say on the relationships between stress and nature?

The ecosophy literature, beginning with Rachel Carson and Theodore Rozak, was clear about the positive impact that nature experiences have on human health. Evidence to support this view was also apparent in the literature relating to stress and health, most particularly in institutional settings but also in community settings (Clay, 2001). But little empirical work was available on the relationship between stress and environmentalism in terms of beliefs and attitudes required to adopt a pro-ecological lifestyle. These are lifestyles consistent with the notion of connectivity between ecological sustainability and healthful life experience.

### 7.2 CHAPTERS REVIEW

In the first chapter of the thesis, we set out the rationale for linking environmental values, threat perception, and psychological well-being. Reviewing relevant literature, we observed how gaps in the research to date indicated the utility of such a study in non-psychiatric populations. We presented a conceptual model of what we have coined eco-wellness, an ecology of health in the individual and their environment.

In the second chapter, we plotted the evolution of the survey instrument with reference to operationalisation of the constructs within the model. Of central importance to the project were the empirical credentials of the measures used. From the initial data we found support for the assertion that the instrument demonstrates

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25 Ecosophy is an emerging term in the literature used to refer to the combination of ecological psychology and ecological philosophy literature
impressive psychometric attributes, that concur with earlier findings reported in the literature and warrant retention for further analysis, guided by the research questions to be specified by way of testing the IPECC hypothesis. In this chapter, we also clarified issues pertaining to the dimensionality of the NEP-R scale, finding support for Riley Dunlap’s conception of a uni-dimensional measure. In addition, through factor analysis we developed subscales of the EAI scale that were particularly useful in terms of distinguishing thematic differences between environmental hazards.

Findings from responses to this validated instrument, from a sample of college students in Dublin presented in Chapter 3, supported the IPECC hypothesis. Concern about environmental issues was demonstrated, and the relationship between this consciousness, ecological threat perception, and psychological well-being was shown to be complex. In addition, the results also appeared to confirm the utility of the IPECC model as a theoretical framework to explore the dynamic between threat perception, environmentalism, and psychological well-being. Scores on Somatic Symptoms, Sleep disturbance and Anxiety & Dysphoria sub-scales were elevated in the conditions predicted by the model.

When the three sub-scales of the EAI were entered into the model limited evidence of the IPECC phenomenon was observed, it may well be that the constructs were too cohesive to afford the variation required in the analysis. Therefore, the conclusion was that further research should limit the use of these subscales to a less complex analysis design, and envisioned their application in a more descriptive fashion. Given the design limitations pursuant from the nature of the data and the essentially correlational analysis, the generalisability of the findings was deemed questionable and would require further investigation. Further recommendations for improvement in internal validity were also specified at this stage.

An implication of the study however was that ‘eco-overload’ is an issue that might be fruitfully addressed in the design of information and education programs addressing environmental issues. With reference to earlier discussion about the use of ‘fear-appeal’ as communication strategy the findings suggested that such designs may be more than simply ineffective, but may also be counterproductive in terms of fostering environmental orientations but also in terms of psychological well-being. In this context, given the propensity for targeting educational programs at younger children
and adolescents the utility of examining the IPECC phenomenon in a teenage sample was argued. In addition, elements such as environmental knowledge and environmental behaviour were deemed necessary constructs for inclusion. It was also deemed appropriate to include a measure of general well-being and self-concept operationalised as self-esteem.

Pursuant to the methodological weaknesses already specified above the internal validity of the design was enhanced by the addition of a longitudinal aspect and a control for personality characteristics. Within this framework, two further studies were conducted in parallel. Data was collected from a large sample of teenagers, using a cross-sectional design in study two and a longitudinal design in study three, in conjunction with the pilot phase of a national environmental education program designed and managed by educational specialists.

Given the size of the sample it was decided to explore the possibility of using dedicated computer software to eliminate the 'key-punching' stage of the data collection process. There are two types of software available for this purpose, Optical Mark Recognition (OMR), and Optimal Character Recognition (OCR). The former is used on large data sets that have professionally printed forms, for example multiple-choice exam forms for colleges. The equipment is specialised and the design of forms requires knowledge of DOS operating systems. The scanning machinery is vulnerable to slight variations in print formats and particularly susceptible to dust. The throughput rate however is high, theoretically affording a highly efficient data entry process. Data is scanned into pre-formulated DOS files and later manipulated for transfer into a format suitable for use with statistical packages like SPSS or STATVIEW. The OCR software operates on a standard desktop PC and the forms are created in WORD files. The data is scanned through a small desktop scanner and is placed directly into an ASCII file readable by SPSS. While there is a considerable loss in throughput rate, the technical aspects are more transparent to the user with moderate levels of computer literacy. In the first of the parallel studies the OMR, software was used.

In Chapter 4, we present data from the first of the parallel studies comprising a smaller group of teenagers. The first aim of the study was to develop a methodology
for the research theme to hand. The questionnaire contained all the measures for the final phase except the measure of emotional well-being. In itself, this instrument was sound in terms of psychometric quality, however, the technological innovation proved less than satisfactory. The OMR technology was neither easy to master, nor reliable. This represented substantial investment of resources with less than satisfactory level of return. Questionnaires (several alternative designs were explored prior to testing) developed with this technology lacked face validity and were difficult to complete. Score sheets had to be re-checked and input by hand in many cases. Given these findings it would be necessary to re-design the protocol for the next data collection phase. Feedback reports from students, recorded by teachers, and pointed to the need to control for research effects in the next phase. In addition, feedback sessions in the form of group discussions proved very useful both in terms of research design and in terms of a de-briefing mechanism. The findings from the IPECC analysis indicated a lack of transfer in terms of health outcome across age groups, although the factorial design offered an effective method to identify the contrasting effects on well-being of the ‘surface-level’ and ‘fundamental’ aspects of environmental consciousness.

This second study was an important step in the validation of these research instruments for use with a younger sample. Despite the technical difficulties outlined above the psychometric properties of the scales were impressive, certainly validating further use. However, given the limitations of the sample, pursuant to size it was not possible to explore the properties of the operational measure of self-esteem. In light of the variable results in terms of health outcome it was decided that an alternative version of the operational measure of psychological distress be used in phase two. While none of the items tapping more severe symptoms (e.g. Suicidal Depression items) had been used in the teenage sample for ethical reasons, it was considered more prudent to employ a more complete scale, the GHQ-12, rather than two sub-scales. This measure incorporated the essence of the subscales tapping sleep disturbance and somatic symptoms and had been used with adolescents in previous studies. In addition, questions about the stability of the operational measure of environmental attitudes and knowledge were outstanding alongside technical aspects of coding of the measure of affect, which required exploration.
In Chapter 5 we set five principle aims, namely to answer questions about validity aspects of five of the scales to be used in the following chapter of this work. The first of these questions concerned the appropriate application of the Self-concept dimensions established elsewhere to the present data. Through a series of investigations, it seemed apparent that the existing descriptions of the sub-scales of the measure of self-esteem were appropriate for the current data. In addition, the psychometric properties of the instrument proved robust for the sample. The second concern of the chapter was the operational measure of environmental attitudes and knowledge. This measure had proved reliable and valid across several parameters, in line with the indication of its psychometric strength suggested in the smaller sample of 160 teenagers described in the last chapter, and the findings from a North American study of younger students. The third matter of interest in this chapter was the dimensionality of the sub-scales of the EAI, and findings suggested that in the context of the current work it was preferable to apply the total scale in pursuance of the IPECC model. Fourthly, regarding the NEP-R, we found further evidence of the uni-dimensional structure of the scale. Further, we addressed the issue of coding the Affect Balance Scale, comparing the two mechanisms reported in the literature. The superiority of one of the methods was recommended on the basis of greater internal consistency. Finally, we explored the characteristics of the GHQ-12 and found both the factor structure and the internal reliability of the scale to be robust.

In summary, each of the questions addressed in the chapter were answered by the analysis. The conclusion emerging from this chapter was that each of the validated sections of the PEHQ designed for the third study demonstrated impressive psychometric qualities thereby reducing concerns about measurement error. The research instrument was then redesigned for presentation at the next phase. Initial indications from early pilot testing, were that the changes in design considerably enhanced the face validity of the questionnaire. Features of the new design included separate question and answer booklets representing a saving in resources as the question booklet could be re-used on the second administration. Another feature was to apply a scoring mechanism that would be appropriate to an alternative form of computer software, Optical Character Recognition (OCR) a
modern innovation of the OMR software, that was compatible with a regular desktop computer and printer. This software offered the distinct advantage of more attractive presentation of scoring sheets. In effect, despite promising test runs, when the data from the first administration was collected this too proved less than successful in scanning the data. Therefore, manual input of data was necessary. Given the improved design however, this did not impede the replication of the study at the second stage of administration. This OCR software was indeed user-friendlier than the OMR software and has definite potential for use with shorter protocols that can be spaced more generously on the page.

In the penultimate chapter, we found, within the enhanced research design, further evidence for the IPECC phenomenon. Consistent with the extant links between nature and health, in terms of evidence for the positive health effects that accrue from exposure to visual representations of nature and working in natural environments we have shown that espousing pro-ecological values and beliefs are also predictive of better adjustment in terms of social behaviours across different settings of school and home environments. That espousing such beliefs may have a larger effect than simply the propensity toward environmentally protective behaviours is evidently important in terms of social adjustment. However, such a belief system it seems may not conducive to contentment with physical aspects of the self and general satisfaction and happiness.

From the work of Seyle on the concept of stress, we know that the price of adaptation to or coping with stressful inputs to a system is measurable. When later research, by Lazarus and Seligman, implicated cognitive processes in the elaboration of the psychological stress construct answers to questions such as why events are stressful and how stressful events are identified were made available. In the body of work since then it has been shown that stress ensues when events are perceived, as harmful and coping ability is judged ineffective. Within this framework, the concept of coping has been broadly defined and has come to infer a process, which includes decisions and actions in the face of stressful life-events and the attendant negative emotions. The manifestation of effective coping is to ‘manage’ the event with the aim of lowering the harm potential and reducing the negative emotional reactions. The ability to sustain illusions that buffer against present and future threat (Taylor, 1983)
is central to successful adaptation. Within such a theoretical framework it is sensible
to interpret the findings that those who reject the pro-ecological viewpoint are in
effect managing the stress associated with the perception of harm from environmental
hazards.

It also makes sense that social behaviours are enhanced by green beliefs given the
social and political climate of the day. From an environmentalist standpoint the
systemic policies adopted in Ireland, this far could be seen as ‘lip service’, and
engaging in such belief systems is now politically correct. Subsequently, the
contradictions between policy and implementation are perhaps manifest in the
negative association between ‘green-thinking’ and contentment with body image and
general happiness and satisfaction with life. The interaction between ‘green-thinking’
and perception of harm in the environment is a theoretically sound expectation within
the classic stress model. In this representation, the cost of ‘eco-worry’ is tangible in
terms of aspects of self-concept and psychological distress, and is therefore likely to
be avoided.

Introduction of the environmental attitude and knowledge measure increased the
explanatory power of the IPECC factorial model, most particularly by differentiating
the health outcome of threat-perception interactions with either attitudes or beliefs.
The more profound health-effect of the interaction of stress and beliefs is consistent
with the view that attitudes are more superficial in terms of cognitive layering. It also
inspires confidence in so far as attitudes are held to be more malleable than belief
systems. The implications for the self-appraisal of Popularity are indicated by the
distinction in terms of population percentiles.

The mediating effect that knowledge has on the impact of threat perception on
Popularity could well be a reactive issue to be considered in the design and delivery
of materials aimed at increasing levels of environmental knowledge. For example, the
Vygotskyian representation of the social context of learning would suggest that peer
popularity is a defining concept in terms of knowledge transfer.

The current manifestation of Robert Bechtel’s (1997) hypothesis that ‘in the long term
engaging in pro-environmental behaviours is psychologically beneficial’ received
only partial support in terms of adaptive social behaviour, scholastic ability, happiness and satisfaction and overall self-esteem but the effect was complicated by the level of commitment to ‘green’ belief systems and level of threat perception. Interpreted within a progressive process of personal responses to threat (Bechtel, 1997), perhaps behavioural acts have a different outcomes depending on the stage that one is at. For instance, as one becomes more committed to the idea of recycling removal of a paper recycling facility would result in a more profound emotional reaction.

That no measurable association between the availability or use of recycling facilities, and reported levels of environmental actions or sense of general well-being was found in this data may be explained in two possible ways. Firstly, it may be that the design of the study was inadequate to address the question, particularly in terms of item specificity and secondly in terms of population effect size. We know, from the data published over the past five years by the EPA and ENFO, that recycling behaviours in Ireland are still at very low levels in the general population. Clarification of this dynamic between availability of ‘green’ facilities and well-being would require further research with adjustment for these methodological difficulties. Given the gender-based division of labour in our society and the tendency for recycling facilities to be located at shopping centres any research on this topic should include the issue of gender in its design.

Within the examination of gender effects, it appeared that in general males fared better across a range of health measures relating to body-image, anxiety management, general happiness and satisfaction with life, and global self-esteem, in addition to reporting greater resistance to psychological distress. No differences in scores for males and females were observed on Intellectual and School Status, or emotional well-being.

Females, on the other hand, did report better adjustment in terms of social behaviour. In addition, females reported higher levels of ‘environmentalism’ in terms of how they felt about environmental issues, their intention to engage in pro-environmental behaviours, their reports of instances of environmental behaviours, and their level of environmental knowledge. No difference between males and females was observed for eco-philosophy or threat however.
That no gender difference on the eco-threat measure emerged in the data is incongruent with Bord & O'Connor's (1997) increased vulnerability hypothesis for females, while the higher scores for females on the environmental measures is consistent with Davidson & Freudberg's (1996) review of findings related to environmental concern. Given the nature of the data it might be fair to assume that the finding is representative of the discord in the gender literature on environmentalism (Berger, 1997; Schutz & Wiedemann, 1998). This data offers nothing in terms of incorporating concepts such as socialization, or the role of power, status, alienation, trust, and other socio-political factors into the discussion. In addition, at a broader level of analysis “...the effects of gender on the perception of risks bring into play a subtle interaction between factors that are culturally and socially specific” (Boholm, 1998: p. 151). This limitation of the current design however, must be viewed within context that this aspect, gender, was never meant to be a central part of the research, rather a peripheral consideration not aspiring toward central stage.

More central to the research however, was the mediating effect of providing specific environmental instruction on the dynamic between eco-philosophy, threat, and well-being. In the main, we found evidence for the positive effect of the program.

On average, those who participated in the Eco-Audit exercise experienced positive effects, in terms of Environmental Attitudes (CHEAKS), and Well-being, but also showed an increase in psychological distress (GHQ) after the educational intervention. The influence of gender difference was such that compared to the control group; males reported slightly less distress, substantially better emotional well-being, and slightly lower average scores on the Environmental Attitude scale. Females on the other hand, reported increased knowledge, slightly less well-being, and substantially higher distress scores. What conclusions can be drawn about the gender difference in intervention effect are however, limited by the small number of females in the sample. Although initially matched for gender the final data resulted in this disparity in gender distribution. This is a feature of field designs where experimental control over the sample is mediated by real life considerations.
Nonetheless, this finding indicates the utility of considering gender, within a socio-political context, as a central variable in further studies.

The difference between the sizes of control and experimental groups also evokes questions about the design of the experiment, in terms of program evaluation. A second methodological issue of concern arises from the association of the environmental exercise with the work-experience program. The variety of type of placement is something that is generally beyond control but may be a potentially confounding variable in this study and others designed around the work experience program.

The data in the current study suggest that Eco-threat holds little predictive power on Actual commitment scores. This was also the case when gender differences were accounted for. This is in contrast to the finding of Baldassare & Katz (1992) who suggest that personal environmental threat is a better predictor of environmental behaviour than demographic variables. One explanation for the disparity may lie within the type of measures used. In this study a 12-item measure was used in contrast with the single-item measure used by the study reported above. However, the finding from our data is consistent with that from a recent environmental education program, in the USA, suggesting that teaching young people about environmental issues increases their knowledge but doesn’t increase their concern about these issues or promote conservation behaviour (Clay, 2001).

The predictive process was further examined in the structural equation model examining links between eco-philosophy, threat, and well-being. Results indicated that the relationship between eco-threat and specific attitudes, including self-reports of environmental acts, was mediated by ecological beliefs. A further illumination of the model was that although ecological beliefs had no direct effect on psychological distress, mediated through other variables in the model the link between the two becomes important.
7.3 SUMMARY OF FINDINGS

Towards the end of the first chapter in this thesis, we summarised the research questions posed by the work. In summarising the findings, we can usefully apply the same conceptual framework defining sections dealing with analytical, methodological, and theoretical issues:

(i) Analytical issues

(a) The utility of eco-wellness paradigm:

- What is the best way to describe eco-wellness?

The thesis examined the relationship between environmental philosophy, threat, and well-being. People have a philosophical view of the environment and their relationship to it. Environmental philosophy refers to one’s sense of connectedness with the environment at both local and global levels (i.e. the biosphere). It describes one’s position in terms of whether one views the human as being an integrated part of a larger eco-system, a web-of-life, or whether they profess the anthropocentric view of world order, where the human species occupies a superordinate position holding dominion over other species on the planet. There is increasing awareness of environmental degradation because of economic development and the potential threat to personal well-being from hazards in the natural and built environment. Threat refers to the sense of personal threat, posed by environmental hazards, which is perceived by people. Well-being refers to psychological aspects of personal health, which include: happiness, self-esteem, and sense of distress. This principle aim was to examine how these three aspects of Eco-Wellness; philosophy, threat and well-being, interact at both simple and complex levels.

(b) The appropriateness of the theoretical framework:
• Can eco-wellness be described within the context of overload theory?

One problem with the overload theory, in the context of human behaviour, is the difficulty in strictly defining critical levels, beyond which ‘mal-adaptation’ occurs. This is the idea of how many ‘straws’ does it take to ‘break the camel’s back’. In this case, the benefit of applying the overload concept or carrying capacity idea lies in the description of the relative difference between combinations of perspectives.

(c) Utility of the Structural Equation model

• What are the benefits of using the path model approach in this context?

The structural equation model of eco-wellness allows one quantify direct and indirect paths between elements of the model and demonstrates the relative contribution of the variables in. The great strength of the model is the parsimony of its exposition of the eco-wellness paradigm. This approach imposed limitations in terms of complexity but the findings underlined the findings of the factorial IPECC model by demonstrating the mediating effects of philosophy, attitudes, and knowledge on the relationship between threat perception and well-being.

(d) Utility of the IPECC model

• What is the IPECC framework?

The individual psycho-ecological carrying-capacity (IPECC) framework is a factorial model where both positive and negative health outcomes are measurable within the context of environmental philosophy, threat, and the interaction between these constructs. The model illuminates the complex nature of the eco-wellness phenomenon. Capitalising on research within the social and health psychology fields, it re-states the importance of mediating effects of threat perception on the interaction between eco-philosophy and well-being in the individual. The model was usefully
applied to the data from both teenage and young adult populations, further indicating its adaptability.

- *Is the IPECC framework sufficiently robust to variability in its substrates?*

The framework was equally useful in examining various combinations of environmental predictors on health outcomes, indicating its utility for exploring the many facets of the eco-wellness paradigm. Such an approach offers a structure to examine further aspects of the phenomenon not specified in the current project.

- *Can the model be usefully applied to longitudinal data?*

We have demonstrated the power of the framework to examine the effects of eco-load in the short-term and over time. The analysis employing longitudinal data indicates an additional aspect of the framework, in terms of processes underlying the IPECC paradigm within the eco-wellness phenomenon.

(c) The appropriateness of multiple levels of analysis:

- *Are both uni-variate and multi-variate statistics necessary for the thesis?*

While direct linear relationships were usefully explored within the uni-variate analyses it was apparent from the literature that more complex models would be required to account for the observation that some people who reject the NEP views and espouse HEP views do well in terms of health outcomes. In this regard, a multi-variate factorial model was most appropriate.
Methodological issues

(a) Construct validity:

• *What is the best way to operationalise the theoretical constructs?*

While development of project-based measures may have been attractive, this would have altered the emphasis of the thesis toward a methodological work. In particular, the use of the Threat perception measure (EAI), which contained little reference to environmental hazards emanating from agricultural activity, might present as a curiosity. Placed with the Irish context of considerable environmental pollution of this kind, which we have described, one might query the appropriateness of its use. Within the context of the urban-based sample, however the choice is more rational and given the psychometric considerations we feel that the EAI was the correct measure to use in the circumstances. Therefore, the decision to opt for previously validated measures proved fruitful in this enquiry. The generalisability of both the research paradigm and the findings was greatly enhanced by this approach.

(b) Psychometric properties of research instrument:

• *Are there sub-categories of environmental hazards?*

We examined this issue using three sets of data following a factor analytic approach. While we established sub-scales on the EAI, distinguishing discrete groups of hazards, the variability in hazard definition across age groups implies developmental differences in construction of hazard categories. Consistent with developmental aspects of environmental consciousness reported in the literature this finding implies the need to differentiate between samples for advocacy materials in particular with respect to education and attitude change.

• *What is the internal structure of the measure of environmental philosophy?*

The findings from three sets of data consistently indicate the uni-dimensional structure of the NEP-R. This finding has implications for future research as the
literature indicates various evolutions and versions being used. While it is undoubtedly useful at times to use shortened versions of a scale, this can lead to a lack of clarity in the literature. Future research could be brought to bear on the development of various versions of this very useful scale, which has now come 'into it's time' long after it's first development 'well ahead of it's time'.

- How robust is the measure of environmental attitudes and knowledge?

The psychometric properties of the CHEAKS were impressive and consistent with the original validation study conducted in the USA. Comparison of the present data with the findings of that study confirms the utility of the measure for project evaluation. The disparity in the scores of the Irish and North American students empirically separates knowledge and attitudes as facets of environmentalism, and suggests certain malleability, possibly as a function of education. The implication here is the possibility for more in-depth cross-cultural analysis to clarify the issue. In the current context, the scale was applied with equal benefit within the IPECC framework. This project demonstrated the role of the measure in the capacity of both dependent and mediator variables.

- How valid is the measure of hedonic happiness?

The reliability of the Affect Balance Scale was confirmed by the findings and the inconsistency regarding the scoring mechanism was resolved within the current context. These findings indicate that treating the scale as a uni-dimensional measure and applying reverse coding yields the most robust measure. Given the increased interest in broader definitions of well-being being applied increasingly in Quality of Life indicators research, this finding provides a useful clarification for psychometric considerations in the use of this scale.

- Do the measures of self-esteem and psychological distress retain their validity in the context of the current data?

As anticipated, the Piers-Harris and the GHQ scales were established as sound measures in the context of the current data. Given the consistency with Normed data,
the generalisability of these findings, from data with Irish students, was enhanced. The implication here is that the present construction of the IPECC framework may be applied in other countries to facilitate cross-cultural comparisons. This would be particularly useful in the context of enhancing green lifestyles. In certain countries environmental degradation is more stringently controlled and examining the complexity of the interaction between philosophy, threat and well-being in such contexts might well offer insights into the necessary elements required for optimal models of Eco-wellness.

(c) Technological innovations:

- How useful are data-entry technologies in large survey designs?

The OMR and OCR technologies were interesting but proved less than useful in this project. Given the recent exponential advances in computerised technologies and the increasing trend for more streamlined research, studies employing large samples may indeed benefit from such innovations. While it is true that the technology is developing along web-based media rather than more traditional paper based applications, this aspect of the project was extremely informative and indicates the potential in exploring such technological innovations as a means to enhance the research process. By reducing the demands at a functional level, such software has the potential to afford the researcher more time for analytical aspects of a project. Additionally, in research situations where financial resources are limited this type of innovation offers potential cost saving in terms of data input and as such deserves further investigation.
(iii) Theoretical issues

This section re-frames the findings from data analysis in the project under seven headings:

(d) The nature of environmentalism:

- How are the various aspects of environmentalism related?

  - Philosophy and Threat

  A consistent significant positive relationship emerged between the NEP-R and EAI scores across the three studies. The magnitude of the correlation was weak to moderate tending to increase with age. In the data where calculation of EAI subscales was defensible (i.e. the young adults), the relationship between threat and philosophy was apparent for the Techno-human sub-scale and the Everyday Life sub-scale but failed to reach significance when natural hazards were isolated.

  - Philosophy and Attitudes

There was a consistent moderate relationship between philosophy and attitude scores across samples of adolescents and over time.

  - Philosophy and Knowledge

The NEP-R scores were positively related to Knowledge scores at a weak-moderate level consistently over time and across samples of teenagers.

  - Threat and Attitudes

Threat and Attitude scores were consistently correlated to a weak level of magnitude that reached a high degree of statistical significance.
In contrast to the association between philosophy and knowledge there was little relationship between threat and knowledge. Where statistically significant relationships emerged these were in the negative direction. This lack of influence between the constructs, suggests the futility of presenting advocacy material to teenagers in a manner that elicits threat perception.

(e) The nature of well-being:

- What are the relationships between:
  
  - Self-esteem and Psychological Distress

We found the expected negative relationships between the Psychological Distress (GHQ) and Self-Esteem that remained consistent over time and samples of teenagers.

- Self-esteem and Happiness

A strong, highly significant (p< .01), positive correlation emerged between Self-Esteem and Happiness, at both administration times.

- Happiness and Psychological Distress

The data confirmed the expected negative relationships between the Psychological Distress (GHQ) and Happiness measures, at both administration times.
The nature of eco-wellness:

- What are the relationships between:
  - Threat and well-being

Relationships between threat and well-being emerged in each of the three data sets of the project. The nature of the relationship between the construct varied as a function of age, time, and measures of well-being with threat having a greater predictive value for psychological distress in the adult sample than the teenage samples. In each of these cases, high threat scores were associated with higher symptomatology.

Within the IPECC analysis mediating effects of philosophy, environmental attitudes and knowledge were observed on the psychological distress scale, the Intellectual and School Status scale, and the Anxiety and Happiness and Satisfaction scales respectively. The nature of the interaction was disordinal in each instance. These findings support the IPECC hypothesis of the amplifying effect that threat can have on the distress of pro-environmental thinkers and the concordant buffering effect on well-being.

- Philosophy and well-being

The direct negative association between philosophy and psychological distress observed in the correlation analysis was supported by the findings of positive main effects for philosophy in the factorial analyses. Pro-eco philosophy was associated with greater sense of satisfaction within the domains of intellectual status, physical appearance, and popularity along with less anxiety.

- Environmental attitudes and well-being

When taken in isolation, environmental attitudes had a positive effect on well-being. This was apparent in the positive correlation between Intellectual and School Status...
score and the negative association with the GHQ scores. This connection was further exposed within the factorial analyses where main effects were observed for the self-concept scales measuring Behaviour scale and Intellectual School Status

- Environmental knowledge and well-being

Knowledge scale scores were positively correlated to Intellectual and School Status scores, Self-concept scores, and Anxiety scores. This was similar to the finding from the factorial analyses where high Knowledge scorers excelled on both Anxiety and Happiness and Satisfaction scales. Together these findings suggest, greater environmental knowledge is associated with better levels of self-esteem in general, and greater happiness and satisfaction with life, more positive self-evaluation in terms of intellectual and school status and less anxiety.

- What is the effect of the belief that one’s world is being poisoned?

The answer to this question is that ‘it depends’, at a broad level of analysis it depends on how you feel about your connection to the environment. On the one hand, if you feel closely connected to the environment then the idea that you are a central part of a ‘system’ which is being poisoned will have a deleterious effect on your personal well-being. On the other hand, if you feel distant from the ‘natural’ environment and hold an anthropocentric (human-centred) worldview then degradation of the environment would be unlikely to have a measurable impact on your personal well being. Between these two positions are interactions between aspects of these views, which occur as a function of operating within one’s personal belief systems in the wider socio-political context. To model this variation we applied the concept of ‘carrying capacity’ within a factorial model. The IPECC model affords a mechanism for a quantitative evaluation of the effects of the interactive effects of environmental philosophy and threat on personal well-being.
• Are people who espouse pro-ecological worldviews more distressed by environmental degradation than those who espouse more traditional anthropocentric worldviews?

This question was examined within the IPECC framework across the three data sets. In the first two cross-sectional studies and inconsistent finding emerged with significant main effects and interactive effects emerging for the adult sample only. In the third study when the phenomenon was examined in a longitudinal context, the finding observed earlier emerged strongly for this teenage sample. These findings suggest possible age related differences with effects present in an adult sample emerging in teenagers over time.

• What is the relative contribution of the constructs within the Eco-Wellness paradigm, describing the relationship between environmentalism and well-being?

The structural equation model indicated that while ecological belief has no direct effect on psychological distress, when mediated through other variables in the model, the link between the two becomes more important.

(d) Relating environmental advocacy and well-being:

• Does threat perception predict environmental behaviour?

A stronger association between behavioural intentions and reports of actual behaviours was observed when relationships between threat and behaviour were examined. While there was a significant correlation between measures of threat and environmental behaviour, which although weak in magnitude was, consistent over time and samples of data from teenagers, the data suggest that Eco-threat holds little predictive power on self-reports of environmental behaviour. This was also the case when gender differences were accounted for. Given the inconsistency with some of the literature on the topic, (see section 6.4) further studies could fruitfully examine this issue.
Do those who engage in eco-behaviours enjoy better health?

The effect on health of engaging in pro-environmental behaviours was mediated by threat perception. Not performing pro-environmental behaviours enhanced health more for those who perceived higher levels of threat. Those who perceived low levels of threat did better when they engaged in environmental behaviours. The results were specific to Intellectual and School status, Happiness and Satisfaction, and Self-esteem scores.

The one exception was the influence of actual commitment on Behaviour scores where engaging in pro-environmental behaviours increased scores, albeit more sharply for those in with lower levels of threat perception. This is partial support for the hypothesis that 'in the long term engaging in pro-environmental behaviours is psychologically beneficial'.

In terms of the relationship between worldview and the benefit of engaging in pro-environmental acts, those espousing 'green' beliefs enjoyed a distinct improvement in perceptions of Intellectual and School Status, but the opposite effect occurred, to a lesser degree, for those with less ecological worldviews.

(c) The mediating effect of Knowledge and Education:

Does Knowledge moderate the effect of threat perception on health?

The interaction between Knowledge and Threat perception on the Popularity scale suggests the importance of environmental knowledge as a mediating variable. The counter-intuitive nature of the effect of knowledge combined with threat indicates vulnerability in terms of carrying capacity when it comes to popularity. This could well be a reactive issue to be considered in the delivery of materials designed to increase environmental knowledge.

What impact does Knowledge have on the relationship between environmental philosophy and health?

In this analysis, the interactive trend for Popularity implies that it is more acceptable to have little environmental knowledge when one doesn’t espouse a 'green'
worldview than when one does, in terms of popularity with classmates, being chosen for games, and the ability to make friends. Another implication of the finding however is that those with more accurate environmental knowledge are less popular in general.

The direct contribution of environmental knowledge to well-being was also apparent in the results. High Knowledge scores predicted higher average scores on Behaviour and Intellectual & School Status scores, while low Knowledge scores predicted higher average scores on the Physical Appearance & Attribute scale. This implies that in terms of fostering scholastic achievement and adaptive social behaviour increasing environmental knowledge may have a positive impact, a negative impact of knowledge on self-attributions to do with body image.

- **What are the effects of environmental education, i.e. participating in the experiential education program, the Eco-enterprise Audit?**

As a group, those who participated in the Eco-Audit exercise experienced positive effects in terms of Environmental Attitudes, and Self-esteem. They also showed an increase in scores on the measure of psychological distress. Methodological issues limit the implications of this finding (see Section 6.4), however the findings indicate the importance of gender as a possible moderating variable.

(f) The mediating effect of environmental facilities:

- **What is the impact of recycling facilities on environmental behaviour?**

No significant association between the availability or usage of recycling facilities and reported levels of environmental actions or sense of general well-being emerged in the data. This finding says little to explain the underlying dynamics here however, and given the limitations in the data, the finding must be interpreted in this light (see section 6.4 for discussion).
Gender effects:

- *What differences were attributable to gender?*

Findings consistently indicated lower self-esteem and greater psychological distress in females, alongside greater endorsement of pro-ecological environmental measures. However, important variations occurred across samples (compare sections 2.2, 4.3, 6.4; and 6.5 for discussion), an inconsistency concordant with the literature. Gender differences also emerged in the context of the educational intervention, which were inconclusive given the sample limitations. Together, these findings indicate the utility of considering gender, within a socio-political context, as a central variable in further studies.

### 7.4 IMPLICATIONS OF FINDINGS

The findings of these studies suggest the importance of the interplay between eco-philosophy, threat, and well-being in the design of educational interventions. This has further implications in terms of policy development and public health. Consideration of psychosocial aspects within environmental research is of paramount importance, not only in terms of research outcome but also in terms of ethics. It is incumbent on planners to use approaches that do not harm individuals. Given the nature of relationships between stress and health, demonstrated here in terms of environmental constructs, it is important to avoid approaches that heighten distress. Even when sample effect sizes are small or moderate, the impact at a population level is an important consideration.

Within a framework that is sensitive to ethical considerations for the person and the environment it is more likely that effective solutions to environmental degradation can be crafted. This is of particular importance in the developed countries of the world that not only contribute most to the problem but also serve as a model for research in academic institutions in the developing world. In this respect notion of reflexive and recursive modelling becomes apparent when we realise that we in the
Northern Hemisphere have lessons to learn from residents in the Southern Hemisphere. We have already recounted one such example from Brazilian city of Sao Paulo, one of the ten largest cities in the world. This was an example of an effective intervention designed to increase sustainable lifestyles in a city with many more severe problems than we generally experience in our cities in the ‘developed’ world. This impressive result of a co-ordinated intervention was observed in a community where high technology was not the norm, but local government initiatives have contributed to an ethos of sustainability within the city and made a real difference to the lives of people. In the Favelas of Curitiba, the air is smog free, because of a policy that actively promotes the use of public transport. There has been a massive increase in the green space because of a law that criminalizes the felling of a tree without replacing it two-fold, innovative ways to collect garbage and feed the poor. In the main, Jaime Lemer, former mayor, architect and city planner achieved these dramatic changes. Slow and difficult negotiations with diverse interest groups brought about changes that addressed multiple problems. The public transport system for example reduced air pollution and provided cheap transportation. This is an example of the multidisciplinary nature of environmental interventions. In Curitiba recycling was a common practice. Three quarters of the paper, one half of the metal, glass and plastics are recycled. There has been a 50% reduction in the volume of waste going to landfill because of the recycling scheme. Part of the success in recycling may be attributed to the strategy of recruiting children in schools to instruct parents on how to recycle.

7.5 FINAL CONCLUSION

The record of the Irish in dealing with their discharge into the waste stream is not so impressive, indeed waste disposal in Ireland has reached ‘crisis point’ (EPA, 2002). In contrast to Curitiba, for example, of the estimated 38 million tonnes of solid waste

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26 (this must be seen in context of the massive poverty in the area and may be inherently unsustainable if the standard of living of the people improves – however the plan is that then the extra money in the coffers will support payment to these people by employing them as municipal workers who will not then need free food).
generated in 1993 the Republic of Ireland recycled only 14% of its paper, 1.5% of its metal, 21% of its glass and 0.1% of its plastic (EPA, 1996). Almost 93% of solid waste was land filled and Local Authorities spent £60 million pounds disposing of that waste. The comparative data five years later indicated a massive increase to 80 million tonnes of solid waste being generated with only 2% more waste recovery and an actual decrease in household waste recovery (EPA, 2000). This trend for increase in waste generation is consistent with the rest of Europe where a 9.5% increase was recorded for the period 1990-1995, but landfill is more a common method of waste disposal in Ireland (91%) than in other EU countries (61%) (EPA, 2001).

This propensity to ‘bury’ the problem is perhaps in part a consequence of living in the sanitized ‘developed’ world where we are perhaps blinded to the consequences of our actions. This was graphically illustrated by Alice Taylor in her book Quench the Lamp, describing Irish rural life in the 1950’s, in which she describes the arrival of the first flush toilet.

One came to our house shortly after the advent of electricity when my father harnessed a free-flowing spring that poured down the hill behind our house and put it to a more practical use. Old Tom, when he viewed it in action declared: ‘Be the hokey but that’s a mighty yoke when you can flush everything down a hole. That could give a man the idea that he is no longer responsible for his actions’.

Well the fact of the matter is that we are responsible for our actions, which take place locally but have global consequences. Attaining a sustainable future will involve dramatic changes and no common set of variables can be used to predict a wide range of pro-environmental activity (McKenzie-Mohr, Nemiroff, Beers & Desmarais, 1995). The shift toward ‘green’ psychology in the US (Clay, 2001) and Europe (Pol, 1993) is reflected by the clearer role of psychologists in addressing the problems ensuing from engaging in unsustainable lifestyle practices. There are increasing prospects for interested psychologists to contribute toward air, water and energy conservation, in addition to devising strategies for re-direction of waste from landfill sites fast reaching available capacity (McKenzie-Mohr & Oskamp, 1995). The extent of the problem, reported in the literature would seem to justify the sense of extreme urgency communicated by some:
Our choice is a simple one: either we put our society on a radically different course so as to reduce, rather than continue to increase, its destructive impact on the biosphere, or we delegate this task to the four horsemen of the Apocalypse. (Goldsmith, 1988, p. 8; cited in ibid p.1).

In this thesis, we have endeavoured to show that the route to such change may be less direct than might be expected. By taking an ecological approach, we argued that an individual’s stance regarding degradation to the environment is linked to their sense of wellness. By shoring up the empirical foundations for exploring the links between eco-philosophy, threat, and well-being, the framework presented here has shown consistent evidence to support this line of research in these samples of young people.

Therefore, while we do not deny the sense of urgency required for dealing with the manifold problems this research strikes a cautionary note regarding how this sense of urgency is communicated.

Either humanity will recognize its peril and take steps to survive or we shall perish from one form of poisoning or another...but...there is the illusion of a third choice: avoidance. Many still see threats to their lives from the environment as actually coming from environmentalists (Bechtel, 1997; p.39).

Well, the overarching conclusion from this project is that those who see threats coming from ‘environmentalists’, including academic researchers, may indeed have a valid point. If attempts at persuasion toward ecological lifestyles are framed in such a way as to heighten stress then they may indeed be harmful to psychological well-being and tip the balance of the Individual Psycho-Ecological Carrying-Capacity.
REFERENCES


EPA (2001). *Newsletter. 8(1)*.


APPENDICES
List of Appendices

a) Questionnaire for Study One
b) Consent form
c) Standard statements introducing study two and three
d) Questionnaire for Study Two
e) Teacher Report Form
f) Changes to Piers Harris scale
g) Changes to CHEAKS scale
h) Research Instrument for Study Three
i) Results of analysis with EAI sub-scales, Chapter 3
Dear Participant,

We are interested in how people think about the environmental aspects of the world they live in and how that may affect them.

The aim of this study is to examine how environmental awareness and well-being interact.

It is important that you understand that there are no 'right' or 'wrong' answers. We are interested in what your opinion is.

We would like you to complete this questionnaire in your own time. We suggest you do this at a time when there is the least likelihood of your being disturbed.

Read each question carefully and answer honestly, working your way from the beginning to the end.

Any information given will be treated with complete confidentiality.

Thank you for taking time to partake in this study.
Age: 

Nationality: 

Gender: Female ☐ Male ☐ (please tick as appropriate) 

Please note: All information will be treated with utmost confidentiality. 

For Office Use - Please leave blank. 

Protocol number: ☐

1
We should like to know if you have had any medical complaints, and how your health has been in general, over the past few weeks. Please answer ALL the questions on the following pages simply by underlining the answer which you think most nearly applies to you. Remember that we want to know about present and recent complaints, not those that you had in the past.

It is important that you try to answer ALL the questions.

Thank you very much for your cooperation.

### HAVE YOU RECENTLY:

<table>
<thead>
<tr>
<th>Question</th>
<th>Better than usual</th>
<th>Same as usual</th>
<th>Worse than usual</th>
<th>Much worse than usual</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - been feeling perfectly well and in good health?</td>
<td>Not at all</td>
<td>No more than usual</td>
<td>Rather more than usual</td>
<td>Much more than usual</td>
</tr>
<tr>
<td>2 - been feeling in need of a good tonic?</td>
<td>Not at all</td>
<td>No more than usual</td>
<td>Rather more than usual</td>
<td>Much more than usual</td>
</tr>
<tr>
<td>3 - been feeling run down and out of sorts?</td>
<td>Not at all</td>
<td>No more than usual</td>
<td>Rather more than usual</td>
<td>Much more than usual</td>
</tr>
<tr>
<td>4 - felt that you are ill?</td>
<td>Not at all</td>
<td>No more than usual</td>
<td>Rather more than usual</td>
<td>Much more than usual</td>
</tr>
<tr>
<td>5 - been getting any pains in your head?</td>
<td>Not at all</td>
<td>No more than usual</td>
<td>Rather more than usual</td>
<td>Much more than usual</td>
</tr>
<tr>
<td>6 - been getting a feeling of tightness or pressure in your head?</td>
<td>Not at all</td>
<td>No more than usual</td>
<td>Rather more than usual</td>
<td>Much more than usual</td>
</tr>
<tr>
<td>7 - been able to concentrate on whatever you’re doing?</td>
<td>Better than usual</td>
<td>Same as usual</td>
<td>Less than usual</td>
<td>Much less than usual</td>
</tr>
<tr>
<td>8 - been afraid that you were going to collapse in a public place?</td>
<td>Not at all</td>
<td>No more than usual</td>
<td>Rather more than usual</td>
<td>Much more than usual</td>
</tr>
<tr>
<td>9 - been having hot or cold spells?</td>
<td>Not at all</td>
<td>No more than usual</td>
<td>Rather more than usual</td>
<td>Much more than usual</td>
</tr>
<tr>
<td>10 - been perspiring (sweating) a lot?</td>
<td>Not at all</td>
<td>No more than usual</td>
<td>Rather more than usual</td>
<td>Much more than usual</td>
</tr>
<tr>
<td>11 - found yourself waking early and unable to get back to sleep?</td>
<td>Not at all</td>
<td>No more than usual</td>
<td>Rather more than usual</td>
<td>Much more than usual</td>
</tr>
<tr>
<td>12 - been getting up feeling your sleep hasn’t refreshed you?</td>
<td>Not at all</td>
<td>No more than usual</td>
<td>Rather more than usual</td>
<td>Much more than usual</td>
</tr>
<tr>
<td>13 - been feeling too tired and exhausted even to eat?</td>
<td>Not at all</td>
<td>No more than usual</td>
<td>Rather more than usual</td>
<td>Much more than usual</td>
</tr>
<tr>
<td>Question</td>
<td>Not at all</td>
<td>No more than usual</td>
<td>Rather more than usual</td>
<td>Much more than usual</td>
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<td>--------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>14 - lost much sleep over worry?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 - been feeling mentally alert and wide awake?</td>
<td>Better</td>
<td>Same as usual</td>
<td>Less alert than usual</td>
<td>Much less alert</td>
</tr>
<tr>
<td>16 - been feeling full of energy?</td>
<td>Better</td>
<td>Same as usual</td>
<td>Less energy than usual</td>
<td>Much less energetic</td>
</tr>
<tr>
<td>17 - had difficulty in getting off to sleep?</td>
<td>Not at all</td>
<td>No more than usual</td>
<td>Rather more than usual</td>
<td>Much more than usual</td>
</tr>
<tr>
<td>18 - had difficulty in staying asleep once you are off?</td>
<td>Not at all</td>
<td>No more than usual</td>
<td>Rather more than usual</td>
<td>Much more than usual</td>
</tr>
<tr>
<td>19 - been having frightening or unpleasant dreams?</td>
<td>Not at all</td>
<td>No more than usual</td>
<td>Rather more than usual</td>
<td>Much more than usual</td>
</tr>
<tr>
<td>20 - been having restless, disturbed nights?</td>
<td>Not at all</td>
<td>No more than usual</td>
<td>Rather more than usual</td>
<td>Much more than usual</td>
</tr>
<tr>
<td>21 - been managing to keep yourself busy and occupied?</td>
<td>More so</td>
<td>Same as usual</td>
<td>Rather less than usual</td>
<td>Much less than usual</td>
</tr>
<tr>
<td>22 - been taking longer over the things you do?</td>
<td>Quicker</td>
<td>Same as usual</td>
<td>Longer than usual</td>
<td>Much longer than usual</td>
</tr>
<tr>
<td>23 - tended to lose interest in your ordinary activities?</td>
<td>Not at all</td>
<td>No more than usual</td>
<td>Rather more than usual</td>
<td>Much more than usual</td>
</tr>
<tr>
<td>24 - been losing interest in your personal appearance?</td>
<td>Not at all</td>
<td>No more than usual</td>
<td>Rather more than usual</td>
<td>Much more than usual</td>
</tr>
<tr>
<td>25 - been taking less trouble with your clothes?</td>
<td>More trouble as usual</td>
<td>Less trouble than usual</td>
<td>Much less trouble</td>
<td></td>
</tr>
<tr>
<td>26 - been getting out of the house as much as usual?</td>
<td>More</td>
<td>Same as usual</td>
<td>Less than usual</td>
<td>Much less than usual</td>
</tr>
<tr>
<td>27 - been managing as well as most people would in your shoes?</td>
<td>Better</td>
<td>About the same</td>
<td>Rather less than usual</td>
<td>Much less than usual</td>
</tr>
<tr>
<td>28 - felt on the whole you were doing things well?</td>
<td>Better</td>
<td>About the same</td>
<td>Less well than usual</td>
<td>Much less than usual</td>
</tr>
<tr>
<td>29 - been late getting to work, or getting started on your housework?</td>
<td>Not at all</td>
<td>No later than usual</td>
<td>Rather later than usual</td>
<td>Much later than usual</td>
</tr>
<tr>
<td>30 - been satisfied with the way you've carried out your task?</td>
<td>More</td>
<td>About as usual</td>
<td>Less satisfied than usual</td>
<td>Much less satisfied</td>
</tr>
<tr>
<td>31 - been able to feel warmth and affection for those near to you?</td>
<td>Better</td>
<td>About as usual</td>
<td>Less well than usual</td>
<td>Much less well</td>
</tr>
<tr>
<td>32 - been finding it easy to get on with other people?</td>
<td>Better</td>
<td>About as usual</td>
<td>Less well than usual</td>
<td>Much less well</td>
</tr>
<tr>
<td>33 - spent much time chatting with people?</td>
<td>More time</td>
<td>About as usual</td>
<td>Less than usual</td>
<td>Much less than usual</td>
</tr>
</tbody>
</table>

GO ON TO THE NEXT PAGE
<table>
<thead>
<tr>
<th>Question</th>
<th>Not at all</th>
<th>No more than usual</th>
<th>Rather more than usual</th>
<th>Much more than usual</th>
</tr>
</thead>
<tbody>
<tr>
<td>34 - kept feeling afraid to say anything to people in case you made a fool of yourself?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35 - felt that you are playing a useful part in things?</td>
<td>More so</td>
<td>Same as usual</td>
<td>Less useful than usual</td>
<td>Much less useful</td>
</tr>
<tr>
<td>36 - felt capable of making decisions about things?</td>
<td>More so</td>
<td>Same as usual</td>
<td>Less so than usual</td>
<td>Much less capable</td>
</tr>
<tr>
<td>37 - felt you’re just not able to make a start on anything?</td>
<td>Not at all</td>
<td>No more than usual</td>
<td>Rather more than usual</td>
<td>Much more than usual</td>
</tr>
<tr>
<td>38 - felt yourself dreading everything that you have to do?</td>
<td>Not at all</td>
<td>No more than usual</td>
<td>Rather more than usual</td>
<td>Much more than usual</td>
</tr>
<tr>
<td>39 - felt constantly under strain?</td>
<td>Not at all</td>
<td>No more than usual</td>
<td>Rather more than usual</td>
<td>Much more than usual</td>
</tr>
<tr>
<td>40 - felt you couldn’t overcome your difficulties?</td>
<td>Not at all</td>
<td>No more than usual</td>
<td>Rather more than usual</td>
<td>Much more than usual</td>
</tr>
<tr>
<td>41 - been finding life a struggle all the time?</td>
<td>Not at all</td>
<td>No more than usual</td>
<td>Rather more than usual</td>
<td>Much more than usual</td>
</tr>
<tr>
<td>42 - been able to enjoy your normal day-to-day activities?</td>
<td>More so</td>
<td>Same as usual</td>
<td>Less so than usual</td>
<td>Much less</td>
</tr>
<tr>
<td>43 - been getting things hard?</td>
<td>Not at all</td>
<td>No more than usual</td>
<td>Rather more than usual</td>
<td>Much more than usual</td>
</tr>
<tr>
<td>44 - been getting edgy and bad tempered?</td>
<td>Not at all</td>
<td>No more than usual</td>
<td>Rather more than usual</td>
<td>Much more than usual</td>
</tr>
<tr>
<td>45 - been getting scared or panicky for no good reason?</td>
<td>Not at all</td>
<td>No more than usual</td>
<td>Rather more than usual</td>
<td>Much more than usual</td>
</tr>
<tr>
<td>46 - been able to face up to your problems?</td>
<td>More so</td>
<td>Same as usual</td>
<td>Less able than usual</td>
<td>Much less able</td>
</tr>
<tr>
<td>47 - found everything getting on top of you?</td>
<td>Not at all</td>
<td>No more than usual</td>
<td>Rather more than usual</td>
<td>Much more than usual</td>
</tr>
<tr>
<td>48 - had the feeling that people were looking at you?</td>
<td>Not at all</td>
<td>No more than usual</td>
<td>Rather more than usual</td>
<td>Much more than usual</td>
</tr>
<tr>
<td>49 - been feeling unhappy and depressed?</td>
<td>Not at all</td>
<td>No more than usual</td>
<td>Rather more than usual</td>
<td>Much more than usual</td>
</tr>
<tr>
<td>50 - been losing confidence in yourself?</td>
<td>Not at all</td>
<td>No more than usual</td>
<td>Rather more than usual</td>
<td>Much more than usual</td>
</tr>
<tr>
<td>51 - been thinking of yourself as a worthless person?</td>
<td>Not at all</td>
<td>No more than usual</td>
<td>Rather more than usual</td>
<td>Much more than usual</td>
</tr>
<tr>
<td>52 - felt that life is entirely hopeless?</td>
<td>Not at all</td>
<td>No more than usual</td>
<td>Rather more than usual</td>
<td>Much more than usual</td>
</tr>
<tr>
<td>53 - been feeling hopeful about your own future?</td>
<td>More so</td>
<td>About same as usual</td>
<td>Less so than usual</td>
<td>Much less hopeful</td>
</tr>
</tbody>
</table>

PLEASE TURN OVER
<table>
<thead>
<tr>
<th>Question</th>
<th>More so than usual</th>
<th>About same as usual</th>
<th>Less so than usual</th>
<th>Much less than usual</th>
</tr>
</thead>
<tbody>
<tr>
<td>HAVE YOU RECENTLY:</td>
<td></td>
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<tr>
<td>54 — been feeling reasonably happy, all things considered?</td>
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<tr>
<td>55 — been feeling nervous and strung-up all the time?</td>
<td>Not at all</td>
<td>No more than usual</td>
<td>Rather more than usual</td>
<td>Much more than usual</td>
</tr>
<tr>
<td>56 — felt that life isn’t worth living?</td>
<td>Not at all</td>
<td>No more than usual</td>
<td>Rather more than usual</td>
<td>Much more than usual</td>
</tr>
<tr>
<td>57 — thought of the possibility that you might make away with yourself?</td>
<td>Definitely not</td>
<td>I don’t think so</td>
<td>Has crossed my mind</td>
<td>Definitely have</td>
</tr>
<tr>
<td>58 — found at times you couldn’t do anything because your nerves were too bad?</td>
<td>Not at all</td>
<td>No more than usual</td>
<td>Rather more than usual</td>
<td>Much more than usual</td>
</tr>
<tr>
<td>59 — found yourself wishing you were dead and away from it all?</td>
<td>Not at all</td>
<td>No more than usual</td>
<td>Rather more than usual</td>
<td>Much more than usual</td>
</tr>
<tr>
<td>60 — found that the idea of taking your own life kept coming into your mind?</td>
<td>Definitely not</td>
<td>I don’t think so</td>
<td>Has crossed my mind</td>
<td>Definitely has</td>
</tr>
</tbody>
</table>
Please rate how threatening the following problems are to you by drawing a circle around the response that best describes your position.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>No Threat</th>
<th>Minimal Threat</th>
<th>Mild Threat</th>
<th>Moderate Threat</th>
<th>Strong Threat</th>
<th>Very Strong Threat</th>
<th>Extreme Threat</th>
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</thead>
<tbody>
<tr>
<td>61</td>
<td>Water Pollution</td>
<td></td>
<td></td>
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<td>62</td>
<td>Storms (e.g., lightning, hurricanes, tornados, snow)</td>
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<tr>
<td>63</td>
<td>Pollution from cars</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>64</td>
<td>Pollution from factories</td>
<td></td>
<td></td>
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<tr>
<td>65</td>
<td>Pollution from burning rubbish</td>
<td></td>
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<tr>
<td>66</td>
<td>Smoking in public buildings</td>
<td></td>
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<td>67</td>
<td>Acid Rain</td>
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<td>68</td>
<td>Pollution from office equipment</td>
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<td>69</td>
<td>Number of people (e.g., crowding, population explosion)</td>
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<td>70</td>
<td>Fluorescent lighting</td>
<td></td>
<td></td>
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<tr>
<td>71</td>
<td>Water shortage, (e.g., drought, water depletion)</td>
<td></td>
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<tr>
<td>72</td>
<td>Noise</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>73</td>
<td>Visual pollution (e.g., billboards, ugly buildings, litter)</td>
<td></td>
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</tbody>
</table>

PLEASE GO ON TO THE NEXT PAGE
Please rate how threatening the following problems are to you by drawing a circle around the response that best describes your position.

<table>
<thead>
<tr>
<th>No</th>
<th>Minimal</th>
<th>Mild</th>
<th>Moderate</th>
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<th>Extreme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Threat</td>
<td>Threat</td>
<td>Threat</td>
<td>Threat</td>
<td>Threat</td>
<td>Threat</td>
<td>Threat</td>
</tr>
</tbody>
</table>

74 - Radioactivity in building materials (e.g., radon gas)

75 - Change to the ozone caused by pollution

76 - Earthquakes

77 - Soil erosion

78 - Impure drinking water

79 - Large fires

80 - Floods or tidal waves

81 - Germs or micro-organisms

82 - Radioactive fallout

83 - Fumes or fibers from synthetic materials (e.g., asbestos, carpets, plastics)

84 - Chemical dumps

85 - Video screen emissions

86 - Pesticides and herbicides

PLEASE GO ON TO THE NEXT PAGE
Please indicate whether you agree or disagree with the following statements by drawing a circle around the appropriate response.

87. We are approaching the limit of the number of people the earth can support.
    - Strongly Agree
    - Mildly Agree
    - Undecided
    - Mildly Disagree
    - Strongly Disagree

88. Humans have the right to modify the natural environment to suit their needs.
    - Strongly Agree
    - Mildly Agree
    - Undecided
    - Mildly Disagree
    - Strongly Disagree

89. When humans interfere with nature it often produces disastrous consequences.
    - Strongly Agree
    - Mildly Agree
    - Undecided
    - Mildly Disagree
    - Strongly Disagree

90. Human ingenuity will insure that we do NOT make the earth uninhabitable.
    - Strongly Agree
    - Mildly Agree
    - Undecided
    - Mildly Disagree
    - Strongly Disagree

91. Humans are severely abusing the environment.
    - Strongly Agree
    - Mildly Agree
    - Undecided
    - Mildly Disagree
    - Strongly Disagree

92. The earth has plenty of natural resources if we just learn how to develop them.
    - Strongly Agree
    - Mildly Agree
    - Undecided
    - Mildly Disagree
    - Strongly Disagree

93. Plants and animals have as much right as humans to exist.
    - Strongly Agree
    - Mildly Agree
    - Undecided
    - Mildly Disagree
    - Strongly Disagree

94. The balance of nature is strong enough to cope with the impacts of modern industrial nations.
    - Strongly Agree
    - Mildly Agree
    - Undecided
    - Mildly Disagree
    - Strongly Disagree

95. Despite our special abilities humans are still subject to the laws of nature.
    - Strongly Agree
    - Mildly Agree
    - Undecided
    - Mildly Disagree
    - Strongly Disagree

96. The so-called "ecological crisis" facing humankind has been greatly exaggerated.
    - Strongly Agree
    - Mildly Agree
    - Undecided
    - Mildly Disagree
    - Strongly Disagree

97. The earth is like a spaceship with very limited room and resources.
    - Strongly Agree
    - Mildly Agree
    - Undecided
    - Mildly Disagree
    - Strongly Disagree

98. Humans were meant to rule over the rest of nature.
    - Strongly Agree
    - Mildly Agree
    - Undecided
    - Mildly Disagree
    - Strongly Disagree

99. The balance of nature is very delicate and easily upset.
    - Strongly Agree
    - Mildly Agree
    - Undecided
    - Mildly Disagree
    - Strongly Disagree

100. Humans will eventually learn enough about how nature works to be able to control it.
     - Strongly Agree
     - Mildly Agree
     - Undecided
     - Mildly Disagree
     - Strongly Disagree

101. If things continue on their present course, we will soon experience a major ecological catastrophe.
     - Strongly Agree
     - Mildly Agree
     - Undecided
     - Mildly Disagree
     - Strongly Disagree
Appendix B  Consent form for Study Two and Study Three
I consent to the scoring sheets from our student's 'Person and Environment Health Questionnaire' being used in a research project being carried out by Anne Walsh-Daneshmandi, Psychologist.

I understand that all identifying information will be kept in strict confidence, and that each student's part in the project will be completely anonymous.

Signed .................................................................

Date .........................................................
Hello,

My name is Anne Walsh-Daneshmandi. I am doing research on how students think about themselves and the environment. The research is part of a larger study for a Ph.D. at Trinity College.

We will have a discussion at the end of this session when you make any comments. I can be contacted at the Department of Psychology, if you have any questions after the end of this study.

Your part in the research project will be to fill in some questionnaires, along with the rest of your class, giving your own opinions. If you have any questions during this session please raise your hand and we will come to your desk.

Thank you for agreeing to take part in the study.

Before we start, I would like to emphasize that:
Your participation is entirely voluntary
You are free to refuse to answer any question
You are free to withdraw at any time

The questionnaires will be kept strictly confidential and will be available only to members of the research team. Excerpts from the individual results may be made part of the final research report, but under no circumstances will your name or any identifying information be included in the report.

Are there any questions?
Appendix D  Questionnaire for Study Two
Thank you for deciding to take part in this study. Please read each question and answer truthfully.

Here are statements that describe how some people feel about themselves. Please read each one and decide if it is like you or not. If it is like you - then choose the Yes option. If the statement describes a person that is not like you - then choose the No option.

1. My classmates make fun of me. ........................................... Yes No

2. I am a happy person. .................................................. Yes No

3. It is hard for me to make friends. ................................ Yes No

4. I am often sad. .......................................................... Yes No

5. I am clever. ............................................................... Yes No

6. I am shy. ................................................................. Yes No

7. I get nervous when the teacher calls on me. ................ Yes No

8. My looks do not interest me. ......................................... Yes No

9. When I grow up, I will be important. ......................... Yes No

10. I get worried when we have tests in school. ............. Yes No

11. I am unpopular. ....................................................... Yes No

12. I am well behaved in school. ...................................... Yes No

13. It’s usually my fault when something goes wrong. .. Yes No

14. I cause trouble for my family. ................................... Yes No

15. I am strong. ............................................................. Yes No

16. I have good ideas. ................................................... Yes No

17. I am an important member of my family. ...................... Yes No

18. I usually do my work my own way. .......................... Yes No

19. I speak well in front of my class. ............................. Yes No

20. I am good at making things with my hands. ............. Yes No

21. I give up easily. ...................................................... Yes No

22. I am good at my school work. .................................... Yes No

23. I can draw well. ....................................................... Yes No

24. I am good at music. .................................................. Yes No

25. I am badly behaved at home. ..................................... Yes No

26. I am slow in finishing my school work. ................. Yes No

27. I am an important member of my class. ..................... Yes No

28. I am nervous. .......................................................... Yes No

29. I have pretty eyes. .................................................. Yes No

30. I speak well in front of my class. ............................. Yes No

31. In school I am a dreamer. ......................................... Yes No

32. I pick on my brother(s) and sister(s). .................. Yes No

33. My friends like my ideas. .......................................... Yes No

34. I often get into trouble. ........................................... Yes No

35. I am obedient at home. ............................................ Yes No

36. I am lucky. ............................................................. Yes No

37. I worry a lot. .......................................................... Yes No

38. My parents expect too much of me. ......................... Yes No

39. I like being the way I am. ........................................ Yes No

40. I feel left out of things. ......................................... Yes No

41. I have nice hair. ..................................................... Yes No

42. I often volunteer to do things in school. ................ Yes No
We would like to know more about how people feel about the environment. Please read each of the sentences below, then choose one option.

Here are some to practice with. For example, in last sentence - if you really do not like to have holidays from school then, mark the 'Very true' option. Now you try. Please ask if you have any questions.

Here are some sentences describing what some people actually do. Please read each one and choose ONE option.

Now that you have had some practice, we can begin. Here are some sentences about what some people might do. Please read each one and choose ONE option.

In this next part we have some sentences describing what some people actually do. Please read each one and choose ONE option that best describes you.

In this next part we have some sentences describing how some people feel. Please read each one and mark the option that best describes how you feel.
This part is a quiz - you get to choose one of the answers that are given. Please choose the one that you think is the correct one, like this.

1. Most elephants are killed every year to provide people with:
   a) Ivory... .......................................................... ⚫
   b) Meat. .......................................................... ⚫
   c) Oil... ..........................................................  
   d) Skin. ..........................................................  
   e) None of these... ........................................... ⚫

2. Burning coal for energy is a problem because it:
   a) Releases carbon dioxide and other pollutants into the air... ⚫
   b) Decreases needed acid rain... .................................. ⚫
   c) Reduces the amount of ozone in the stratosphere... ⚫
   d) Is too expensive... ............................................. ⚫
   e) Pollutes the water in aquifers...  

3. Ecology assumes that humans are most part of nature because it:
   a) Special... ...................................................... ⚫
   b) Related to all other parts... .................................... ⚫
   c) Not important... ................................................ ⚫
   d) The best part... ................................................ ⚫
   e) The first part... ................................................ ⚫

4. Phosphates are harmful in sea water because they:
   a) Cause cancer in fish... .......................................... ⚫
   b) Stop reproduction in fish... .................................... ⚫
   c) Make fish nervous... .............................................. ⚫
   d) Have no effect on fish... ........................................ ⚫
   e) Suffocate fish by increasing algae...  

5. Compared to other paper, recycled paper:
   a) Takes more water to make... .................................... ⚫
   b) Takes less energy to make... .................................... ⚫
   c) Is less expensive to buy... ....................................... ⚫
   d) Is harder to write on... .......................................... ⚫
   e) Produces more pollutants... ..................................... ⚫

6. The most pollution of our water sources is caused by:
   a) Farms on rivers... ............................................... ⚫
   b) Chemical runoff from farms... .................................... ⚫
   c) Methane gas... ................................................... ⚫
   d) Leaks in the sewers... ............................................ ⚫
   e) Human and animal wastes... ...................................... ⚫

7. Ecology is the study of the relationship between:
   a) Different species of animals... .................................. ⚫
   b) Plants and the atmosphere... .................................... ⚫
   c) Organisms and their environments... ⚫
   d) Man and other animals... ........................................ ⚫
   e) Man and the environment... ....................................... ⚫

8. The most common poisons found in water are:
   a) Arsenic, silver nitrates... ....................................... ⚫
   b) Hydrocarbons... ................................................... ⚫
   c) Carbon monoxide... ............................................... ⚫
   d) Sulpher, calcium... ............................................... ⚫
   e) Nitrates, phosphates... .......................................... ⚫

9. Where does most of the rubbish go after it is dumped from the rubbish trucks?
   a) To an aquifer where it is buried... ................................ ⚫
   b) It is dumped into the ocean... .................................... ⚫
   c) It is recycled to make plastic... ................................ ⚫
   d) To a landfill where it is buried... ................................ ⚫
   e) To farmers for use as fertilizer...  

10. Which is most responsible for creating acid rain?
    a) Sulphur dioxide... ............................................... ⚫
    b) Carbon dioxide... ............................................... ⚫
    c) Ozone... ........................................................ ⚫
    d) Nitrogen... ...................................................... ⚫
    e) Ultra violet radiation... ....................................... ⚫

11. Catching tuna in the ocean:
    a) Is eliminating a main food source for whales... ............. ⚫
    b) Protects baby sea turtles... .................................... ⚫
    c) Also kills many dolphins... ..................................... ⚫
    d) Is now against the law... ........................................ ⚫
    e) Is necessary to keep the population size down... ............. ⚫

12. Which is an example of a perpetual source?
    a) Nuclear... ...................................................... ⚫
    b) Oil... ........................................................ ⚫
    c) Wood... ........................................................ ⚫
    d) Uranium... ..................................................... ⚫
    e) Solar... ........................................................ ⚫

13. Which of the following is the most dangerous to the Earth’s environment?
    a) Damming rivers... ............................................... ⚫
    b) Overpopulation... ............................................... ⚫
    c) Tornadoes... ...................................................... ⚫
    d) Household pets... ............................................... ⚫
    e) Nuclear power plants... ......................................... ⚫

14. Most of the lead in our air is caused by:
    a) Cars... ........................................................ ⚫
    b) Industrial plants... ............................................. ⚫
    c) Aeroplanes... .................................................... ⚫
    d) Burning rubber... ............................................... ⚫
    e) Cigarettes... .................................................... ⚫

15. Pre-cycling means that:
    a) People buy things that can be used again... ..................... ⚫
    b) More people should ride bicycles...  
    c) Small children should wear the...  
    d) Items should be tested before we buy them...  
    e) Environmental changes are always taking place...  

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### Questions and Answers

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
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<tbody>
<tr>
<td>16 Animals alive today are most likely to become extinct because:</td>
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<tr>
<td>a) Natural selection kills weaker animals.</td>
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<td>b) Where they live is getting too warm.</td>
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<td>c) They are unable to reproduce because of pollution.</td>
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<tr>
<td>d) The habitat where they live is destroyed.</td>
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<tr>
<td>e) Their food supply is destroyed by acid rain.</td>
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<tr>
<td>17 Coal and petrol are examples of:</td>
<td></td>
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<tr>
<td>a) Fossil fuels.</td>
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<td>b) Renewable sources of energy.</td>
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<td>c) Energy sources that are plentiful.</td>
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<tr>
<td>d) Alternative sources of energy.</td>
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<tr>
<td>e) Recycled resources.</td>
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<tr>
<td>18 Environmental problems are a threat to:</td>
<td></td>
</tr>
<tr>
<td>a) Mostly people in small countries.</td>
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<td>b) Only people who live in cities.</td>
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<td>c) Only wild animals and endangered species.</td>
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<td>d) Mostly tropical plants and animals.</td>
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<td>e) All living things in the world.</td>
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<tr>
<td>19 Which of the following does not do much to reduce the pollution by cars?</td>
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<tr>
<td>a) Properly tuned engine.</td>
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<td>b) High octane petrol.</td>
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<td>c) Low lead petrol.</td>
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<td>d) Smog control devices.</td>
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<tr>
<td>e) Propane engines.</td>
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<tr>
<td>20 The main problem with landfills is that they:</td>
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<tr>
<td>a) Take up too much space.</td>
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<td>b) Are ugly to look at and smell bad.</td>
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<td>c) Attract rats and other pests.</td>
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<tr>
<td>d) Prevent farming of nearby land.</td>
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</tr>
<tr>
<td>e) Do not produce enough methane.</td>
<td></td>
</tr>
<tr>
<td>21 Building a dam on a river can be harmful because it:</td>
<td></td>
</tr>
<tr>
<td>a) Makes the river muddy.</td>
<td></td>
</tr>
<tr>
<td>b) Can no longer be used to make electricity.</td>
<td></td>
</tr>
<tr>
<td>c) Increases level of pollution on the water.</td>
<td></td>
</tr>
<tr>
<td>d) Causes the river to flood.</td>
<td></td>
</tr>
<tr>
<td>e) Damages the river's natural ecosystem.</td>
<td></td>
</tr>
<tr>
<td>22 Where is water under the ground found?</td>
<td></td>
</tr>
<tr>
<td>a) In landfills.</td>
<td></td>
</tr>
<tr>
<td>b) In ponds.</td>
<td></td>
</tr>
<tr>
<td>c) In low pressure areas.</td>
<td></td>
</tr>
<tr>
<td>d) In aquifers.</td>
<td></td>
</tr>
<tr>
<td>e) In rivers.</td>
<td></td>
</tr>
<tr>
<td>23 Killing animals like wolves that eat others:</td>
<td></td>
</tr>
<tr>
<td>a) Is necessary and should be done.</td>
<td></td>
</tr>
<tr>
<td>b) May increase the number of other animals.</td>
<td></td>
</tr>
<tr>
<td>c) Does not affect other animals in the area.</td>
<td></td>
</tr>
<tr>
<td>d) May decrease the number of other animals.</td>
<td></td>
</tr>
<tr>
<td>e) Will help protect the environment.</td>
<td></td>
</tr>
<tr>
<td>24 An example of a non-renewable resource is:</td>
<td></td>
</tr>
<tr>
<td>a) Petrol.</td>
<td></td>
</tr>
<tr>
<td>b) Trees.</td>
<td></td>
</tr>
<tr>
<td>c) Ocean contain too much fresh water.</td>
<td></td>
</tr>
<tr>
<td>d) Sunlight.</td>
<td></td>
</tr>
<tr>
<td>e) Animals raised for food.</td>
<td></td>
</tr>
<tr>
<td>25 Most air pollution in our big cities comes from:</td>
<td></td>
</tr>
<tr>
<td>a) Cars.</td>
<td></td>
</tr>
<tr>
<td>b) Abundant.</td>
<td></td>
</tr>
<tr>
<td>c) Factories.</td>
<td></td>
</tr>
<tr>
<td>d) Big trucks.</td>
<td></td>
</tr>
<tr>
<td>e) Landfills.</td>
<td></td>
</tr>
<tr>
<td>26 An item which cannot be recycled and used again is:</td>
<td></td>
</tr>
<tr>
<td>a) Disposable nappies.</td>
<td></td>
</tr>
<tr>
<td>b) Newspapers.</td>
<td></td>
</tr>
<tr>
<td>c) Aluminium cans.</td>
<td></td>
</tr>
<tr>
<td>d) Motor oils.</td>
<td></td>
</tr>
<tr>
<td>e) Plastic bottles.</td>
<td></td>
</tr>
<tr>
<td>27 What is the main problem with the use of aquifers for a water supply?</td>
<td></td>
</tr>
<tr>
<td>a) They recharge too quickly.</td>
<td></td>
</tr>
<tr>
<td>b) They are becoming used up.</td>
<td></td>
</tr>
<tr>
<td>c) They contain too much salt water.</td>
<td></td>
</tr>
<tr>
<td>d) They contain too much fresh water.</td>
<td></td>
</tr>
<tr>
<td>e) It is hard to get the water out.</td>
<td></td>
</tr>
<tr>
<td>28 A species that no longer exists is:</td>
<td></td>
</tr>
<tr>
<td>a) Protected.</td>
<td></td>
</tr>
<tr>
<td>b) Endangered.</td>
<td></td>
</tr>
<tr>
<td>c) Abundant.</td>
<td></td>
</tr>
<tr>
<td>d) Extinct.</td>
<td></td>
</tr>
<tr>
<td>e) Wild game.</td>
<td></td>
</tr>
<tr>
<td>29 Which uses the most energy in the average house in Ireland?</td>
<td></td>
</tr>
<tr>
<td>a) Lights.</td>
<td></td>
</tr>
<tr>
<td>b) TV.</td>
<td></td>
</tr>
<tr>
<td>c) Hot water heater.</td>
<td></td>
</tr>
<tr>
<td>d) Telephone.</td>
<td></td>
</tr>
<tr>
<td>e) Fridge.</td>
<td></td>
</tr>
<tr>
<td>30 Which of the following groups is most interested in environmental issues?</td>
<td></td>
</tr>
<tr>
<td>a) Signs.</td>
<td></td>
</tr>
<tr>
<td>b) Greenpeace.</td>
<td></td>
</tr>
<tr>
<td>c) Lyons club.</td>
<td></td>
</tr>
<tr>
<td>d) Macra na Feierns.</td>
<td></td>
</tr>
<tr>
<td>e) The Irish Cancer Society.</td>
<td></td>
</tr>
</tbody>
</table>

---

**Please Answer the Questions on This Page in the Same Way as you Did on the Last Page:**

- [ ] MARK IN YOUR NUMBER: 0 1 2 3 4 5 6 7 8 9
- [ ] MARK IN YOUR NUMBER: 0 1 2 3 4 5 6 7 8 9

---

293
M A R K  I N Y O U R  N U M B E R : 5 6 7


Here are some questions about how you have been feeling over the past few weeks. Please read each one and choose the option that best describes how you have been.

HAVE YOU RECENTLY:

1. been feeling perfectly well and in good health?       Not at all    Same    More    Much more
Better        as usual    than usual    than usual    than usual
2. been getting any pains in your head?  3. been getting a feeling of tightness in your head?
4. been afraid that you were going to collapse in a public place?
5. been having hot and cold spells?
6. been sweating a lot (not from exercise)?
7. found yourself waking early and unable to get back to sleep?
8. been feeling like you haven’t slept at all when you get up?
9. been having difficulty in getting off to sleep?
10. been having difficulty in staying asleep once you go to sleep?
11. been having restless, disturbed nights?

Please show whether you agree or disagree with the following statements by choosing the response that is best for you.

Strongly    Mildly    Undecided    Mildly    Strongly
Agree        Agree        Disagree        Disagree

12. We are approaching the limit of the number of people the earth can support.
13. Humans have the right to modify the natural environment to suit their needs.
14. When humans interfere with nature it often produces disastrous consequences.
15. Human ingenuity will ensure that we do not make the earth uninhabitable.
16. Humans are severely abusing the environment.
17. The earth has plenty of natural resources if we just learn how to develop them.
18. Plants and animals have as much right as humans to exist.
19. The balance of nature is strong enough to cope with the impacts of modern industrial nations.
20. Despite our special abilities humans are still subject to the laws of nature.
21. The so-called ecological crisis facing humankind has been greatly exaggerated.
22. The earth is like a spaceship with very limited room and resources.
23. Humans were meant to rule over the rest of nature.
24. The balance of nature is very delicate and easily upset.
25. Humans will eventually learn enough about how nature works to be able to control it.
26. If things continue on their present course, we will soon experience a major ecological catastrophe.
Please mark this option to let the computer know that you are working on page 6.  

<table>
<thead>
<tr>
<th>Threat</th>
<th>Minimal Threat</th>
<th>Mild Threat</th>
<th>Moderate Threat</th>
<th>Strong Threat</th>
<th>Strong Threat</th>
<th>Extreme Threat</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Water Pollution</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>2. Storms (e.g. lightning, snow)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>3. Pollution from cars</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>4. Pollution from factories</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>5. Pollution from burning rubbish</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>6. Smog in public buildings</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>7. Acid Rain</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>8. Pollution from office equipment</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>9. Number of people (e.g. population explosion)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>10. Fluorescent lighting</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>11. Water shortage (e.g. drought, water depletion)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>12. Volcano</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>13. Visual Pollution (e.g. billboards, ugly buildings, litter)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>14. Radioactivity in building materials (e.g. radon gas)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>15. Change to the ozone caused by pollution</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>16. Earthquakes</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>17. Soil erosion</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>18. Injure drinking water</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>19. Large Fires</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>20. Floods or tidal waves</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>21. Germs or micro-organisms</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>22. Radioactive fallout</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>23. Fumes or fibres from synthetic materials (e.g. asbestos, carpets, plastics)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>24. Chemical burns</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>25. Video screen emissions</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>26. Pesticides and herbicides</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

You have now completed the majority of the questionnaire, well done! All that is left is for you to add your own personal comments in the space below.

__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________

THANK YOU FOR COMPLETING THIS QUESTIONNAIRE.
Appendix E  Teacher Report Form for Study Two
<table>
<thead>
<tr>
<th>Time of query</th>
<th>Page number</th>
<th>Question number</th>
<th>Nature of query</th>
<th>Frequency of query</th>
<th>Who dealt with query</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Teacher(T) / Researcher(R)</td>
</tr>
</tbody>
</table>

Please continue overleaf
Appendix F: Changes made from the original Piers-Harris Self-Concept Scale
Changes made from the original Piers-Harris: (changes in brackets)

Q 5. I am smart. (I am clever).
Q21. I am good in my school work. (I am good at my school work).
Q25. I behave badly at home. (I am badly behaved at home).
Q30. I can give a good report in front of the class. (I speak well in front of my class).
Q42. I often volunteer in school. (I often volunteer to do things in school).
Q43. I wish I were different. (I wish I was different).
Q49. My classmates in school think I have good ideas. (My classmates think that I have good ideas).
Q53. I am dumb about most things. (I am stupid about most things).
Q55. I have lots of pep. (I have lots of energy).
Q56. I get into a lot of fights. (I get into lots of fights).
Q63. I am a leader in games and sport. (I am a good leader in sports and games).
Q75. I am always dropping or breaking things. (I am always afraid of dropping or breaking things).
Changes made to CHEAKS

Slight changes were necessitated by local semantic differences, sexist terminology and non-transferrable names of environmental organisations.

Thus: the word ‘rubbish’ replaced the more Americanised terms of ‘trash’ (item 6, Verbal Commitment Section), the word ‘garbage’ (item 9, Knowledge Section), and the word ‘refuse’ (item 14, Knowledge Section). The word ‘diapers’ was replaced by ‘nappies’ (item 26 Knowledge Section), and ‘refrigerator’ was replaced by ‘fridge’ (item 29 Knowledge Section).

Other changes made were: ‘air conditioning’ replaced with ‘heating’ (item 2 Verbal Commitment Scale), ‘bathe’ with ‘wash’ (item 3, Verbal Commitment Scale, Changing $15 to £5 (items 4&7, Verbal Commitment Scale, and replacing ‘faucet’ with ‘water tap’ (item 9, Actual Commitment Scale).

Pilot testing indicated lack of clarity with the word ‘perpetual’ (item 12, Knowledge Scale), thus the word was replaced with ‘endless’. The word ‘man’ was replaced with the less sexist term ‘human(s)’ (items 3&7 Knowledge Scale).

Responses to item 30 on the Knowledge Scale (‘Which of the following groups is most interested in environmental issues?’) were revised considerably, changes are shown in italics and original text in parentheses: A) Signets (The Boy Scouts of America); B) Voice (The Sierra Club); c) Lions Club (Kiwanis); d) Macra na Feirme (4H-Club; e) The Irish Cancer Society (American).
Appendix H  Research Instrument for Study Three

i  Cover Letter for Teacher and Principal
ii Question Booklet
iii Answer Booklet
Cover Letter for Teacher and Principal
Outline for Person and Environment Health Study

Aim:

This study is designed to examine the relationship between, personal well-being (physical and psychological aspects), ecological worldview (one's sense of connectedness with the biosphere), and threat perception (perception of threat to the self from environmental hazards). Of specific interest, is the role of education as a mediating variable.

Design and Method:

A comparative study with a before-after analysis, using the 'Eco-friendly Enterprise' pilot programme as a mediating variable, will be employed. Survey methods will encompass both quantitative and qualitative data in the Person and Environment Health Questionnaire.

The Person and Environment Health Questionnaire will be completed twice during the spring term; in January - before the programme, and again in March - after the programme. Questionnaires must be completed during class under supervision of teacher, this will require a double-class period.

The sample will comprise Transition year students from schools participating in the 'Eco-friendly Enterprise' pilot programme, and schools not participating in the programme (matched on socio-economic status) to act as a control group.

Measures:

The Person and Environment Health Questionnaire incorporates appropriate standardised measures that have been pilot tested with Transition Year students in Dublin. The constructs of interest are:

**Well-being**

Piers Harris Children's Self-Concept Scale (Piers & Harris, 1983, 1996),

General Health Questionnaire-GHQ-12 (Goldberg, 1978),

Psychological Well-Being Scale (adapted version of Affect-Balance Scale, Bradburn, 1969).

**Ecological Worldview:**

Revised New Environmental Paradigm (NEP) Scale (Dunlap, Van Liere et al., 1992), Children's Environmental Attitudes and Knowledge (CHEAKS) Scale (Leeming, O'Dwyer & Bracken, 1995)

**Perception of environmental hazards:**

Revised Environmental Appraisal Inventory (EAI) Self Scale (Schmidt & Gifford, 1989, Walsh-Daneshmandi & MacLachlan, 1998)

Analysis:

Multivariate methods for quantitative data. Content analysis for qualitative data.

Outcome:

This research will afford a measure of knowledge, attitudes, and commitment before and after an environmental-educational intervention in a sample of Irish adolescents. Further, it will provide an insight into the constructs underpinning environmental awareness and their relationship to personal well-being.
General Instructions for completing this Questionnaire:

1. Check that you have a copy of the Answer Sheet that matches this questionnaire.
2. Be sure to always match the sections on the Questionnaire and Answer Sheet.
3. Follow the DIRECTIONS given at the top of the Answer Sheet.
4. Follow the instructions given at the top of each section on the Answer Sheet.

PLEASE ASK IF YOU HAVE ANY QUESTIONS.

Section A: "The way I feel about myself"  

Section A on the Answer Sheet.

Here are some statements that describe how some people feel about themselves. Please read each one and decide if it is like you or not. In some cases it may be difficult to decide on a Yes or No answer, so please think about how you usually feel.

1. My classmates make fun of me
2. I am a happy person
3. It is hard for me to make friends
4. I am often sad
5. I am clever
6. I am shy
7. I get nervous when the teacher calls on me
8. My looks bother me
9. When I grow up, I will be an important person
10. I get worried when we have tests in school
11. I am unpopular
12. I am well behaved in school
13. It's usually my fault when something goes wrong
14. I cause trouble for my family
15. I am strong
16. I have good ideas
17. I am an important member of my family
18. I usually want my own way
19. I am good at making things with my hands
20. I give up easily

21. I am good at my school work
22. I do many bad things
23. I can draw well
24. I am good at music
25. I am badly behaved at home
26. I am slow in finishing my school work
27. I am an important member of my class
28. I am nervous
29. I have pretty eyes
30. I speak well in front of my class
31. In school I am a dreamer
32. I pick on my brother(s) and sister(s)
33. My friends like my ideas
34. I often get into trouble
35. I am obedient at home
36. I am lucky
37. I worry a lot
38. My parents expect too much of me
39. I like being the way I am
40. I feel left out of things
41. I have nice hair

42. I often volunteer to do things in school
43. I wish I was different
44. I sleep well at night
45. I hate school
46. I am among the last to be chosen for games
47. I am sick a lot
48. I am often mean to other people
49. My classmates think that I have good ideas
50. I am unhappy
51. I have many friends
52. I am cheerful
53. I am stupid about most things
54. I am good looking
55. I have lots of energy
56. I get into lots of fights
57. I am popular with boys
58. People pick on me
59. My family is disappointed in me
60. I have a pleasant face

61. When I try to make something everything seems to go wrong
62. I am picked on at home
63. I am a good leader in sports and games
64. I am clumsy
65. In games and sports, I watch instead of play
66. I forget what I learn
67. I am easy to get along with
68. I loose my temper easily
69. I am popular with girls
70. I am a good reader
71. I would rather work alone than with a group
72. I like my brothers (sisters)
73. I have a good figure
74. I am often afraid
75. I am always afraid of dropping things
76. I can be trusted
77. I am different from other people
78. I think bad thoughts
79. I cry easily
80. I am a good person
**Section B: 'How well I've been feeling recently'**

Here are some questions about how you have been feeling recently.

*When answering each item think about how you usually feel.*

During the past few weeks have you:

1. Felt particularly excited or interested in something
2. Felt angry because people do not understand you
3. Felt proud because someone complimented you on something you had done
4. Felt very lonely or remote from other people
5. Been pleased about having accomplished something
6. Felt bored
7. Felt on top of the world
8. Felt helpless because you are not able to meet your obligations
9. Felt things were going your way
10. Felt upset because someone criticised you

**Section C: 'People and the environment'**

Please show whether you agree or disagree with the following statements by choosing the response that is best for you.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>We are approaching the limit of the number of people the earth can support</td>
<td></td>
</tr>
<tr>
<td>Humans have the right to modify the natural environment to suit their needs</td>
<td></td>
</tr>
<tr>
<td>When humans interfere with nature it often produces disastrous consequences</td>
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</tr>
<tr>
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</tr>
<tr>
<td>Humans are severely abusing the environment</td>
<td></td>
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<tr>
<td>The earth has plenty of natural resources if we just learn how to develop them</td>
<td></td>
</tr>
<tr>
<td>Plants and animals have as much right as humans to exist</td>
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<td></td>
</tr>
<tr>
<td>Despite our special abilities humans are still subject to the laws of nature</td>
<td></td>
</tr>
<tr>
<td>The so-called 'ecological crisis' facing humankind has been greatly exaggerated</td>
<td></td>
</tr>
<tr>
<td>The earth is like a spaceship with very limited room and resources</td>
<td></td>
</tr>
<tr>
<td>Humans were meant to rule over the rest of nature</td>
<td></td>
</tr>
<tr>
<td>The balance of nature is very delicate and easily upset</td>
<td></td>
</tr>
<tr>
<td>Humans will eventually learn enough about how nature works to be able to control it</td>
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<td>If things continue on their present course, we will soon experience a major ecological catastrophe</td>
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**Section D: 'Hazards in the Environment'**

Here is a list of 26 items.

Please rate how threatened you feel by each of the items.

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Threat Level</th>
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<tr>
<td>Water pollution</td>
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<td>Pollution from cars</td>
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<td>Pollution from factories</td>
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<td>Pollution from disposal of rubbish</td>
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<td>Smoking in public buildings</td>
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<td>Acid Rain</td>
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<td>Storms (e.g. lightning, snow)</td>
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<td>Pollution from office equipment</td>
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<td>Number of people (e.g. population explosion)</td>
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<td>Fluorescent lighting</td>
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<td>Water shortage (e.g. drought, water depletion)</td>
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<td>Noise</td>
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<td>Visual pollution (e.g. billboards, ugly buildings, litter)</td>
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<td>Radioactivity in building materials (e.g. radon gas)</td>
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<td>Change to the ozone caused by pollution</td>
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<td>Earthquakes</td>
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<td>Soil erosion</td>
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<td>Impure drinking water</td>
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<td>Large fires</td>
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<td>Floods or tidal waves</td>
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<td>Germs or micro-organisms</td>
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<td>Radioactive fallout</td>
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<td>Fumes or fibres from synthetic materials (e.g. asbestos, carpets, plastics)</td>
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<td>Chemical dumps</td>
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<td>Video screen emissions</td>
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<td>Pesticides and herbicides</td>
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**Person and Environment Health**

**Section E:** *What I would be willing to*

In this part we have some sentences about what some people might do about environmental issues. What would you be willing to do?

1. I would be willing to stop buying some products to save animals' lives
2. I would not be willing to save energy by using less heating
3. To save water, I would be willing to use less water when I wash
4. I would not be willing to give £5 of my own money to help the environment
5. I would be willing to take the bus to more places to reduce air pollution
6. I would not be willing to separate my family's rubbish for recycling
7. I would give £5 of my own money to help protect wild animals
8. To save energy, I would be willing to use dimmer light bulbs
9. To save water, I would be willing to turn off the water while I wash my hands
10. I would go from house to house to pass out environmental information
11. I would be willing to write letters asking people to help reduce pollution
12. I would be willing to go from house to house asking people to recycle

**Section F:** *What I have done*

In this part we have some sentences describing what some people actually do.

What have you done?

1. I have not written to someone about a pollution problem
2. I have talked with my parents about how to help with environmental problems
3. I turn off the water in the sink while I brush my teeth to conserve water
4. To save energy, I turn off lights at home when they are not in use
5. I've asked my parents not to buy products made from animal fur
6. I have asked my family to recycle some of the things we use
7. I have asked others what I can do to help reduce pollution
8. I often read stories that are mostly about the environment
9. I do not let the water tap run when it is not necessary
10. I leave the fridge door open while I decide what to get out
11. I have put up a bird house near my home
12. I do not separate things at home for recycling

**Section G:** *How I feel about the environment*

In this part we have some sentences describing how some people feel about the environment.

How do you feel?

1. I'm frightened to think people don't care about the environment
2. I get angry about the damage pollution does to the environment
3. It makes me happy when people recycle bottles, cans and paper
4. I get angry when I think about companies testing products on animals
5. It makes me happy to see people trying to save energy
6. I am not worried about running out of water
7. I do not worry about environmental problems
8. I am not frightened about the effects of pollution on my family
9. I get upset when I think of the things people throw away that could be recycled
10. It makes me sad to see houses built where animals used to live
11. It frightens me to think how much energy is wasted
12. It upsets me when I see people use too much water
Section H: Environmental knowledge quiz

For each question, read the question and choose the ONE answer that you think is correct.

1. Most elephants are killed every year to provide people with
   A Trophies
   B Ivory
   C Meat
   D Oil
   E Skin

2. Burning coal for energy is a problem because it
   A Releases carbon dioxide and other pollutants into the air
   B Decreases needed acid rain
   C Reduces the amount of ozone in the stratosphere
   D Is too expensive
   E Pollutes the water in aquifers

3. Ecology assumes that humans are what part of nature?
   A Special
   B Related to all other parts
   C Not important
   D The best part
   E The first part

4. Phosphates are harmful in sea water because they:
   A Cause cancer in fish
   B Stop reproduction in fish
   C Make fish nervous
   D Make the water cloudy
   E Suffocate fish by increasing algae

5. Compared to other paper, recycled paper:
   A Takes more water to make
   B Takes less energy to make
   C Is less expensive to buy
   D Is harder to write on
   E Produces more pollutants

6. The most pollution of our water sources is caused by:
   A Dams on rivers
   B Chemical runoff from farms
   C Methane gas
   D Leaks in the sewers
   E Human and animal wastes

7. Ecology is the study of the relationship between:
   A Different species of animals
   B Plants and the atmosphere
   C Organisms and their environments
   D Humans and other animals
   E Humans and the environment

8. The most common poisons found in water are:
   A Arsenic, Silver nitrates
   B Hydrocarbons
   C Carbon monoxide
   D Sulphur, calcium
   E Nitrates, Phosphates

9. Where does most of the rubbish go after it is dumped from the rubbish trucks?
   A To an aquifer where it is buried
   B It is dumped into the ocean
   C It is recycled to make plastic
   D To a landfill where it is buried
   E To farmers for use as fertiliser

10. Which is most responsible for creating acid rain?
    A Sulphur dioxide
    B Carbon dioxide
    C Ozone
    D Nitrogen
    E Ultra violet radiation

11. Catching tuna in the ocean:
    A Is eliminating a main food source for whales
    B Protects baby sea turtles
    C Also kills many dolphins
    D Is now against the law
    E Is necessary to keep the population size down

12. Which is an example of an endless energy source?
    A Nuclear
    B Oil
    C Wood
    D Uranium
    E Solar

13. Which of the following is the most dangerous to the earth's environment?
    A Damming rivers
    B Overpopulation
    C Tornadoes
    D Household pets
    E Nuclear power plants

14. Most of the lead in our air is caused by:
    A Cars
    B Industrial plants
    C Aeroplanes
    D Burning rubbish
    E Cigarettes

15. Pre-cycling means that:
    A People buy things that can be used again
    B More people should ride bicycles
    C Small children should wear the clothes of their older brothers or sisters
    D Items should be tested before we buy them
    E Environmental changes are always taking place

16. Animals alive today are most likely to become extinct because:
    A Natural selection kills weaker animals
    B Where they live is getting too warm
    C They are unable to reproduce because of pollution
    D The habitat where they live is destroyed
    E Their food supply is destroyed by acid rain
### Environmental Knowledge Quiz

For each question, read the question and choose the **one** answer that you think is correct.

**17. Coal and petrol are examples of:**
- A Fossil fuels
- B Renewable sources of energy
- C Energy sources that are plentiful
- D Alternative sources of energy
- E Recycled resources

**18. Environmental problems are a threat to:**
- A Mostly people in small countries
- B Only people who live in cities
- C Only wild animals and endangered species
- D Mostly tropical plants and animals
- E All living things in the world

**19. Which of the following does not do much to reduce the pollution by cars?**
- A Properly tuned engine
- B High octane petrol
- C Low lead petrol
- D Smog control devices
- E Propane engines

**20. The main problem with landfills is that they:**
- A Take up too much space
- B Are ugly to look at and smell bad
- C Attract rats and other pests
- D Prevent farming of nearby land
- E Do not produce enough methane

**21. Building a dam on a river is harmful because it:**
- A Makes the river muddy
- B Can no longer be used to make electricity
- C Increases the level of pollution of the water
- D Causes the river to flood
- E Damages the river’s natural ecosystem

**22. Where is water found underground?**
- A In landfills
- B In ponds
- C In low pressure areas
- D In aquifers
- E In rivers

**23. Killing animals like wolves that eat others:**
- A Is necessary and should be done
- B May increase the number of other animals
- C Does not affect other animals in the area
- D May decrease the number of other animals
- E Will help protect the environment

**24. An example of a non-renewable resource is**
- A Petrol
- B Trees
- C Ocean water
- D Sunlight
- E Animals raised for food

**25. Most air pollution in our big cities comes from:**
- A Cars
- B Jet planes
- C Factories
- D Big trucks
- E Landfills

**26. An item which cannot be recycled and used again is:**
- A Disposable nappies
- B Newspapers
- C Aluminium cans
- D Motor oils
- E Plastic bottles

**27. What is the main problem with the use of aquifers for a water supply?**
- A They recharge too quickly
- B They are becoming used up
- C They contain too much fresh water
- D They contain too much salt water
- E It is hard to get the water out

**28. A species that no longer exists is:**
- A Protected
- B Endangered
- C Abundant
- D Extinct
- E Wild game

**29. Which uses the most energy in the average house in Ireland?**
- A Lights
- B TV
- C Hot water heater
- D Telephone
- E Fridge

**30. Which of the following groups is most interested in environmental issues?**
- A Signets
- B Voice
- C Lyons club
- D Macra na Feirme
- E The Irish Cancer Society
Section I: 'My general health'

We should like to know if you have had any medical complaints and how your health has been in general, over the last few weeks. Please answer ALL the questions.

Remember that we want to know about present and recent complaints, not those that you had in the past.

It is important that you try to answer ALL the questions.

Thank you very much for your co-operation.

HAVE YOU RECENTLY:

1. - been able to concentrate on whatever you're doing?
2. - lost much sleep over worry?
3. - felt that you are playing a useful part in things?
4. - felt capable of making decisions about things?
5. - felt constantly under strain?
6. - felt you couldn't overcome your difficulties?

7. - been able to enjoy your normal day-to-day activities?
8. - been able to face up to your problems?
9. - been feeling unhappy and depressed?
10. - been losing confidence in yourself?
11. - been thinking of yourself as a worthless person?
12. - been feeling reasonably happy, all things considered?

THANK YOU FOR YOUR CO-OPERATION
iii Answer Booklet
**Answer Sheet**

**Person and Environment Health**

Confidential Document

**DIRECTIONS:**
First fill in all the identification requested below, including date, name, school, sex, age and student identification number. For age, and student ID number, write the numbers in the spaces above the circles and then darken the circles that match. If you haven't been assigned a student ID number, ask your teacher or researcher.

MAKE DARK HEAVY MARKS THAT COVER THE WHOLE CIRCLE - LIKE THIS - •

**PLEASE ASK IF YOU HAVE ANY QUESTIONS.**

---

**Date:**

**Name:**

**School:**

**SEX**

Male Female

**AGE**

**STUDENT NUMBER**

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**Section A:** "The way I feel about myself"  

If the statement describes you - then choose the Yes option by filling in the circle in the Yes column. If the statement does not describe you - then choose the No option by filling in the circle in the No column. Try to answer all the statements, but do not fill in both the Yes and No circles for the same statement.

**Example:** 1. My classmates make fun of me
   - If this statement describes you, fill in the Yes circle
   - If this statement does not describe you, fill in the No circle

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Section B: ‘How well I’ve been feeling recently’

If the statement describes how you have been feeling - then choose the Yes option.
If the statement does not describe how you have been feeling - then choose the No option.

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Section C: ‘People and the environment’

Read each statement and choose one option for each where:
A = Strongly Agree, B = Mildly Agree, C = Undecided, D = Mildly Disagree, E = Strongly Disagree

Please try to give a definite opinion and avoid option C

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Section D: ‘Hazards in the Environment’

Please rate how threatened you feel by each of the items.

Read each statement and choose one option for each where:
A = No threat, B = Minimal threat, C = Mild threat, D = Moderate threat, E = Strong threat, F = Very strong threat, G = Extreme threat

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Section E: 'What I would be willing to do'

For each sentence choose one option on that describes what you would be willing to do - where:

A = Very false, B = Mostly false, C = Not sure, E = Mostly true, F = Very true

Please try to avoid option C

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Section F: 'What I have done'

Please read each sentence and choose the one option that best describes you - where:

A = Very false, B = Mostly false, C = Not sure, E = Mostly true, F = Very true

Please try to avoid option C

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Section G: 'How I feel about the environment'

Please read each sentence and choose the one option that best describes how you feel - where:

A = Very false, B = Mostly false, C = Not sure, E = Mostly true, F = Very true

Please try to avoid option C

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### Section H: ‘Environmental knowledge quiz’

For each question, read the question and choose the **one** answer that you think is correct.

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### Section I: ‘My general health’

Please answer **ALL** the questions simply by filling in the circle beside the answer which you think most nearly applies to you.

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<th>Same as usual</th>
<th>Less than usual</th>
<th>Much less than usual</th>
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### Section J: ‘My comments’

**Yes** | **No** (please fill in one circle)

1. **If you answered yes - then on the next page,**
   a) please say what you did for that work experience and
   b) list the three **best** things and the three **worst** things about your experience during work placement.

2. **Please write any other comments that you might care to make, regardless of how you answered the above question**

**THANK YOU FOR YOUR CO-OPERATION IN COMPLETING THIS SURVEY.**

**YOUR OPINIONS ARE A VERY IMPORTANT PART OF THIS STUDY AND WILL BE TREATED CONFIDENTIALLY AT ALL TIMES.**
Appendix I: Results of analysis with EAI sub-scales, Chapter 3.
Salience of the EAI subscales in the IPECC model for University Sample reported in Chapter 3.

Analysis of salience of the EAI subscales within the IPECC model was then conducted. As shown earlier all of the environmental scale scores were correlated. Results for the correlation analysis are shown in Table I.1 below.

Significant positive relationships were observed between the NEP-R score and the scores for the 26-item scale ($r = .38; p < .001$), the Techno-human sub-scale ($r = .41; p < .001$), and the Everyday Life sub-scale ($r = .33; p < .001$). There was a substantially lesser relationship between the NEP-R score and the score for the Natural hazards sub-scale ($r = .15; p < .05$).

<table>
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<th></th>
<th>Everyday</th>
<th>Natural</th>
<th>Technological</th>
<th>EAI</th>
<th>NEP</th>
<th>Ecoload#</th>
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<td>1.000</td>
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<td>.575**</td>
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<td>.724**</td>
<td>.949**</td>
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<td>.148*</td>
<td>.412**</td>
<td>.376**</td>
<td>1.000</td>
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<td>Ecoload #</td>
<td>.749**</td>
<td>.650**</td>
<td>.926**</td>
<td>.955**</td>
<td>.614**</td>
<td>1.000</td>
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</table>

Correlation is significant at the 0.01 level (1-tailed). * Correlation is significant at the 0.05 level (1-tailed). # Eco-load scores represent the product of EAI and NEP total scores.

Analysis of the IPECC phenomenon was conducted, within the same MANOVA design outlined above, for each of the subscales of the EAI in turn.

Technological Hazards:
Results for the Technological hazards and NEP scores as the independent variables show that equality of covariance across the dependent variate was maintained across groups ($F (84,26916) = 1.24, p > .05$). Difference between mean scores was not apparent at a multivariate level of analysis. Uni variate analysis confirmed equality of covariance across groups for all except the Suicidal Depression scores. At the uni
A significant main effect was observed for the Technological Hazard scale on the Somatic Symptom scores ($F(1, 142) = 4.13; p < .05; \text{power} = .52$), with median scorers reporting higher scores (Mean=3.41, SD=2.50 compared to Mean=2.43, SD=2.80). No interaction effects emerged.

**Gender effects on Technological Hazard and NEP**

When Gender was included in the factorial model, with Technological Hazards and NEP scores (categorized on median splits), the following effects emerged.

Equality of covariance was not observed across the groups ($F(140, 9192) = 1.213; p < .05$).

No effects were apparent at the multivariate level of analysis.

Levene’s test of equality of error variances indicated a rejection of the null hypothesis ($F(7, 137) = 4.48, p < .001$) for the Suicidal Depression scores. Between-Subjects effects emerged for the General Illness, Social Dysfunction, Anxiety & Dysphoria, and GHQ-60 scale scores.

### Table I.2: Univariate Effects for Gender by Technological Hazards by NEP

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<thead>
<tr>
<th>Source</th>
<th>Dependent Variable</th>
<th>Means#</th>
<th>$F$ (df = 137)</th>
<th>Sig.</th>
<th>Observed Power</th>
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<td>Gender</td>
<td>General Illness</td>
<td>F=6.3366, M=4.9091</td>
<td>4.594</td>
<td>.034</td>
<td>.567</td>
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<td>Social Dysfunction</td>
<td>F=6.2772, M=5.3864</td>
<td>4.684</td>
<td>.032</td>
<td>.575</td>
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<td>Anxiety &amp; Dysphoria</td>
<td>F=5.3267, M=3.3409</td>
<td>6.538</td>
<td>.012</td>
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<td>GHQ-60</td>
<td>F=57.0693, M=45.7045</td>
<td>4.235</td>
<td>.042</td>
<td>.533</td>
</tr>
<tr>
<td>Gender * Technological</td>
<td>Suicidal Depression</td>
<td>5.237</td>
<td>.024</td>
<td>.623</td>
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</table>

#F: Female
M: Male

The strength of these effects, in terms of statistical significance and Power are presented in Table I.2. The strongest of these effects was for gender, on the Anxiety and Dysphoria scale scores. Observed power was considerably below .80 in all cases.
Females scored higher than males in each of the main effect conditions. An interaction effect emerged for Gender by Technological Hazards on the Suicidal Depression scores, and is depicted in Figure 1.1

![Graph showing interaction effect between Gender and Technological Hazards on Suicidal Depression](attachment:figure1.png)

**Figure 1.1:** Interaction effects for Gender and Technological Hazards on Suicidal Depression.

Once again, a disordinal interaction between the independent variables resulted in higher symptom reporting, in terms of suicidal depression, for females who viewed Technological hazards as personally threatening, than their male counterparts, and the counterpoint for the Low threat condition.

Natural Hazards:

Results for the Natural hazard scale showed inequality of group covariance on the dependent variables (Box’s M test; $F(84,33946) = 1.35, p < .05$). Levene’s test indicated the unequal variance across groups occurred for the Suicidal depression scores ($F(3,141) = 7.25, p < .01$). There was an overall multivariate effect for Natural Hazard scores (Wilks’ Lambda $F(7,135) = 2.33, p < .05$), this was not apparent in terms of significant main effects at a univariate level of analysis.

The univariate analysis identified an interaction effect between NEP-R and Natural Hazards on the Suicidal Depression scale ($F(1,141) = 4.67, p < .05$; power = .57).
Cell statistics for this interactive effect are tabulated in Table I.3.

Table I.3: Cell statistics for NEP-R by Natural Hazard effect on Suicidal Depression

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<th>GENDER</th>
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<th>Mean</th>
<th>Std. Deviation</th>
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</tbody>
</table>

Perusal of the line graph (a) presented in Figure I.2, indicated that while a disordinal interactive effect between the independent variables was apparent, the main difference occurred in the low threat condition with above median NEP scorers reporting greater levels of depression.

(a) 2x2 model including Gender

(b) 2x2x2 model

Figure I.2: Line graph for interaction effect of NEP*Natural Hazards on Suicidal Depression.

Gender and Natural Hazards:
The findings of the Box M test rejected the assumption of equal covariance among groups (F (196, 5295) = 1.315; p < .01). At the multivariate level, significant effects emerged for Gender (F (7, 130) = 2.12; p < .05; Power .79) and the interaction of NEP
and Natural Hazard scores ($F(7, 130) = 2.30; p< .05; Power .83$). Levene’s test identified inequality of error variance in the groups on the Suicidal Depression scores ($F(7,136)= 3.99; p< .01$). This was the scale where the interactive effect between NEP-R and Natural Hazard scores produced a significant effect. Main effects for Gender were observed on the General Illness, Anxiety and Dysphoria, and GHQ-60 scale scores.

All significant effects are shown on Table 1.4, alongside the observed power for each of the tests. In general the power was below .80, except for the Anxiety and Dysphoria scale where the power just reached that level.

Table 1.4: Effects on IPECC model for Gender by Eco-Phil by Natural Hazards

<table>
<thead>
<tr>
<th>Source</th>
<th>Dependent Variable</th>
<th>Means#</th>
<th>$F$ (df=1,136)</th>
<th>Sig.</th>
<th>Observed Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>General Illness</td>
<td>F=6.3366 M=4.9767</td>
<td>4.802</td>
<td>.030</td>
<td>.585</td>
</tr>
<tr>
<td></td>
<td>Anxiety &amp; Dysphoria</td>
<td>F=5.3267 M=3.3953</td>
<td>7.735</td>
<td>.006</td>
<td>.789</td>
</tr>
<tr>
<td></td>
<td>GHQ-60</td>
<td>F=57.0693 M=46.2093</td>
<td>4.527</td>
<td>.035</td>
<td>.561</td>
</tr>
<tr>
<td>NEP * Natural Hazards</td>
<td>Suicidal Depression</td>
<td>4.795</td>
<td>.030</td>
<td>.585</td>
<td></td>
</tr>
</tbody>
</table>

#F: Female (n=101)  
M: Male (n=43)

The interaction between NEP-R and Natural Hazard Perception resulted in a disordinal pattern of scores on the Suicidal Depression Scale scores. This pattern is depicted in graph (b) Figure 1.2, where the slight effect of including Gender in the model can be detected from comparison between the two plots.

Everyday Hazards:

Tests of the IPECC model with everyday hazards and NEP scores as the independent variables showed no multivariate or univariate effects at the 5% level of significance.
Everyday Hazards and Gender:
Box’s M test indicated equality of covariance of the dependent variables across groups. At the multivariate level, significant effects emerged for Gender ($F (7, 129) = 2.12; p< .05; Power .79$).
Levene’s test identified inequality of error variance in the groups on the Suicidal Depression scores ($F (7,135)= 2.44; p< .05$). At the univariate level of analysis, main effects emerged for Gender on the General Illness, Social Dysfunction, Anxiety and Dysphoria, and GHQ-60 Scale scores.

Table I.5: Effects for Gender by NEP by Every Day Hazards

<table>
<thead>
<tr>
<th>Source</th>
<th>Dependent Variable</th>
<th>Means#</th>
<th>F (df: 1,135)</th>
<th>Sig.</th>
<th>Observed Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>General Illness</td>
<td>F=6.35</td>
<td>7.662</td>
<td>.006</td>
<td>.785</td>
</tr>
<tr>
<td>M=4.98</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Dysfunction</td>
<td>F=6.27</td>
<td>4.919</td>
<td>.028</td>
<td>.596</td>
<td></td>
</tr>
<tr>
<td>M=5.42</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anxiety &amp; Dysphoria</td>
<td>F=5.29</td>
<td>6.659</td>
<td>.011</td>
<td>.726</td>
<td></td>
</tr>
<tr>
<td>M=3.39</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GHQ-60</td>
<td>F=56.90</td>
<td>5.772</td>
<td>.018</td>
<td>.665</td>
<td></td>
</tr>
<tr>
<td>M=46.21</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#F: Females ($n=100$)
M: Males ($n=43$)

While these effects, shown in Table I.5, were significant the power was low in the case of Social Dysfunction, and GHQ-60 Scale scores. Mean scores within the groups were examined to establish the direction of difference. Perusal of cell means presented in Table I.5 indicates higher symptomatology for female participants on each of the scales.