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Refining the psychometric properties of the *Trinity Student Profile* - A self-report measure of occupational performance difficulties within the student role in higher education.

A Thesis submitted to the Trinity College Dublin, the University of Dublin for the degree of Doctor of Philosophy

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Declaration

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Abstract

Background: The *Trinity Student Profile* (*TSP*) is a self-report measure of occupational performance difficulties within the university student role and is based on the Person-Environment-Occupation Model. The tool was developed in response to the increasing numbers of students with disabilities and mental health difficulties in university in Ireland and Classical Test Theory methodology was used to facilitate its development and piloting. The tool required further rigorous validation, and there is an increasing call for the use of person-centred measurement models such as Rasch analysis methodology to validate tools. This research aimed to refine the psychometric properties of the *TSP.*

Methodology: A two-stage embedded design approach was used. Stage One aimed to refine the psychometric properties of the 'Identifying Needs' section using Rasch analysis. Data from 667 *TSP* files from the disability services in Trinity College Dublin and University College Dublin was collected retrospectively and analysed using Rasch analysis. Stage Two aimed to affirm the face validity and clinical utility of the refined tool in practice. Occupational therapists from three universities engaged in an initial focus group to discuss experiences of using the 2014 version of the tool and were trained in using the refined tool. A follow-up focus group was held after trialling use of the refined tool in practice and the resulting qualitative data was analysed using thematic analysis.

Results: The Rasch analysis in Stage One predominantly focused on the 6-point 'Difficulty' scale used for 74-items across three item-sets (i.e., 'Person' N=30; 'Environment' N=20; 'Occupation' N=24). The 'Difficulty' scale demonstrated stronger psychometric properties as a combined item-set of occupational performance difficulties. Using this combined item-set, the 6-point scale was collapsed to a 4-point scale and 20 redundant items were removed. The 54-item 4-point scale demonstrated strong reliability, separation, and unidimensionality. An item difficulty hierarchy and paper-and-pencil keyform were developed to be used in practice. Preliminary differential item functioning analyses and outcome measurement analyses provided evidence for the tool's generalisability and use as an outcome measure. Four themes

resulted in Stage Two. The occupational therapists reported that the changes following the Rasch analysis have resulted in the tool being easier and more efficient to use in practice. However, there were issues residing in other sections of the tool that could not be remedied using Rasch analysis. Subsequently, additional refinements were made including re-branding as the *Trinity Student Occupational Performance Profile* (*TSOPP*), improving the face validity of other sections of the tool, and the development of an administration manual.

Conclusion: The *TSOPP* is a valid and reliable self-report measure of occupational performance difficulties within the student role for students with disabilities in higher education.

Dissemination

Published papers:

- Lombard, K., Nolan, C., & Heron, E. (2021). A Scoping Review of the Use of Rasch Analysis Methodology to Strengthen Self-Report Occupational Therapy Mental Health Measures. *Occupational Therapy in Mental Health.* https://doi.org/10/1080/0164212X.2021.2005736
- Lombard, K., Nolan, C., & Heron, E. A. (2023). Refining the psychometric properties of the Trinity Student Occupational Performance Profile – A-self report measure of occupational performance difficulties within the student role. *British Journal of Occupational Therapy, 86*(4). https://doi.org/10.1177/03080226221107762

Oral presentations:

- Lombard, K., Nolan, C., & Heron, E. A. (2021). *Rasch analysis methodology for validating assessment tools – what is it and how can occupational therapist appraise literature which uses it? An introduction to Rasch analysis key concepts and terminology using the Trinity Student Profile (Nolan, 2011).* [Poster presentation]. Association of Occupational Therapists of Ireland, 9th October 2021.
- Lombard, K., Nolan, C., & Heron, E. A. (2022). *Using Rasch Analysis to refine the psychometric properties of the Trinity Student Occupational Performance Profile (TSOPP) – A self-report measure of occupational performance difficulties for students with mental health disabilities in higher education.* [3-Minute Thesis Presentation]. World Federation of Occupational Therapists Congress, 28th-31st August, Paris Convention Centre, Paris, France.
- Lombard, K., Nolan, C., & Heron, E. A. (2023). *Using Rasch Analysis to refine the psychometric properties of the Trinity Student Occupational Performance Profile (TSOPP) – A self-report measure of occupational performance difficulties for students with mental health disabilities in higher education.* [3-Minute Thesis

Presentation]. Faculty of Health Sciences Research Blitz, Trinity College Dublin, 27th April 2023.

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List of Abbreviations

COPM	Canadian Occupational Performance Measure
CTT	Classical Test Theory
DIF	Differential item functioning
eTSP	Electronic Trinity Student Profile
FG1	Initial focus group
FG2	Follow-up focus group
GDPR	General Data Protection Regulations
IRI	Item reliability index
IRT	Item Response Theory
ISI	Item separation index
OSA	Occupational Self Assessment
OT	Occupational Therapy
MFRM	Multi-Faceted Rasch Model
MnSq	Mean square fit statistic
PCM	Partial Credit Model
PEO	Person-Environment-Occupation
PIL	Participant Information Leaflet
PRIMSA	Preferred Reporting Items for Systematic Reviews and Meta-Analysis
PRI	Person reliability index
PSI	Person separation index
RMM	Rasch Measurement Model
RSM	Rating Scale Model
TCD	Trinity College Dublin
TSP	Trinity Student Profile
TSOPP	Trinity Student Occupational Performance Profile
TUDublin	Technological University of Dublin
UCD	University College Dublin
Zstd	Standardised mean square fit statistic

1. Chapter 1: Introduction

1.1. Introduction

This thesis presents the psychometric research and refinement process of the *Trinity Student Profile* (*TSP*; Nolan, 2011) – a self-report measure of occupational performance difficulties within the student role in higher education This chapter begins with the background and need for this research (1.2) to improve the evidence-base and measurement practices of occupational therapists supporting students with disabilities in higher education. Following this, the design, aims, and objectives of the research are outlined (1.3), followed by definitions of key terms used throughout the thesis (1.4). The research assumptions and the positionality of the researcher undertaking this research are provided (1.5), and the chapter ends with an overview of the format of the thesis (1.6).

1.2. Background and Need for this Research

1.2.1. Establishment of the *Trinity Student Profile* (*TSP*)

Over the past 20 years, services and supports for students with disabilities have become well established in Irish higher education institutions. This has been the result of the support of national and European Union law, policy, and funding streams, such as the *Disability Act 2005* (Government of Ireland, 2005), the Higher Education Authority's '*National Access Plan 2022-2028*' (HEA, 2022) and its predecessors (HEA, 2004, 2008, 2015) and *European Social Fund* co-financing of the *Fund for Students with Disabilities* (HEA, 2023). The Trinity College Dublin Disability Service (TCD DS) is one of the longest established services in an Irish higher education institution, and has seen a significant increase in the number of students with disabilities accessing reasonable accommodations and supports, from 222 students in 2001/2002 to 2061 students in 2021/2022 (TCD DS, 2022a, 2022b). The TCD Occupational Therapy Service, formerly

known as the Unilink service, was an initiative that was established by Nolan in 2003 in response to the increasing number of students with disabilities experiencing mental health difficulties and occupational performance related difficulties within their student role (Nolan, & MacCobb, 2006). This student-centred and occupation-focused service supports students in developing the self-management skills necessary for managing the complexity of the student role, including the academic (e.g., attending lectures, completing assignments, sitting exams etc.), social (e.g., making friends, communicating with academic and support staff, group work etc.), and personal (e.g., developing self-advocacy skills, organisation skills, manage their mental health, self-determination etc.) aspects of this role (Lewis, 2022; Nolan, & MacCobb, 2006).

Following the success of the service in TCD, services were established in other Irish universities (Nolan, Treanor, Gleeson, & Lewis, 2013), such as University College Dublin (UCD) and Technological University of Dublin (TUDublin; formerly Dublin Institute of Technology). The services are based on-site within the Disability Service of each higher education institution allowing for easy access for students. It is important to note that these services are not supported education programmes (Shindler, 2019), but rather fully integrated services to which students with disabilities can be referred if they are experiencing difficulties within their student role.

The mental health difficulties experienced by students as they transition to university life are well-documented both nationally (Dooley, O'Connor, Fitzgerald, & O'Reilly, 2019) and internationally (Campbell et al., 2022; Sheldon et al., 2021; Storrie, Ahern, & Tuckett, 2010). For the majority of students, this transition occurs alongside the transition into adulthood - a time in which for many, the risk of developing mental health difficulties increases (Kessler et al., 2007). In recent years, the impact of the COVID-19 pandemic and subsequent lockdowns negatively impacted the mental health of university students (Bhargav, & Swords, 2022; Elharake et al., 2023; Li et al., 2021) and continues to do so (Liverpool, et al., 2023; Kohls et al., 2023). Transitioning to higher education requires students to make academic, social, and personal adjustments as they navigate the autonomous institutional environment of university (Baker, & Siryk, 1984; Denovan, & Mascaskill, 2017), all of which impact on a student's occupational

performance (Keptner, & Rogers, 2019) and satisfaction with occupational performance (Keptner, 2018). These occupational performance difficulties can include difficulties with social-related occupations, time management, academic-related occupations, sleep, managing stress and managing money (Keptner, & Rogers, 2019). Factors such as pressure related to exams and course work, financial and accommodation difficulties and behaviours such as lack of engagement with leisure and learning activities are also associated with poor mental health of university students (Campbell et al., 2022). Moreover, for mature students (i.e., those over 23 years or over upon entering higher education), financial costs, managing family responsibilities, and work commitments are some of the major barriers impacting their participation in their studies (Indecon, 2021).

However, this transition to higher education poses further risk factors for developing mental health difficulties and can be accompanied by additional occupational performance difficulties for students with pre-existing mental health difficulties or disabilities (Sheldon et al., 2021), for neurodivergent students (Clouder et al., 2020), especially autistic students (Campbell et al., 2022; McLeod, Meanwell, & Hawbaker, 2019; Nuske Rollitta, Bellon, & Richdale, 2019) and students experiencing attention deficit hyperactivity disorder (ADHD; DuPaul et al., 2021; Jansen et al., 2017). For example, research has shown that the academic performance of autistic students is significantly different to their neurotypical peers, having higher rates of remedial course work or course failure, and experiencing higher levels of difficulty with physical and mental health, as well as social relationships and bullying (McLeod et al., 2019). Autistic students can experience high levels of stress during the transition to post-secondary education, difficulties managing intense emotions, handling conflict, difficulties with executive functioning, time management, self-awareness skills and needing more structured routines (Nuske et al., 2019; White et al., 2016). Whereas for students with ADHD, they can experience difficulties managing negative thought cycles, low self-esteem, difficulties with time management (Kwon, Kim, & Kwak, 2018); executive functioning, goal setting, persisting with their work (Johnson, & Reid, 2011); attention in class (Jansen et al., 2017); and lower levels of quality of life and lower perceived competence with sleep than those without ADHD (Goffer, Cohen, Berger, & Maeir, 2019).

It is evident that the student role and subsequent occupational performance difficulties that can be experienced by students are complex and nuanced. As with any occupational therapy service, it is essential that the measurement tools used in practice can reliably and validly assess the occupational performance difficulties experienced by students in higher education (College of Occupational Therapists [COT], 2013). As the occupational therapy services became more established in Ireland, Nolan (2011) identified the need to develop a self-report measure of occupational performance difficulties within the student role – namely, the *Trinity Student Profile* (*TSP*), which is the focus of this research. In 2011, Nolan developed and piloted the *TSP,* and it has been used in TCD, UCD, and TUDublin since (Nolan, 2011). In 2018, Keptner highlighted the need for a tool which accurately identifies a student's occupational performance concerns and self-perceptions of performance (Keptner, 2018). Furthermore, Eichler and Keptner (2023) highlighted the need for uniform measurement of outcomes in occupational therapy services in higher education globally. The *TSP* fulfils this need, but prior to the research conducted in this thesis, it had not been disseminated within peer-reviewed journals due to the need for further psychometric testing and rigorous validation. Therefore, the focus of this research was to refine the psychometric properties of the *TSP*.

1.2.2. Overview of the *Trinity Student Profile* (*TSP*)

The *TSP* is a self-report measure of occupational performance difficulties within the student role in higher education and enables students to identify priorities and set goals for occupational therapy intervention. An overview of the tool's theoretical underpinnings, format, research and development to-date are provided below.

1.2.2.1. Theoretical underpinnings

There are several conceptual frameworks and theories underlying the *TSP*. The *TSP*'s main underpinning philosophy and framework is based on the Person-Environment-Occupation Model (Law et al., 1996). Other theories that have influenced its development to-date include the Recovery Model (Davidson, & Roe, 2007), Client-

centred Practice (Law, & Mills, 1998), and the Social Model (Hammel et al., 2009) and Affirmation Model (Swain, & French, 2000) of disability.

The **Person-Environment-Occupation Model** (PEO-Model; Law et al., 1996; Figure 1.1) captures the transactive relationship between the person or student, their university environment, and the occupations they need to engage in within their student role. The **Person** concept consists of cognitive and affective factors (motor factors are not considered in the *TSP*); the **Environment** concept encompasses the physical, social, cultural, and institutional environment of the higher education institution; and the **Occupation** concept captures the academic, social, and personal occupations of being a student. There is a transactive relationship between these three concepts which results in the construct of **occupational performance**, how well one is able to perform their occupations. Most importantly, the PEO-Model is easily accessible and understood by students, enabling them to develop self-awareness to start analysing and understanding occupational performance in their everyday student life.

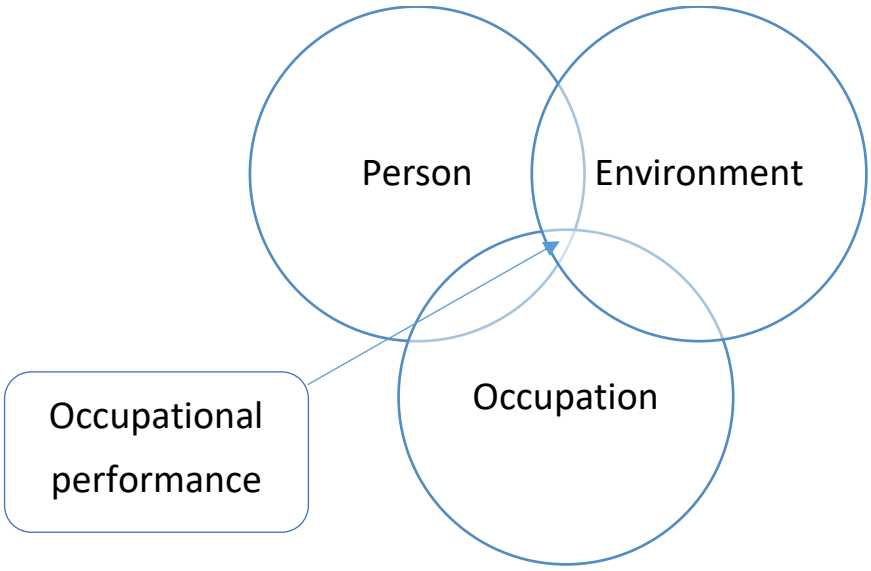


Figure 1.1: Person-Environment-Occupation Model. Adapted from "The Person-Environment-Occupation Model: A Transactive Approach to Occupational Performance" by M. Law, B. Cooper, S. Strong, D. Stewart, P. Rigby and L. Letts, 1996, *Canadian Journal of Occupational Therapy, 63*(1), p. 15. Copyright © 1996 by SAGE Publications. Reprinted with permission.

Globally, the **recovery** movement (Davidson, 2016) has influenced the focus of mental health service provision from institutionalisation to community living, valuing the person as an autonomous decision-maker within their own care and emphasising the importance of personal narratives within the recovery process. In Ireland, where the *TSP* was first developed, several committees and policies have been developed to align mental health care with the recovery approach. These include the *Mental Health Act* (Government of Ireland, 2001), *Quality Framework for Mental Health Services* (Mental Health Commission [MHC], 2007), *A Vision for Change* (Department of Health and Children, 2006) and its successor *Sharing the Vision: A Mental Health Policy for Everyone* (Department of Health, 2022). The Unilink model, which led to the development of the *TSP*, has been considered a model of best practice reflecting these policies (MHC, 2008). Recovery within mental health can be viewed firstly as 'Recovery from' the symptoms of a mental health condition so that daily life is no longer impacted, and also as 'Recovery in' which means that one can live a meaningful life despite the symptoms of a mental health condition if the effects of that condition on daily life can be resolved. These may include for example, isolation, loss of purpose, loss of valued roles etc. (Davidson, & Roe, 2007). It is imperative that a student's strengths in other areas of health and environment can be utilised to enable them to manage the condition and the effects it may have on daily life while maintaining hope for the future (Davidson, & Roe, 2007). For the *TSP*, students are asked to identify their strengths and what they are managing well at present, as well as describe hobbies and interests. They are also provided with an opportunity to outline their academic, social, and personal expectations for the year ahead which captures their hopes and aspirations for their student role. Students are enabled to identify their occupational performance difficulties and prioritise these difficulties for occupational therapy intervention, providing them with choice and control over their intervention.

During the tool's development and pilot, Nolan (2011) advocated for **Client-centred Practice** to inform the tool and assessment process. Client-centred Practice is built upon the assumption that each human being has uniqueness and worth, that one must try to understand the person's subjective experience of occupation and disability and that therapists can create environments that facilitate change, but they cannot promote

change within the client themselves (Law, & Mills, 1998). The *TSP* fulfils several criterion of Client-centred assessment tools, such as being self-report in nature, that the student's report is considered the most relevant source of information and it provides opportunities for students to share their individual narratives and experiences of their student role (McColl, & Pollock, 2017).

In terms of how disability is viewed and understood, the *TSP* was originally developed with the **Social Model of Disability** (Hammel et al., 2009) and has transformed over time to include the **Affirmation Model of Disability** (Swain, & French, 2000). The disability rights movement of the 1960's advocated for a shift in how disability was understood from a Medical Model of Disability towards a Social Model of Disability. Within the Social Model of Disability perspective, it is believed that the structural environment of society disables people with impairments, leading to disability (Hammel et al., 2009). Many of the higher education disability services in Ireland are underpinned by the Social Model of Disability, hence this has influenced the development of the occupational therapy support services and subsequent *TSP* tool in practice. However, Crow (1992, 1996) argues that the Social Model neglects impairment (e.g., pain, chronic illness etc.) as an important aspect of the lives of many people with disabilities and that personal struggles related to impairment remain even when disabling barriers no longer exist. As a result, Swain and French (2000) suggest an Affirmation Model of Disability. This model, which builds on the liberatory imperative of the Social Model, leads with a non-tragic view of disability and impairment which encompasses positive social identities, both individual and collective, for disabled people grounded in the benefits of lifestyle and life experiences of being impaired and disabled. They are valued as citizens of their communities who determine their own choices, lifestyles, and identities. Society should make reasonable accommodations to support people with disabilities, however also acknowledging that impairments exist and that people with disabilities are given the choice of how these impairments are managed. Within the context of the *TSP*, this tool is guided by both the Social Model and Affirmation Model of Disability as it seeks to identify environmental and occupational adaptations that can be implemented but overall considers the student as a valued member of the university community and

acknowledges that they may experience challenges relating to their impairment such as fatigue, pain etc.

1.2.2.2. Format of the *TSP*

The *TSP* consists of the following four sections, of which the first three are self-reported by the student and fourth section is completed in collaboration with the therapist (Appendix 1.1):

- 'Student Details' section captures demographic details including contact details, course, year of study, next of kin and psychiatrist/GP details if applicable.

- 'Experiences & Expectations' section asks open-ended questions regarding a student's strengths, hobbies/leisure interests, college and work experience followed by what their expectations are academically, socially and personally for the year. Furthermore, the PEO-model (Law et al., 1996) diagram (Figure 1.1) is displayed to inform students of the conceptual model underlying the approach to the self-report measure.

- 'Identifying Needs' section enables students to self-report their occupational performance difficulties within the student role. There are 74 items split over 'Person' (N=30), 'Environment' (N=20) and 'Occupation' (N=24) item-sets. Students rate how difficult an item is to manage on a 6-point Likert-style 'Difficulty' scale (i.e., *0=No difficulty – 5=Extreme difficulty*). There is also a 6-point Likert-style 'Importance' scale (i.e., *0=Not important – 5=Great importance*).

- 'Goal setting' section enables students and therapists to identify priorities for therapy and collaboratively set goals.

1.2.2.3. Research and development to-date

After its conception in 2006, the *TSP* has undergone a process of research and development which has improved the tool over time (Figure 1.2).

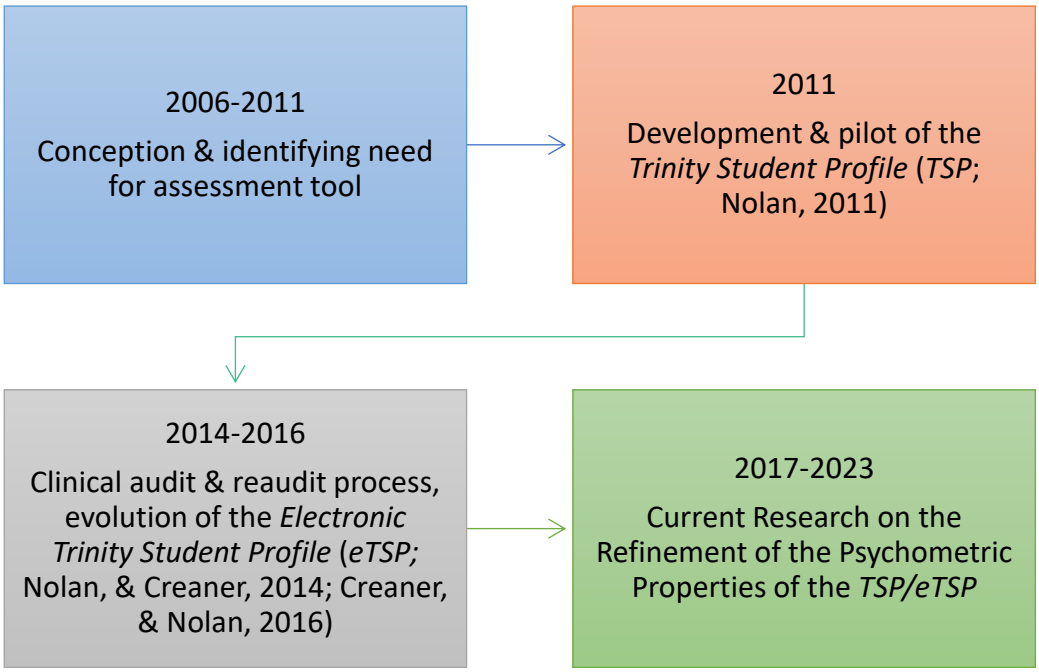


Figure 1.2: Timeline of Research and Development of the *TSP* and *Electronic Trinity Student Profile* (*eTSP*)

Development and pilot of the *TSP* (Nolan, 2011)

Nolan (2011) conducted a sequential exploratory mixed-methods study which aimed to use qualitative and quantitative methods to develop and pilot the paper-based *TSP*. While Nolan (2011) was carrying out this research, a concurrent study by Dolan, Maye, and Monahan (2008) was conducted which sought to determine the concerns and issues experienced by the general undergraduate and postgraduate student population in TCD. Using an adapted version of the *TSP*, Dolan et al. (2008) surveyed 974 students and they identified that the most pressing concerns related to study, sleep, nutritional needs, managing time, managing work overload, dealing with finances and balancing college work and life. Dolan et al. (2008) found that undergraduate students experienced more difficulties than postgraduate students and that for certain items such as '*Getting*

involved in societies' and '*Dealing with work overload'*, female students experienced greater difficulties than male students.

Stage One of Nolan's (2011) study involved qualitative interviews and focus groups with occupational therapists and students regarding the content and face validity of the tool. Several benefits of the *TSP* were identified by both therapist and student research participants. For therapists, the *TSP* facilitated the identification of occupational difficulties, goal setting and intervention planning with students and the interaction and relationship they developed with students. As for students, the *TSP* provided them with the language and framework to discuss their occupational difficulties in relation to their student role and moreover, provided them with a means of tracking their progress throughout their engagement with the occupational therapy service. Furthermore, Nolan (2011) found that the difficulties which arose within the focus groups and interviews aligned with the PEO-Model (Law et al., 1996), providing evidence for the conceptualisation of the *TSP*'s structure of three separate item-sets in the 'Identifying Needs' section: 'Person', 'Environment', and 'Occupation' item-sets. The items in each item set were rated on a 6-point 'Difficulty' scale and a 6-point 'Importance' scale.

Stage Two of Nolan's (2011) study involved developing and piloting the 'Identifying Needs' section with 140 students with disabilities and generating preliminary psychometric evidence for the tool using Classical Test Theory (CTT). In investigating construct validity, Nolan (2011) conducted an exploratory factor analysis on the 'Person', 'Environment', and 'Occupation' item-sets. Any items which did not load onto factors in the factor analysis were omitted from the tool. As for the reliability of the tool, a Cronbach's alpha over 0.80 was considered high and items were maintained within the tool if Cronbach's alpha was above 0.50 (Nolan, 2011). The traits within the 'Person' item-set had Cronbach's alpha values ranging from 0.575 to 0.887; those within the 'Environment' item-set had 0.518 to 0.845; and lastly, those within the 'Occupation' item-set were found to have Cronbach's alpha values ranging from 0.751 to 0.860. Nolan (2011) concluded that these results supported the construct validity and reliability of the *TSP*, however further research was needed on the 'Person' and 'Environment' item-sets to enhance their reliability.

Clinical audit of the service and development of the *Electronic Trinity Student Profile* (*eTSP*; Nolan, & Creaner, 2014; Creaner, & Nolan, 2016)

In 2014, a clinical audit of the TCD service was conducted to determine if the service was following best practice guidelines and standards (Nolan, & Creaner, 2014). Clinical audits are used to determine if a service is doing what it should be doing in accordance with guidelines of best practice (Regulation and Quality Improvement Authority [RQIA], n.d.). During this audit, Nolan and Creaner (2014, p.5) aimed *"to assess the Unilink service in terms of its adherence to international and Unilink standards of OT; to examine fidelity to OT process within the Unilink service; to assess alignment to Models of OT practice including PEO-Model and Recovery Model; to develop an audit tool that can be used to replicate audit in the future; to examine and discuss the application of Unilink standards within the Unilink manual*". As the audit progressed, Nolan and Creaner (2014, p.5) described how other aims emerged, including to *"analyse record keeping techniques; analyse nature of contact of students across years and faculty; analyse goal setting within Unilink".*

The service scored high in terms of its adherence to international standards of best practice and recovery-oriented practice. Clinical audits can help identify opportunities for improvement within a service (RQIA, n.d.), which Nolan and Creaner's (2014) audit did. This audit identified the need for improving practices regarding setting student goals in line with the PEO-Model and documenting outcomes. To implement these changes in practice, several recommendations were made as a result of this clinical audit. Most significantly, the paper-based 2011 version of the *TSP* was converted into the electronic-based 2014 version known as the *eTSP*, which intended to allow therapists to record student's needs and intervention plans and set goals within the PEO-Model (Creaner, & Nolan, 2016), enabling these to be integrated into the case notes. This 2014 version of the *eTSP* was then rolled out within the occupational therapy services in TCD, UCD, and TUDublin from 2014/2015 onwards, after a period of retraining and upskilling with all staff. The TCD service was re-audited using the same audit tools to determine how well the recommendations and changes were incorporated into practice from the original audit (Creaner, & Nolan, 2016). The service scored higher in all aspects of the audit following the recommendations, except for the

Evaluation section which was concerned with documenting outcomes. However, Creaner and Nolan (2016) reported that this was likely due to the timing of the re-audit in the middle of the trimester and hence intervention was still on-going in several cases.

1.2.3. Research significance & problem: Measurement in Occupational Therapy and refining the psychometric properties of the *TSP*

As healthcare continues to move towards person-centred care (World Health Organization [WHO], 2017), there is a need to ensure the quality of measurement used in healthcare (Pendrill, 2018) so that it delivers what is most important to the people engaging with healthcare services (OECD, 2017). Measurement in occupational therapy is imperative for demonstrating the value of and maintaining the survival of the profession in mental health settings (Doucet, & Gutman, 2013; Hemphill-Pearson, 2008; Laver-Fawcett, 2012; Velozo, 2021). Outcome measurement, or rather the process of determining the effectiveness of and change resulting from intervention in achieving a client's desired outcomes, is essential for demonstrating the value that occupational therapy offers to health care services (Laver-Fawcett, 2014). Sound measurement practices provide benefits at the individual client level as well as at service level. From an individual client perspective, implementing client-centred measurement practices facilitates the development of a therapeutic relationship, systematically documents a client's occupational performance difficulties and priorities over time, and ensures that the client is incorporated into decision-making processes for intervention planning (Dunn, 2017; Law, & Mills, 1998; Velozo, Seel, Magasi, Heinemann, & Romero, 2012). Furthermore, outcome measurement plays a role in determining the effectiveness and efficacy of services and hence provides evidence to support the unique role of occupational therapy in mental health settings for stakeholders (Casteleijn, & Graham, 2012; Rouleau, Dion, & Korner-Bitensky, 2015; Velozo et al., 2012). In an era of increasing need for accountability and quality assurance, without having evidence to demonstrate and justify the contribution of occupational therapy within mental health

practice there is a risk of limiting the growth and survival of the profession (COT, 2013; Donnelly, & Carswell, 2002; Doucet, & Gutman, 2013).

However, there is evidence to indicate challenges in implementing consistent and sound measurement within practice. In Eichler and Keptner's (2023) survey of 58 occupational therapists practising in higher education, no universal measurement tool was identified. In a study of 50 clinicians working in mental health, Garland, Kruse and Aarons (2003) found that only 8% (n=4) of clinicians reported using the scores gathered from assessments within treatment planning and monitoring. Garland et al. (2003) found that the challenges in measurement practices included increase in paperwork, time constraints, and not seeing the value, benefits or rewards of assessment information within clinical practice. In Rouleau et al.'s (2015) study of occupational therapists in Canada, it was found that the *Canadian Occupational Performance Measure* (*COPM*; Law et al., 2005) was the most frequently used outcome measure but that repeated outcome measures were rarely used (0% to 29.5%).

From an Irish perspective, O'Connell and McKay's (2010) mixed methods study investigating the practices of 21 community mental health occupational therapists similarly found that the *COPM* (Law et al., 2005) was the most frequently used outcome measure (38%, n=8) followed by non-standardised methods (19%, n=4). O'Connell and McKay (2010) identified that occupational therapists within Ireland need to establish a mechanism of providing evidence for occupational therapy contribution within the recovery process with clients throughout wider mental health practice, indicating the need for further research and evidence to be generated for occupational therapy in mental health in Ireland. In their systematic review in identifying occupational therapy outcome measures supportive of recovery-orientated mental health services in Ireland, Kearns, Salmon, Cahill and Egan's (2021) found that the *COPM* (Law et al., 2005) was most aligned with recovery-orientated practice, but cited Brown, Stoffel and Munoz (2019) and the American Occupational Therapy Association (AOTA, 2008) when highlighting the need for occupational therapists to use measures that have the ability to detect change in occupational performance and are underpinned by occupational therapy conceptual models. As can be seen, implementing sound measurement

practices with validated outcome measures is significant as it provides evidence for the value of occupational therapy, but is faced with many challenges in practice.

As a result, when considering measurement, Velozo (2021) advocates that the profession needs to move from validating measures using traditional measurement models (e.g., CTT) towards person-centred measurement models, namely through validating measures using Rasch analysis (Rasch, 1960). As will be outlined further in this thesis, there is an evolving paradigm shift (Bond, & Fox, 2015) towards the use of Rasch analysis to validate measures due to the solutions it provides for the challenges presented by CTT (Fisher, 1993; Velozo, Kielhofner, & Lai, 1999b; Velozo et al., 2012; Velozo, 2021). Velozo (2021) highlights how tools validated with Rasch analysis can support the value of occupational therapy as they have the ability to create a picture of a client's level on a construct of interest over time and they can assist in identifying just-right challenges (Christie, 1999) for intervention planning.

Considering this within the context of the *TSP*, although the piloted version of this self-report tool has been used in practice, the psychometric properties require further rigorous validation and refinement. This is especially important as the construct it intends to measure (i.e., self-reported occupational performance difficulties within the student role) is latent, meaning it is abstract and cannot be easily observed (Bond, & Fox, 2015). Furthermore, Paulhus and Vazire (2007) raise concerns regarding the credibility and sources of bias of self-report measures such as the *TSP*, arguing that clients may choose socially desirable answers or may lack self-awareness. Smith, Wakey, de Kruif and Swartz (2003) also highlight how some clients are prone to choose extreme scores on a Likert-style scale while others may only choose middle categories. Self-report measures which have poorly defined category labels or have too many categories to discriminate between may lead to clients using the scale idiosyncratically which can affect the measure's validity (Smith et al., 2003). For the *TSP* to be robust in measuring a latent construct such as occupational performance difficulties in the student role, the items should be well-defined and act as a ruler or hierarchy, representing 'less' to 'more' of the construct (Bond, & Fox, 2015). Consequently, this ruler or hierarchy would enable the identification of where a student sits on this hierarchy (i.e., a student's level of

occupational performance difficulties) and would subsequently assist in developing graded intervention plans. Therefore, the research problem which was the focus of this thesis was to improve the psychometric properties of the *TSP* to make the measure more meaningful to use in practice (Velozo, 2021).

1.3. Research Design, Aims, and Objectives

The overall aim of this research was "to refine the psychometric properties (see 1.4.4 for full definition) of the *Trinity Student Profile* (*TSP*)". This research follows an embedded design (Creswell, & Plano Clark, 2007) approach consisting of two Stages. As described in 1.2.2.2, the *TSP* consists of several sections. Stage One focuses on refining the 'Identifying Needs' section only using Rasch analysis. Stage Two focuses on using focus groups to gather the experiences of occupational therapists in using each section of the 2014 version of the *eTSP* to affirm the tool's face validity and clinical utility, as well as using the refined 'Identifying Needs' section in practice.

1.3.1. Stage One Aim & Objectives

Stage One Aim: To refine the psychometric properties of the 'Identifying Needs' section of the *TSP* using Rasch analysis.

Objectives:

(a) Determine if the 'Difficulty' scale demonstrates stronger psychometric properties as three separate 'Person', 'Environment', and 'Occupation' item-sets or as a combined itemset of occupational performance difficulty within the context of the Person-Environment-Occupation Model.

(b) Refine the psychometric properties of the 'Difficulty' scale using an iterative process of Rasch analysis.

(c) Establish preliminary evidence for the generalisability of the 'Difficulty' scale across measurement contexts (i.e., university, gender, level of degree, administration format).

(d) Establish preliminary evidence that the 'Difficulty' scale can be used as an outcome measure (i.e., is sensitive to detecting change over time).
(e) Develop a keyform for the 'Difficulty' scale that can be used to estimate a student's measure of occupational performance difficulties in practice.
(f) Improve the rating scale functioning of the 'Importance' scale (see 1.3.3 for clarification).

1.3.2. Stage Two Aim & Objectives

Stage Two Aim: To affirm the face validity and clinical utility of the refined tool in practice.

Objectives:

(a) Gather the experiences of occupational therapists in using each section of the 2014 version of the *eTSP* in practice to identify if refinements of other sections of the tool are warranted.
(b) Train the occupational therapists in using the refined 'Identifying Needs' section and gather their experiences after a period of using this in practice.
(c) Make final refinements to each section of the tool and devise an administration manual on how to use the tool that is accessible for occupational therapists wishing to use the tool in their practice.

1.3.3. Scope of the Rasch analysis

The Rasch analysis conducted in Stage One is predominantly focused on refining the 'Difficulty' scale of the 'Identifying Needs' section. An in-depth Rasch analysis was not conducted on the 'Importance' scale, other than an investigation into the rating scale functioning of the 6-point Likert scale. The rationale for this decision was that the underlying construct of the 'Difficulty' scale is occupational performance difficulty within the student role. It was assumed that this construct could be quantified and displayed on a unidimensional hierarchy from 'less' to 'more' that was interpreted similarly by any student completing the *TSP* (Bond, & Fox, 2015). Whereas when Nolan

(2011) developed the 'Importance' scale, this part of the *TSP* was simply to be used as a mechanism to prioritise the difficulties identified in the 'Difficulty' scale. This part of the tool does not seek to measure a construct of importance or value that the student assigns to a particular item, but rather was intended to be a mechanism for students to prioritise what items to focus on in occupational therapy intervention at a particular time. This is a highly individualised situation – for example, a student may rate '*Managing family* [*MANFAMIL*]' as extremely difficult but indicate the same item as not important to focus on in occupational therapy as they may be receiving support elsewhere. Another example is where at the start of term, a student may rate '*Managing stress before an exam* [*MANSTREE*]' as extremely difficult but no importance as although it is an issue, it is not a priority to focus on at the start of term. Moreover, the 'Importance' scale is different to the 'Value' scale within the *Occupational Self Assessment* (Baron, Kielhofner, Iyenger, Goldhammer, & Wolenski, 2006) which aims to gather an individual's sense of value in occupation. Whereas the 'Importance' scale is simply seeking to prioritise the difficulties identified in the 'Difficulty' scale (Nolan, 2011).

As will be discussed throughout this thesis, it is important to note that on the original paper-based *TSP* (Nolan, 2011), students were asked '*How important is it for you to work on this item in Unilink'*. However, this language did not get translated over to the Excel-based *eTSP* after a clinical audit (Creaner, & Nolan, 2016), where the tool simply stated, *'Level of importance'*. The impact of this change will be further discussed later in the thesis.

1.4. Definition of terms

1.4.1. *Trinity Student Profile* (*TSP*)

The *Trinity Student Profile* (*TSP*) is the name established by Nolan (2011) for the self-report measure of occupational performance difficulties within the student role, originally a paper-based tool. As explained above, this tool has evolved over time into the 2014 version called *Electronic Trinity Student Profile* (*eTSP*) which was in use in

practice at the time of this research. For the reader's ease, the term '*TSP*' will be used to refer to both versions of the tool throughout the thesis, apart from when it is relevant and necessary to specifically mention the separate versions of the tool.

1.4.2. Students with disabilities

The term 'students with disabilities' will be used throughout this thesis to encompass students experiencing mental health difficulties, autism, attention deficit hyperactivity disorder (ADHD), dyspraxia, dyslexia, significant ongoing illness, students with a physical/sensory disability and those students who identify as being neurodivergent. The occupational therapy services in which the *TSP* is utilised are based with Disability Services in higher education in Ireland. These Disability Services are influenced by the Disability Advisers Working Network (DAWN) which is currently underpinned by the Social Model of Disability (Hammel et al., 2009) and uses person-first language (i.e., student with a disability) (DAWN, 2019). It is acknowledged that there is currently a paradigm shift towards an Affirmation Model of Disability (Swain, & French, 2000) as well as greater emphasis placed on neurodiversity (Dallman, Williams, & Villa, 2022; Singer, 1999), all of which advocates for identity first language such as 'autistic student' or 'disabled student'. While it is acknowledged this shift is occurring and that there is ongoing debate on language use (Shah et al., 2022), for the purposes of this research the term 'students with disabilities' will be used to align with the current model of practice in Disability Services in higher education in Ireland.

1.4.3. Occupational performance

The term 'occupational performance' refers to Law et al.'s (1996) definition within the PEO Model, in that is it the result of the transactive relationship between the person, environment, and occupation concepts and represents how well one is able to perform their occupations. Within the context of this thesis, the focus of occupational performance is on the student role (i.e., the academic, social, and personal occupations associated with this role).

1.4.4. Psychometric properties

The term 'psychometric properties' is used throughout this thesis to capture the concepts of *reliability* and *validity*. *Reliability* is concerned with how reproducible and consistent the results or scores are within a measurement tool (Polgar, & Thomas, 2013), and represents how dependable the results are for a particular sample (Magasi, Gohil, Burghart, & Wallisch, 2017). Whereas *validity* is concerned with the extent to which the scores of an instrument are representative of the underlying construct which they are intended to measure (Mokkink et al., 2010). For Stage One of this research, the concept of validity was influenced by the following:

- ***Content validity*:** If the item content is relevant to and representative of the underlying constructs (Messick, 1989).
- ***Substantive validity*:** The extent to which the observed responses are explained or supported by the underlying conceptual framework upon which they are based (Messick, 1989).
- ***Structural validity:*** The consistency of the scoring structure of a tool to the structure of the intended underlying construct (Messick, 1989).
- ***Generalisability:*** The extent to which a tool can be used in different formats or administration contexts (Messick, 1989).
- ***External validity,*** specifically ***responsiveness:*** Also known as the sensitivity in detecting changes in person measures in the construct of interest (Medical Outcomes Trust Scientific Advisory Committee [MOT], 1995).
- ***Interpretability:*** How well the meaning derived from a measure is disseminated and used by those unfamiliar with psychometrics (MOT, 1995).

Messick's (1989) aspect of *consequential validity* (i.e., standard setting and cut scores derived from measures) was not applicable to the *TSP* and hence not investigated. Stage Two of this research was focused on the *face validity* (i.e., how well a tool appears to measure the intended underlying construct) and *clinical utility* (i.e., how useful and feasible a tool is to administer in clinical practice) of the *TSP* in practice (Magasi et al., 2017).

1.5. Research Assumptions

The following assumptions were made regarding this research:

1. Using Rasch analysis, the 'Identifying Needs' section could be refined in a clinically-useful manner.
2. The underlying construct of the 'Difficulty' scale (i.e., occupational performance difficulty within the student role) could be quantified and displayed on a unidimensional hierarchy from 'less' to 'more' that could be interpreted similarly by any student completing the *TSP* (Bond, & Fox, 2015).
3. The students who completed the *TSP* gave true and accurate ratings of their occupational performance difficulties at the time of administration.
4. The occupational therapists would provide true and honest accounts of their experiences of using the 2014 and 2021 versions of the *eTSP* in practice.

1.5.1. Researcher's Positionality

From the outset of this thesis, the researcher acknowledges their dual role of clinician and researcher while conducting this research (Milne, & Oberle, 2005). The researcher began their clinical post in University College Dublin (UCD) in 2017 at the same time as beginning this research, and is currently practising as a Senior Occupational Therapist. Engaging in clinical work alongside conducting this research was paramount for gaining an understanding of the occupational performance difficulties experienced by students with disabilities in higher education, the impact of the temporal context of an academic year, as well as how the *TSP* is administered within practice in order to make clinically-useful decisions (Forsyth, Summerfield Mann, & Kielhofner, 2005) during the refinement process. Although this clinical experience was necessary and beneficial for this research, the researcher aimed to put appropriate measures in place to manage potential researcher bias and enhance reflexivity (Dodgson, 2019) which will be discussed throughout the thesis.

1.6. Format of the thesis

The research conducted in this thesis is captured in eight chapters, this being the first. **Chapter Two** details what the *TSP* offers over existing assessment tools of occupational performance, justifying use of Rasch analysis methodology over other psychometric methodologies and positions this research within existing literature of self-report mental health occupational therapy measures which have been validated using Rasch analysis. **Chapter Three** then outlines the research design and methods used to achieve aims and objectives in Stage One (Chapters 4 & 5) and Stage Two (Chapters 6 & 7) of the research. **Chapter Four** presents and compares the initial Rasch analysis results of the separate 'Person', 'Environment', and 'Occupation' 'Difficulty' item-sets to a combined 'Difficulty' item-set and justifies continuing the *TSP*'s refinement as one combined measure of occupational performance difficulty in the student role. Continuing with this combined 'Difficulty' item-set, this chapter also presents the iterative refinement process using Rasch analysis to improve the psychometric properties of the Difficulty' item-set, resulting in the original 74-item 6-point scale being refined to a 54-item 4-point scale. Using this 54-item scale, **Chapter Five** then outlines the preliminary differential item functioning analyses, outcome measurement analysis, keyform development, and refinement of the rating scale functioning of the 'Importance' scale. **Chapter Six** presents findings from the qualitative focus groups with occupational therapists, firstly on the use of 2014 version of the *eTSP* in practice, followed by their experiences of using the refined 2021 version *eTSP* following the Rasch analysis in Stage One. These findings also identified the need for additional refinements of the tool that could not be rectified using Rasch analysis, which are also discussed in this chapter. Finally, **Chapter Seven** discusses the above results and findings within the context of existing literature, the implications and recommendations from this research for Occupational therapy practice and recommendations for future research.

2. Chapter 2: Literature Review

2.1 Introduction

This chapter provides a comprehensive review of existing literature to position the current research and justify the need to refine the psychometric properties of the *TSP*. The chapter begins with a discussion of widely used measures in occupational therapy to illustrate how the *TSP* can better measure the occupational performance difficulties within the student role (2.2). This is followed by an introduction to objective measurement (2.3) and an overview of the benefits of and justification for the use of Rasch analysis methodology over other psychometric methodologies such as Classical Test Theory and Item Response Theory in the current research (2.4). In order to position the current research on the *TSP* within published scholarly work on self-report measures in mental health occupational therapy, a scoping review was conducted (Lombard, Nolan, & Heron, 2021). This review is presented (2.5), supplemented with updated literature published since the scoping review was conducted. Finally, the chapter closes by justifying the need for the current study (2.6).

2.2 *Trinity Student Profile* versus Other Tools of Occupational Performance

Considering there are a variety of tools measuring occupational performance to choose from, it poses the question – what does the *TSP* offer over other tools in identifying the difficulties with occupational performance experienced within the student role in higher education? Fundamentally, the *TSP* deals with the most problematic aspect of widely used tools of occupational performance – the ability to specifically investigate the nuanced occupational performance difficulties experienced by students with disabilities within the student role. Hence, this section will outline why a therapist would consider using the *TSP* over other measures of occupational performance when supporting students in a university or higher education setting. It must be noted that this section

will not discuss measures of occupational performance and participation that are validated solely for paediatric populations (e.g., *School Setting Interview* [Hemmingsson, Egilson, Hoffman, & Kielhofner, 2005; Yngve, Munkholm, Lidström, Hemmingsson, & Ekbladh, 2018]; *School Function Assessment* [Coster, Deeney, Haltiwanger, & Haley, 1998], *School Participation Questionnaire* [Maciver et al., 2020]). Furthermore, as this research is focused on refining a client-centred self-report measure, this section will not discuss measures that are fully or predominantly observational-based tools (e.g., *Assessment of Motor and Process Skills* [Fisher, 2006]).

Starting with one of the most widely used measures of occupational performance, the *Canadian Occupational Performance Measure* (*COPM*; Law et al., 2005) is an outcome measure based on the Canadian Model of Occupational Performance (CMOP; Canadian Association of Occupational Therapists [CAOT], 1997; Townsend, & Polatajko, 2013) which aims to identify client's occupational performance issues and outcomes within their self-care, productivity, and leisure occupations. In Eichler and Keptner's (2023) survey of 58 occupational therapists working in higher education, it was found that the *COPM* was used by 17.2% (n=10) of the sample. During the *TSP*'s development, Nolan (2011) maintained that the *COPM* assessment did not specifically address the occupational performance issues related to the student role which made it difficult to implement in practice, especially with first year students who had newly entered college and hence were unaware how to articulate their challenges. Moreover, Keptner and Rogers (2019) used the *COPM* (Law et al., 2005) to investigate the occupational performance concerns of the general student population but needed to adapt the measure to include questions which were more relevant to university students. Keptner (2018) further highlighted the need for a tool which accurately identifies a student's occupational performance concerns and self-perceptions of performance. A tool that fulfils these needs is the *TSP* and although it had not been published in a peer-reviewed journal prior to the current research, it has been implemented in several occupational services in higher education in Ireland to-date (Nolan, 2011).

Unlike the CMOP model, the Kawa Model (Iwama, Rhomson, & Macdonald, 2009) does not have any associated assessment tools but the constructs of the model itself can be

used to guide a subjective assessment in identifying the roles, activities and/or processes that are important within an individual's life and the issues one may be experiencing within their environment. 'Kawa' is the Japanese word for 'river', which acts as a metaphor for an individual's life course (Iwama et al., 2009). The Kawa model views occupational performance through an Eastern lens which acknowledges the interconnection between the person and their environments, and posits that an individual's life energy (i.e., the water) flows through the river from birth and both impacts and is impacted by personal circumstances and environmental factors along the river (i.e., rocks, walls, floor and debris) (Teoh, & Iwama, 2015). How well the water can flow (i.e., how well someone can performance within their occupations) is a result of the interaction between the water and these obstacles. Although the Kawa model is concerned with subjective experience and is rich in imagery, it lacks scientific and qualitative underpinnings (Long, 2006). Moreover, even though there are suggested questions therapists can use to guide a subjective assessment with a client (Teoh, & Iwama, 2015), the model lacks associated assessment tools as stated previously, especially those that address occupational performance difficulties within the student role.

One of the most widely used models in occupational therapy practice is the Model of Human Occupation (MOHO; Kielhofner, 2008). Influenced by his study of occupational therapy and psychology, Gary Kielhofner introduced this conceptual model with Janice Burke to improve the rehabilitation process for clients with disabilities by understanding the psychosocial challenges associated with this process (Kielhofner, & Burke, 1980). In brief, the MOHO framework (Kielhofner, 2008) is focused on an individual's motivation for, patterns of, and performance of occupation. It represents a dynamic open system between the physical and social environment and performing in an occupation with the person's internal system which consists of their volition (i.e., personal causation, interests and valued goals), habituation (i.e., internalised roles and habits) and performance (i.e., objective and subjective ability to do/perform an occupation). Since the model's inception, several assessment tools have been developed that are underpinned by the MOHO concepts. However, although these assessment tools focus on a range of factors that impact occupation, Kielhofner and Forsyth (2008) maintained

that therapists may use non-MOHO-based tools depending on a particular client group or situation as another tool may provide important information or detailed assessment of occupation that is not captured by existing MOHO-based tools.

This is the case for the *TSP* which provides a more detailed assessment of occupational performance difficulties in the student role for students with disabilities in higher education which is not currently captured in-detail by any existing MOHO-based assessment. For example, the *Occupational Self-Assessment* (*OSA*; Baron et al., 2006) is a 21-item self-report measure which asks clients to rate themselves using a 4-point scale of competence and importance in relation to volition, habituation, and performance and has been validated using Rasch analysis (Kielhofner, & Forsyth, 2001; Kielhofner et al., 2009; Kielhofner et al., 2010). One of the questions refers to the student role alongside other roles such as the worker, volunteer, or family member role, but does not examine the performance of this role in detail. This challenge of insufficient detailed assessment specifically on the student role is also reflected in some interview-based assessment tools such as the *Occupational Performance History Interview* (*OPHI-II*; Kielhofner et al., 2004) and the *Occupational Circumstances Assessment Interview and Rating Scale* (*OCAIRS*; Forsyth et al., 2005), both of which have been validated using Rasch analysis (Haglund, & Forsyth, 2013; Kielhofner, Mallinson, Forsyth, & Lai, 2001). The *OPHI-II* (Kielhofner et al., 2004) consists of a semi-structured interview about an individual's occupational life history and therapist-rated scales on occupational identity, occupational competence, and occupational settings, and a life history narrative co-created by the client and therapist; while the *OCAIRS* (Forsyth et al., 2005) involves a semi-structured interview of participation and therapist ratings of concepts such as roles, habits, personal causation, values, interests, skills short-term goals, long-term goals, past experiences, physical environment and social environment, and readiness for change. Although these tools provide beneficial insights into an individual's motivation for, patterns of, and performance of occupations, they do not provide the necessary detailed assessment of the occupational performance difficulties within the student role that the *TSP* provides, which Nolan (2011) also reflected on during the tool's development and pilot. Moreover, this issue is further experienced in the *Role Checklist Version 3* (*RCv3*; Scott, 2019), a MOHO-based self-report survey about an individual's

participation and satisfaction with various occupational roles, which only asks one general question about the student role.

Unlike the student role in higher education, there is a plethora of tools that specifically focus on the worker role. One MOHO-based tool, the *Worker Role Interview* (*WRI*; Braveman et al., 2005) is a semi-structured interview and therapist-rated scales of psychosocial and environmental factors impacting a worker returning to work, be it from an injury, long term disability or limited work history. The *WRI* gathers information on personal causation, values, interests, roles, habits and the environment. Another MOHO-based tool is the *Work Environmental Impact Scale* (*WEIS*; Moore-Corner, Kielhofner, & Olson, 1998), which is a semi-structured interview with therapist-rated scales of the physical and social environment of work and the impact on successful employment experiences. Both the *WRI* (Velozo et al., 1999a; Yngve, Nyman, Pihlava, Sandqvist, & Ekbladh, 2023) and the *WEIS* (Corner, Kielhofner, & Lin, 1997) have been validated using Rasch analysis, but similar to the *OPHI-II* and *OCAIRS*, are not self-report measures and are not focused on the student role in higher education.

An example of a self-report tool focused on the worker role is the *Job Content Questionnaire* (*JCQ*; Karasek et al., 1998), which aims to measure perceptions of psychological and social job characteristics (e.g., decision latitude, psychological demands, social support, physical demands, job insecurity). The student role, similar to the worker role, is considered an important aspect of occupational identity and incorporates a set of behaviours which is expected by society (AOTA, 2020). As evidenced by the measures of the worker role, this role is complex and tools measuring it are multifaceted. Nevertheless, other than the *TSP*, no other tool to-date exists which focuses specifically on occupational performance of the student role within higher education, despite the complexity of this role.

There are other tools that include some questions about education or the school context but do not assess the student role in higher education sufficiently or only include questions about education within a wider initial assessment of occupational performance. For example, the *Assessment of Life Habits Scale 4.0* (*LIFE-H 4.0*;

Fougeyrollas et al., 2015) is a self-report measure based on the Human Development Model and Disability Creation Process (HDM-DCP 2; Fougeyrollas, 2010) which allows clients to assess level of 'accomplishment', 'assistance', 'difficulty' and 'satisfaction' with a range of daily activities (i.e., communication, mobility, nutrition, physical fitness and psychological well-being, personal care and health, housing) and social roles (i.e., responsibilities, interpersonal relationships, community and spiritual life, education, work, recreation). Out of the 96 items, six pertain to 'education', asking respondents if they are participating in school or professional courses, specialised courses, managing team projects, engaging with services and infrastructure within school, completing homework and participating in extra-curricular activities organised by the school. Although some of these items reflect some of the *TSP* items (e.g., such as '*Managing student support services [MANSUPSE]'*, '*Getting involved in societies [INVOLVES]*', '*Working in groups [WORKGROU]'* etc.), the *LIFE-H 4.0* does not sufficiently capture the complex and nuanced factors of occupational performance associated with the student role in higher education.

Another example is the *World Health Organization-Disability Assessment Schedule 2.0* (*WHODAS 2.0*; WHO, 2012), a 36-item self-report measure an individual's level of disability within understanding and communicating, getting around, self-care, getting along with people, life activities – household, life activities – school/work, and participation in society. In terms of the items relating to school, the *WHODAS 2.0* assesses an individual's difficulty with their day-to-day in school, doing their most important school tasks well, getting the work done that they need to and getting the work done as quickly as needed. Although this tool asks more specific questions in comparison to the *OSA* and *OPHI-II* on the student role, the language is focused on 'school' rather than university, college or higher education, and it does not assess the nuanced occupational performance difficulties within the student role as captured by the *TSP*.

In relation to creating an occupational profile, Hansell, Bisset and Caine's (2023) scoping review found that there were different approaches used to evaluate and develop occupational profiles of various populations. From this review, only one study (Goffer,

Choen, Berger, & Maeir, 2019) focused on describing the occupational profile of a sample of college students with and without attention deficit hyperactivity disorder (ADHD). Similar to the issues Keptner and Rogers (2019) experienced with the *COPM* discussed previously, Goffer et al. (2019) needed to use a modified version of the *Occupational Questionnaire* (*OQ*; Smith, Kielhofner, & Watts, 1986) to be more relevant to a sample of college students, including expanding the categories to include formal studies, informal studies, work, daily living tasks, leisure-quiet, leisure-active, leisure-social, and sleep. Although these modified categories better captured the occupational profile of these students, it does not capture the nuanced occupational performance difficulties associated with the student role as is captured by the *TSP*.

Interestingly, none of the above tools are based on the Person-Environment-Occupation Model (PEO-Model; Law et al., 1996). The PEO-Model provides occupational therapists with a practical analytical framework for evaluating occupational performance and facilitating communication of their practice to others (Strong et al., 1999a). Stewart et al. (2003) explain how the PEO-Model is a conceptual framework which does not have its own set of accompanying assessments, rather suggesting that therapists apply the PEO-Model to their relevant practice context and provide guidelines for doing so (Strong et al., 1999b). Nolan (2011) identified the PEO-Model as the most appropriate model to underpin the *TSP* as it allowed for the assessment of personal, environmental, and occupational factors in order to understand the difficulties with occupational performance students with disabilities' were experiencing within their student role. Furthermore, this model was deemed appropriate as it would be easily understood by this population. Considering the above, it is evident that the *TSP* poses several benefits over other existing tools in supporting students with disabilities in higher education to self-report their occupational performance difficulties within their student role, including enabling students to communicate their difficulties especially if they are struggling to articulate this, and providing a nuanced assessment of occupational performance difficulties in the student role that is currently not offered by any other tool. Nevertheless, although the *TSP* has been used in practice in Ireland, the psychometric properties of the tool require further rigorous validation and refinement.

2.3 Introduction to Objective Measurement

Objective evidence is essential for underpinning the value of occupational therapy services (Doucet, & Gutman, 2013). Much of the objective evidence underpinning occupational therapy derives from the assessment tools or outcome measures used in practice, such as the *TSP* in occupational therapy services in higher education. Unlike constructs measured in physical sciences such as length or temperature, within the human and social sciences the observations which are obtained through assessment and outcome measurement consist predominantly of people's *behaviour* or *self-reported perception* of a construct, introducing a subjective element into the measurement process. This poses a difficulty in quantifying the construct of interest. Within the *TSP*, this construct is occupational performance difficulty within the student role, which is obtained through the student's self-reporting.

As for measurement data, the data generated from self-report measures using Likert-style scales, such as in the *TSP*, is ordinal in nature. Stevens (1946) describes ordinal-level data as ordering observations in a meaningful way (e.g., a Likert-style scale of agreement such as 'very satisfied', 'satisfied', 'neither satisfied or dissatisfied', 'dissatisfied' and 'very dissatisfied'). Although this data can be categorised and ordered in terms of level of agreement, it is sample-dependent (Wright, & Masters, 1982) due to the subjective interpretation imposed by respondents (i.e., perceptions different people have of the differences between the categories vary greatly) and hence cannot be quantified. On the other hand, interval-level data can be measured using a numerical scale where the distances between units on this scale are equidistant (Bond, & Fox, 2015), are invariant (i.e., remain the same regardless of respondent interpretation; Engelhard, 2012), have the capability of being added/subtracted from one another (Wright, 1977), similar to centimetres on a ruler.

Moreover, an interval-level scale can achieve unidimensionality (Bond, & Fox, 2015; Wright, & Masters, 1982) in which one construct of interest is measured by the tool, and this construct can be represented as a quantifiable abstract continuum/hierarchy from 'less' to 'more' (e.g., construct of 'length' is unidimensional and represented by

progressively larger centimetre quantities/units on a ruler). In relation to measurement in the human and social sciences, including mental health occupational therapy, it is often the case that the level of measurement is overlooked in that ordinal-level data is treated like interval-level data, and statistical analyses are inappropriately conducted on this ordinal-level data, leading to unfounded and sample-dependent results on which important decisions are based (Hays, 1988; Smith, & Wind, 2018), whereas interval-level data can be quantified, and hence statistical analyses can be appropriately conducted on this data (Bond, & Fox, 2015).

This was the case for the *TSP.* Prior to this research, the *TSP* data was ordinal in nature due to its use of self-report Likert-style scales which posed challenges for conducting reliable psychometric research and representing the construct of interest (i.e., occupational performance difficulty in the student role) on a hierarchy from 'less' to 'more'. Hence, this research focused on transforming the *TSP* data to interval-level data as it addresses the issues posed by ordinal-level data.

2.4 Methodologies for Psychometric Studies

There are various psychometric methodologies that can be used to refine the psychometric properties (i.e., reliability and validity) of the *TSP* in this research. This section will justify the use of and benefits that a Rasch analysis model (Rasch, 1960) poses for refining the psychometric properties of the *TSP* over other methodologies, including Classical Test Theory (CTT), and 1-, 2- or 3-parameter Item Response Theory models (IRT; Lord, & Novick, 1968).

2.4.1 How Rasch Analysis solves the measurement issues associated with Classical Test Theory in this research on the *TSP*

Classical Test Theory (CTT) has been the predominant methodology within health and social science psychometric research, including occupational therapy (Bond, & Fox,

2015). Nolan (2011) used CTT to pilot and provide preliminary psychometric properties of the *TSP*. CTT assumes that each person has a true score (*t*) which, when combined with random error (*e*), results in an individual's observed score (*x*). CTT uses raw ordinal-level scores from measures to calculate an individual's observed score under the assumption that higher responses on items are reflective of higher levels of the construct of interest (Cappelleri, Lundy, & Hays, 2015). However, CTT has two measurement challenges which raise concerns for measures validated using this theory (Smith, & Wind, 2018). Firstly, self-report measures commonly use Likert-style rating scales which have different categories for persons to select to reflect their level on a particular construct. For example, in the *TSP*, the categories provided on the 'Difficulty' scale include 'No difficulty', 'Small difficulty', 'Some difficulty', 'Medium difficulty', 'Moderate difficulty' and 'Extreme difficulty'. This raw data is considered ordinal-level data and although it can be meaningfully ordered (Bond, & Fox, 2015), it is not linear and cannot be quantified on a scale due to the subjective interpretations imposed by persons making a scale sample-dependent (e.g., students have varying perceptions of the difference between 'Moderate difficulty' and 'Extreme difficulty' etc.; Wright, & Masters, 1982). Hence, the first fundamental challenge facing psychometric research of self-report measures such as the *TSP* using CTT is the assumption that raw ordinal-level data can be used to generate indicators of reliability and validity, which are inherently sample-dependent (Bond, & Fox, 2015).

Secondly, CTT assumes that all items within a tool are of the same level of difficulty rather than establishing an item difficulty hierarchy which accurately reflects the relative difficulty of items from 'less' to 'more' (Wolfe, & Smith, 2007a). For example, it is acknowledged that items relating to activities of daily living (ADLs) are easier to manage than items relating to more complex instrumental activities of daily living (IADLs; AOTA, 2014). However, if a tool measuring occupational performance includes items relating to basic ADLs and more complex IADLs, CTT assumes they are all of the same difficulty level. This makes it challenging to gather a person's precise measure of occupational performance (Bond, & Fox, 2015), as we do not truly know the level of difficulty they are able to manage. As a result, this poses challenges for gathering precise outcome measures to demonstrate the effectiveness of occupational therapy intervention. In the

TSP's case, the relative difficulty of the items that represent 'less' to 'more' occupational performance difficulty within the student role has not been established thus far. For example, one could argue that the item '*Understanding the Library System [LIBSYSTE]*' is easier to manage than the item '*Procrastination [PROCRAST]*' as learning to use a library is a skill that may initially be difficult to navigate but once mastered it is easier to engage in, whereas procrastination is a more complex ongoing process that is influenced by a multitude of factors across time.

Consequently, there is an evolving paradigm shift in health and social science research towards Rasch analysis methodology when performing psychometric research. Rasch analysis not only presents solutions to the challenges identified above for CTT but offers additional benefits for psychometric research and assessment practice (Bond, & Fox, 2015). In order to better understand these benefits, let us consider the example of a generic measure of occupational performance in Figure 2.1. Firstly, Rasch analysis uses probability and logarithms to convert the ordinal-level data generated from self-report measures into interval-level units of measurement called 'logits' (Wright, & Masters, 1982). Logits can be considered as analogous to inches on a ruler, they can be added/subtracted. Due to this, **statistical calculations can be performed** on the data (Bond, & Fox, 2015). Due to being probabilistic in nature, Rasch models provide **estimations of the answers** a person will give to particular items based on the level of construct they possess based on their answers to other questions (Smith, & Wind, 2018).

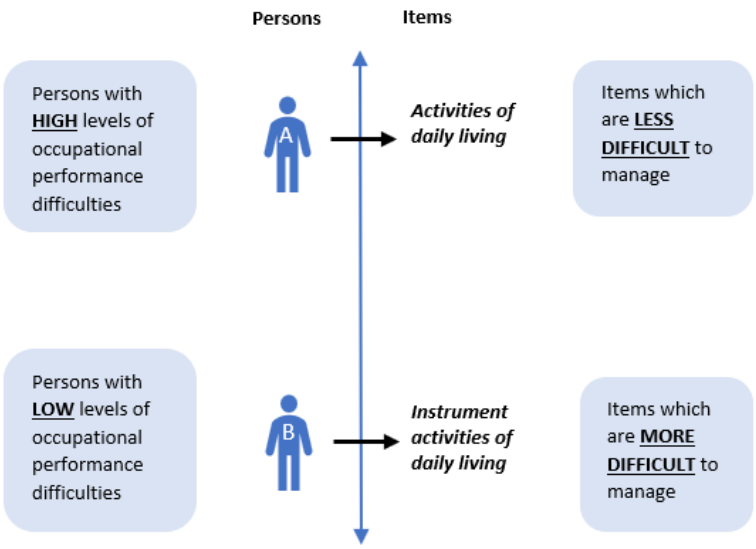


Figure 2.1: Item difficulty hierarchy/logit scale

In addition, Rasch analysis aims to create an **item difficulty hierarchy** which represents a unidimensional (i.e., measuring only one variable of interest) construct from 'less' to 'more' (Wolfe, & Smith, 2007a). In Figure 2.1, the construct of occupational performance is represented with items relating to ADLs being easier to manage towards the lower end of the scale, while items relating to more complex IADLs, which are harder to manage, towards the higher end of the scale. Where an item is located on this hierarchy is referred to as the 'item difficulty measure'. This item difficulty hierarchy acts like a ruler as Rasch analysis attempts to gain an accurate measure of a person's level of occupational performance (i.e., a 'person measure'). This hierarchy should be invariant (i.e., act consistently) across measurement contexts (Engelhard, 2012). In this illustrative example, separate measures for Person A and Person B were obtained using the tool, and it is evident that Person B demonstrates higher levels of occupational performance than Person A.

Not only can Rasch analysis overcome the measurement challenges of CTT, but the item difficulty hierarchy provides empirical evidence for the relative difficulty of the underlying construct (Wolfe, & Smith, 2007a). This has benefits for both occupational therapy theory and practice: it adds to our theoretical knowledge regarding a construct of interest (in this example, we can confidently say that IADLs are harder to manage than ADLs; for the *TSP*, we would be able to determine the relative difficulty of the items associated with the student role). In practice, this can aid occupational therapists in appropriately grading intervention plans and identifying just-right challenges (Christie, 1999; Velozo, 2021) so that they are more achievable depending on a client's person measure.

In addition, Rasch analysis methodology presents other benefits. Firstly, a requirement of Rasch analysis is **data-to-model fit** (Bond, & Fox, 2015). As Rasch analysis is based on probability, the model expects the data to function in a logical manner. To further explain consider again the example in Figure 2.1, people with low levels of the occupational performance construct are expected to have a low probability of managing

items which are higher on the measure, whereas people with high levels of occupational performance will have a higher probability of managing most of the items on the measure. Rasch analysis fit statistics indicate how the observed responses for items and persons fit the model's expectations (Wright, & Masters, 1982). As CTT uses ordinal-level data, it cannot separate the measure from a sample, subsequently working only at group-level data (i.e., cannot differentiate between individual persons) and test-level data (i.e., cannot differentiate between items and their relative difficulty; Wright, & Masters, 1982). Hence, reliability indicators may be confounded by items which are mis-fitting (i.e., items with unexpected scores, items which do not measure the intended construct) (Smith, & Wind, 2018). Whereas Rasch analysis works at **item- and person-level data** meaning mis-fitting items or items which do not measure the intended construct can be identified and dealt with, improving the measure's reliability. In terms of the *TSP*, Nolan's (2011) pilot study generated reliability indicators using Cronbach's alpha using test-level data. However, these indicators may be confounded by misfitting items which could not be identified using CTT, hence the need for further refinement of the *TSP*'s psychometric properties in the current research.

Furthermore, Rasch analysis can assess **rating scale functioning**, or rather if the rating scale is appropriately suited to the target population (Linacre, 2004). For example, for the scale of occupational performance, clients may be asked to rate the difficulty of each item on a 6-point scale. As Rasch analysis assumes that data behave in a logical manner, it expects that clients with higher person measures are more likely to choose higher rating scale categories and those with lower person measures are more likely to choose lower rating scale categories (Linacre, 2004). Rasch analysis can highlight if this is the case, or if a different scale (e.g., a 3-point or 4-point scale) would be more appropriate to use, producing more reliable results (Smith, & Wind, 2018). In the *TSP*'s case, Nolan (2011) chose a 6-point Likert-style scale for the *TSP* 'Difficulty' scale as per Kielhofner's (2006) guidelines. However, the functioning of this rating scale has not been validated to-date with the target population of students with disabilities in higher education.

Rasch analysis can also provide evidence for structural validity, which assesses if a tool's scoring structure is reflective of the construct of interest (Wolfe, & Smith, 2007a). A

requirement in Rasch analysis is that a measure is **unidimensional** or only measures one construct at a time (Bond, & Fox, 2015). Rasch analysis has the capability of assessing if the items within a tool work well together to measure a unidimensional construct, or if multidimensionality (i.e., measures more than one construct) exists among the items. Furthermore, Rasch analysis can also assess a concept of **local independence** (Yen, 1993), which means that the answers one gives to an item are independent from the answers given to other items. Items may violate local independence if they are similarly worded or measuring similar concepts (Yen, 1993). This may indicate redundant items which can be removed from a tool to make it shorter yet still gather the same appropriate clinical information. The *TSP* is underpinned by the PEO-Model (Law et al., 1996), a model which posits that personal, environmental, and occupational factors influence an individual's level of occupational performance. To-date, the three separate 'Person', 'Environment', and 'Occupation' item-sets have been investigated, but the *TSP* has not been investigated to determine if it measures the unidimensional construct of occupational performance within the student role. Likewise, due to the transactive nature of the PEO-Model (Law et al., 1996), there is potential that items across the 'Person', 'Environment', and 'Occupation' item-sets may violate local independence which have not yet been identified as the item-sets have been investigated separately.

Another advantage of using Rasch analysis to conduct psychometric research such as this research on the *TSP* is its **robustness to missing data** (Smith, & Wind, 2018). In CTT the raw scores are added together to get the client's total score which is used to represent the client's level of the construct. However, clients may not answer every question on a measure, resulting in automatically lower raw scores. This may then lead to the incorrect assumption that these clients have lower construct levels, whereas they may have left questions unanswered for a construct-irrelevant reason (e.g., accidently missing questions, not wanting to answer a particular question, or that an item is not relevant at the time of completion). Conversely, as Rasch analysis is a probabilistic model, it can estimate what score the person would likely have given to a question they left unanswered using their scores of other items within the tool (Smith, & Wind, 2018).

Lastly, Rasch analysis can assess **differential item functioning** (Wolfe, & Smith, 2007a), examining if an item on a measure functions differently across time, or across samples. Items are said to be invariant across measurement contexts (e.g., different diagnostic groups, different time points) if they do not demonstrate differential item functioning (Engelhard, 2012). If items are invariant over time (i.e., stable), the measure can be used to assess **responsiveness** (MOT, 1995) or **sensitivity** (i.e., detecting if a change has occurred; Kielhofner, Forsyth, & Kramer, 2010). Wolfe and Chiu (1999) developed a Rasch-based method to assess the stability and sensitivity across time, the standardized difference formula. This can assist in developing reliable and valid outcome measures, thus contributing towards providing evidence for occupational therapy outcomes in mental health. To-date, the *TSP* has not been investigated for its ability to be used as an outcome measure over time or its functioning across different groups (e.g., gender) or administration contexts (e.g., paper-based *TSP* versus electronic-based *eTSP*, different universities).

2.4.2 Why choose Rasch Analysis over Item Response Theory for this research on the *TSP?*

As discussed above, traditional CTT has been the predominant methodology in psychometric research in the health and social sciences to-date. The 1960s saw the rise of modern test theory, or latent trait theories, which are concerned with measuring latent or unobservable constructs through the use of individual item responses and inferring the degree to which an individual possesses a latent trait from these item responses (Bond, & Fox, 2015). Item Response Theory (IRT; Birnbaum, 1967; Lord, & Novick, 1968) is also known as latent trait theory. At the time that IRT was being developed, Rasch measurement theory (Rasch, 1960) was concurrently being developed and it shares similar features to IRT in that it is concerned with measuring latent constructs through item responses (Bond, & Fox, 2015) and both methodologies are focused on working with item-level interval data rather than test-level ordinal data as is the case in CTT (Bond, & Fox, 2015). However, other than these similarities, IRT and Rasch analysis are distinct methodologies, despite some papers grouping them under the same umbrella (for example, Cappelleri et al., 2015).

The biggest difference between Rasch analysis and IRT is the philosophical approach to solving measurement issues (Boone, Staver, & Yale, 2014). As described above, in order for a tool to be considered objective and meet the fundamental principles of measurement, the data must fit the Rasch model (i.e., data-to-model fit), meaning item difficulty is the only parameter needed for calculating a person measure (Wright, & Masters, 1982). On the other hand, IRT aims to find the model which best fits the data by incorporating various item parameters into calculating person measures (Massof, 2002). It does this by maximising how well the model fits the empirical data by adding parameters such as item discrimination (i.e., 2-parameter or 2P model) and pseudo-guessing (i.e., 3-parameter or 3P model) in order to account for variability in the data (i.e., model-to-data fit) (Boone et al., 2014). IRT is focused on modelling, or rather finding the best methods for estimating discrimination and guessing (e.g., only relevant for a multiple-choice test, not a self-report measure); whereas Rasch analysis is focused on quality control within measurement, or rather seeking to identify variability (i.e., why discriminations differ or guessing occurs) and how to rectify this so that the tool fulfils the fundamentals of measurement (Wright, & Stone, 1979). To this end, Panayides, Robinson and Tymms (2010) describe how IRT is better for modelling, whereas Rasch analysis is better for measuring. This philosophical difference has implications particularly for the principle of invariance which is necessary for useful measurement (Thurstone, & Chave, 1929; Wright, 1997). Within Rasch analysis, if the data fit the model, the ordering of the item difficulty hierarchy remains constant/invariant within measurement error regardless of what group of individuals answer the items; whereas the 2P and 3P IRT models do not fulfil this property as the relative order of the items is dependent on the ability level of the persons answering the items (Bond, & Fox, 2015).

From a mathematical perspective, there is an argument that the Rasch model is simply a special case of the 1-parameter (1P) IRT model (Lord, & Novick, 1968) because they are mathematically identical (i.e., if the pseudo-guessing parameter in the 3P model is set to zero creating the 2P model, and then item discrimination is set to a constant in the 2P model, this creates the 1P model which is mathematically identical to the Rasch model) (Hambleton, & Swaminathan, 1985; Suen, 1990). Goldstein (2010) criticises the

Rasch model in proposing that the purpose of data analysis is to account for any idiosyncrasies within the empirical data, as IRT models aim to do. On the other hand, Masters (1998) describes how although the 2P IRT model accounts for data better, this can also hide potential problems with the measure. Whereas from a Rasch analysis perspective, Andrich (2004) describes how the model can be used to understand the origins of anomalies which are disclosed by misfitting data. Importantly, Bond and Fox (2015) argue that idiosyncrasies in the data are not the primary concern and emphasise that it is more ideal to work the data to fit the model to the degree in which it is appropriate for practical measurement in the field in which the tool is being used. For example, they suggest that it is important to try and identify why items misfit rather than simply removing them straight away, or rather considering the practical implications of adjusting the tool during its refinement.

So, what does this mean for the current research on the *TSP*? The aim of this thesis is to refine the psychometric properties of the *TSP* as a self-report measure of occupational performance difficulties within the student role in higher education. Considering the philosophical differences between IRT and Rasch analysis, Rasch analysis will provide more useful measurement refinements to the tool than IRT. For example, one objective is to determine if the *TSP* can be used as an outcome measure in which the principle of invariance is paramount and is better accounted for using Rasch analysis. Moreover, some elements of IRT are not necessarily applicable for the *TSP.* For example, the pseudo-guessing parameter in the 3P model aims to account for an individual guessing or choosing the 'correct' response without knowing all of the facts (Obinne, 2012). Considering the *TSP* is a self-reported measure of occupational performance difficulties within the student role, there are no 'correct' or 'incorrect' answers – it aims to captures a student's perception of their occupational performance difficulties. Furthermore, as this research aims to improve the measurement properties of the *TSP,* Rasch analysis is more appropriate for determining data-to-model fit rather than modelling to fit the data as is the case with IRT (Panayides et al., 2010). Therefore, this research on the *TSP* will utilise Rasch analysis methodology.

2.5 Positioning this Research within Existing Literature

It is evident that Rasch analysis methodology poses benefits for refining the psychometric properties of the *TSP* in this research. However, it was imperative to position the research conducted in this thesis within the context of published scholarly work in the field of self-report mental health occupational therapy measures. Furthermore, reviewing existing literature in this field would subsequently inform the specific Rasch analysis methods employed in this research on the *TSP*.

In terms of what was known prior to this review about the use of Rasch analysis in this field, Yuen and Austin's (2014) review of instrument development papers published between 2009-2013 within the *American Journal of Occupational Therapy* (*AJOT*) found that 11 studies had utilised Rasch analysis methodology to develop an occupational therapy instrument. However, Gutman and Raphael-Greenfield's (2014) review of mental health specific research published within the *AJOT* during the same timeframe found that only three of the seven psychometric studies utilised Rasch analysis, with two focusing on self-report measures (Chang, Ailey, Heller, & Chen, 2013; Hancock, Bundy, Honey, James, & Tamsett, 2011). Furthermore, the *AJOT* was the only occupational therapy specific journal found to have an impact within the Rasch literature as per Aryadoust, Tan and Ng's (2019) scientometric review of the Web of Science. Apart from these reviews, it was difficult to ascertain the extent of psychometric research of occupational therapy mental health self-report measures which have used Rasch analysis before 2009 and after 2013, or within occupational therapy journals other than the *AJOT* in order to best position the current research in the field. Furthermore, Smith, Patel, McCrone, Jin, Osumili and Barrett (2016) advocated for future research to determine how Rasch analysis has been used to construct measures and reduce the length of existing tools within mental health, while Aryadoust et al. (2019) highlight how specific fields should identify how Rasch analysis has been utilised within their domains. Hence, the full extent of psychometric research papers which have utilised Rasch analysis methodology to validate occupational therapy mental health self-report measures was not known.

Therefore, to obtain a comprehensive overview of the use of Rasch analysis within psychometric research of occupational therapy mental health self-report measures and to position the research on the *TSP* within existing literature, a scoping review (Arksey, & O'Malley, 2005; Levac, Colquhoun, & O'Brien, 2010) was conducted (Lombard, Nolan, & Heron, 2021; Appendix 2.1). A scoping review was chosen as it would *"map rapidly the key concepts underpinning a research area and the main sources and types of evidence available"* (Mays, Roberts, & Popay, 2001, p.194). A scoping review provided several benefits at the time of this review, as it could determine the volume and breadth of available literature on the use of Rasch analysis within psychometric research of occupational therapy mental health self-report measures, and identify the way in which this research was conducted (Munn et al., 2018). In determining the existing literature within this field, a scoping review also enabled the identification of gaps within knowledge (Munn et al., 2018).

For this review, the scoping review methodology proposed by Arksey and O'Malley (2005) and advanced by Levac et al. (2010) would identify the breadth of psychometric studies that have used Rasch analysis to validate a self-report occupational therapy mental health measure, and position this research on the *TSP* within this literature. The aims of this scoping review were to:

(1) Determine the extent and range of published psychometric research articles of occupational therapy mental health self-report which have fully or partially utilised Rasch analysis methodology.
(2) Identify the purpose and conceptual/theoretical underpinnings of the measures validated in these articles.
(3) Outline if the use of the Rasch analysis methodology was justified in the articles.
(4) Outline which Rasch analysis techniques were conducted in the articles.

2.5.1 Methods

The scoping review framework established by Arksey and O'Malley (2005) and enhanced by Levac et al. (2010) guided this review. The stages included 1) identifying the research question, 2) identifying relevant articles, 3) article selection, 4) charting

the data, 5) collating, summarizing and reporting the results (Arksey, & O'Malley, 2005). The optional sixth stage, consultation, was not conducted for pragmatic reasons.

Stage 1 Identifying the research question

The following research questions guided this review's search:

"What occupational therapy self-report measures for adults with mental health difficulties have undergone psychometric research using Rasch analysis?"

"What is the purpose and conceptual/theoretical underpinnings of these measures?"

"Was the use of Rasch analysis justified within the measure's psychometric study?"

"Which Rasch analysis techniques were used in the psychometric studies?"

Stage 2 Identifying relevant articles

Database searching, journal searching, and reference list reviews were used to identify relevant papers published up until October 2019. The following search terms were used in various combinations:

(measure OR scale* OR inventor* OR instrument* OR survey* OR questionnaire* OR tool* OR assess* OR evaluat* outcome*) AND (self report OR self-report) AND (Occupational therapy) AND (Mental health OR mental illness OR psych* OR mental health issues OR mental health concerns OR mental health problems OR mental health difficulties OR mental health disability) AND (Rasch analysis OR rasch rating scale model OR partial credit model OR rasch measurement model OR rasch model) NOT (Item response theory OR IRT OR two parameter OR 2 parameter OR 3 parameter OR three parameter OR 2P OR 3P) AND (psychometric)*

A title and abstract search was conducted on Ebscohost (Academic Search Complete, CINAHL, PsychARTICLES and PsychINFO), ProQuest Nursing and Allied Health Source, ScienceDirect and PubMed and the following journals: *American Journal of Occupational Therapy*, *British Journal of Occupational Therapy*, *Scandinavian Journal of Occupational Therapy*, *Canadian Journal of Occupational Therapy*, *Journal of Occupational Science*, *Occupational Therapy in Mental Health*, *OTJR: Occupation, Participation and Health*,

Health and Quality of Life Outcomes and the *Journal of Patient Reported Outcomes.* These journals were chosen based on their relevance for mental health occupational therapy and/or because they are considered Rasch-friendly journals (Institute of Objective Measurement, Inc., n.d.). A chart from the Preferred Reported Items for Systematic Reviews and Meta-analyses (PRIMSA) was used to demonstrate the process of inclusion from the literature search (Figure 2.2).

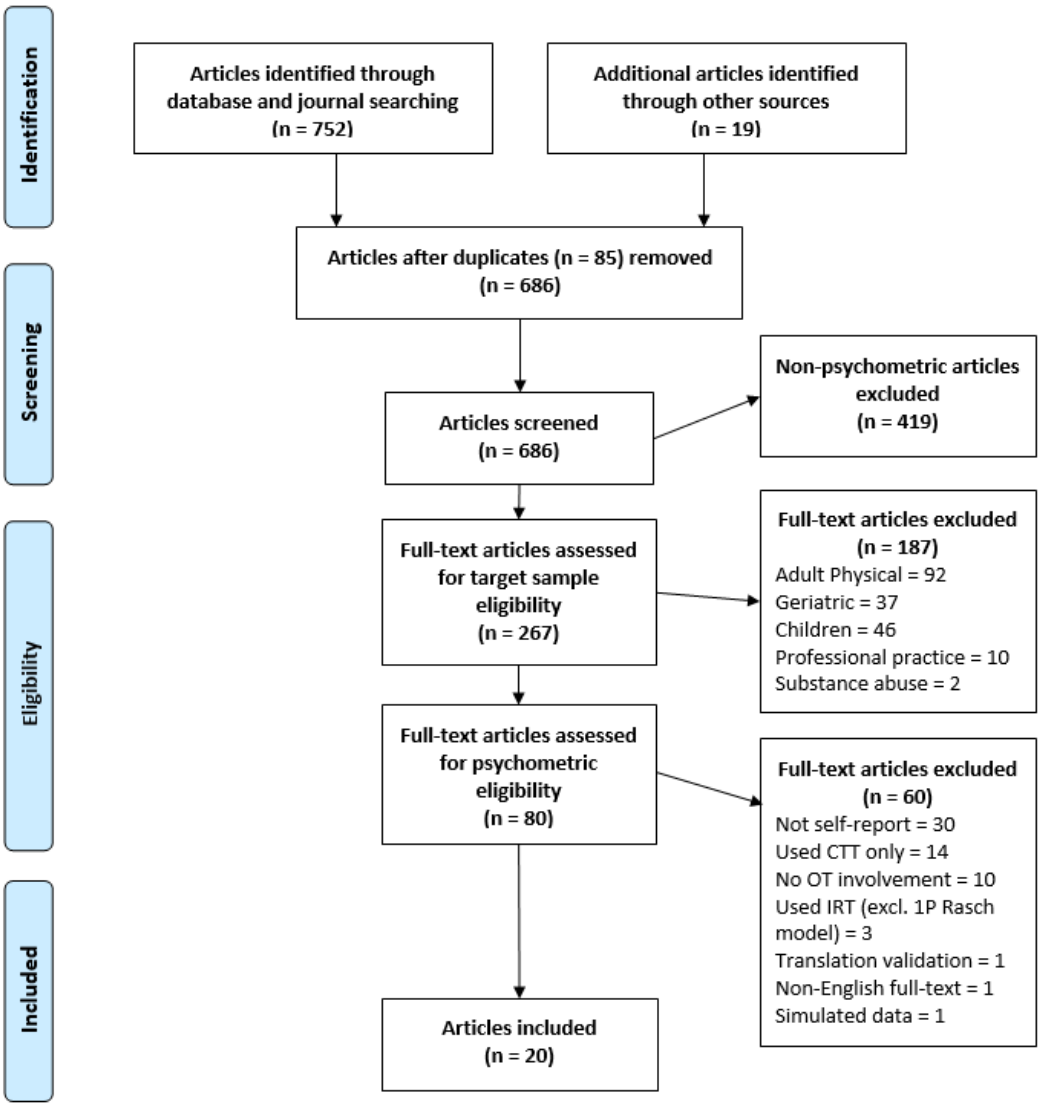


Figure 2.2: PRISMA chart of article selection and inclusion

Stage 3 Article selection

Table 2.1 outlines the inclusion and exclusion criteria which were followed to identify relevant articles.

Table 2.1: Scoping Review Inclusion and Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
● Measures which were self-report in nature with the aim of gathering client-centred data (e.g., gathering client's perceptions etc.). ● Measures which related to occupational therapy constructs and/or models of practice or were fully/partially developed by occupational therapists (i.e., at least one author of the study was an occupational therapist or educator within the field of occupational therapy). ● Studies in which the measure was validated with a sample which fully/partially consisted of adults over 18 years of age and were experiencing mental health difficulties (including depression, anxiety, schizophrenia, psychosis, autism spectrum disorder, attention deficit hyperactivity disorder etc.) or a sample which fully/partially consisted of those from the general population in which the tool's construct was relevant within the field of mental health occupational therapy. ● Studies which identify the use of a Rasch analysis model (e.g., Rasch Rating Scale, Partial Credit, Rasch Measurement Model [Wright, & Mok, 2004]). The Many-Faceted Rasch Model would be considered if the score of a self-report measure is dependent on several questions or parameters. ● Studies which were published in English in peer-reviewed journals before November 2019.	● Measures which were not directly completed by the client (e.g., therapist-administered observation/performance/functional measure, semi-structured interview, tools assessing professional practice). ● Measures which were not directly related to occupational therapy concepts and/or models of practice or in which an occupational therapist or educator within the field of occupational therapy was not involved in the psychometric study. ● Studies in which the sample fully consisted of people with intellectual disabilities, substance abuse disorders, musculoskeletal/neurological conditions, geriatric psychiatry (e.g., dementia, Alzheimer's), paediatric samples (i.e., persons under the age of 18 years of age) or people experiencing homelessness. ● Studies in which an Item Response Theory model was utilised. Studies which utilised the Many-Faceted Rasch Model which were therapist-administered were excluded. ● Studies which were not published in English in peer-reviewed journals. ● Studies which were not psychometric studies (e.g., systematic reviews, intervention effectiveness studies, case report studies etc.).

Stage 4 Charting the data

In order to chart the data (Arksey, & O'Malley, 2005) and achieve the aims of the review, it was imperative to extract the appropriate information from the included articles. Hence, a data extraction matrix was developed to extract the appropriate data. The categories of data in the matrix were influenced by the review's aims and evolved as the articles were being reviewed. The categories in the final data extraction matrix included: journal and country in which article was published, the article's purpose, the tool's original format, the tool's underpinning theory/conceptual model, a description of the sample, if there was a justification given for using Rasch analysis, what Rasch model was used in the article, if any rationale was given for using this Rasch model and what Rasch analysis techniques were used within the article (e.g., rating scale functioning, item and person fit statistics etc).

Stage 5 Collating, summarizing and reporting the results

Once all the appropriate data was extracted, this data was then collated and summarized to achieve each of the review's aims. Where appropriate, the results were reported using proportions and percentages (e.g., '50% (N=10) articles used X technique…') (Arksey, & O'Malley, 2005). A summary table (Colquhoun et al., 2014) was created to collate and report the results pertaining to the first three aims of the review, see Table 2.2. Furthermore, a second summary table was created to demonstrate the use of various Rasch analysis techniques across the articles to achieve the fourth aim, see Table 2.3.

2.5.2 Results

In total, 771 articles were identified through title and abstract searching on databases, journals, and reference lists (Figure 2.2). After duplicates were removed and screening and eligibility criteria were applied, 20 articles remained (see Appendix 2.2 for full details of each tool's original format and sample description from the included articles). As can be seen in Table 2.2, the studies reported in the included articles were conducted between 2001 and 2019. There was a gap in research between 2001 and 2009, with

activity in this area resuming between 2009 and 2019 when at least one article using Rasch analysis was published per year except for 2017 where there was no publication. The purpose of the research within the included articles varied and the constructs measured by the assessment tools included recovery, participation, meaningful time use and occupational balance, occupational competence, mastery, performance skills (e.g., time management skills) and body functions (e.g., sensory responsiveness and psychiatric symptoms). No articles focused on validating a measure of occupational roles (i.e., student role, worker role etc.).

Nine (45%) articles explicitly stated the measure's underlying theoretical/conceptual model, which included MOHO (Kielhofner, 2008), the Value and Meaning in Occupations Model (ValMO; Persson, Erlandsson, Eklund, & Iwarsson, 2001), the Life Balance Model (Matuska, & Christiansen, 2008), Young and Ensing's (1999) recovery model, Ayre's (1972) theory of sensory integration, Chang and Coster's (2014) Model of Participation and White, Riley and Flom's (2013) ten components of effective time management behaviour. Four (20%) articles stated that the measure was developed from another measure. For example, Scanlan and Bundy (2011) state that the *Modified Occupational Questionnaire* under investigation in the study was based on the *Occupational Questionnaire* (Smith, Kielhofner, & Watts, 1986). Four (20%) stated that the measure was based on literature or previous research. In three (15%) articles, the measures' underlying theoretical/conceptual model was unclear or not stated.

A clear justification for the use of Rasch analysis methodology over other methodologies such as CTT and IRT or explaining the benefits of Rasch analysis methodology for their research was provided in nine (45%) articles. Four (20%) articles were deemed to have partially justified the use of Rasch analysis with reasons outlined in Table 2.2. Two (10%) articles validated measures which were validated previously using Rasch analysis and hence did not give an explicit justification for using Rasch analysis again, whereas five (25%) articles did not provide any justification for its use.

Furthermore, the review investigated the extent of the justification for utilising a specific Rasch model (e.g., Rasch Measurement Model, Rating Scale Model, Partial Credit Model,

Many-Faceted Rasch Model). Articles were classified with partial rationale if they did not explain why a model was chosen but it was an appropriate application according to Khosravi (2019) and Masters and Wright (1984). For example, the Rating Scale Model can be used when the same rating scale structure is used for all items in the tool (e.g., a 4-point scale for all items), hence an article was considered to have partial rationale if it appropriately used this model for a tool that has the same rating scale structure across the items, but it did not explicitly state this rationale in the article. Half (50%, n=10) of the articles provided a clear rationale for choosing a specific Rasch model. Four (20%) articles were considered to provide partial rationale for choosing a model with reasons outlined in Table 2.2. The remaining six (30%) articles did not provide a clear justification for the chosen Rasch model.

Table 2.2: Main Characteristics of Included Articles & Justification for Using Rasch Analysis (Chronological Order)

Measure (Author, Year)	Journal, Country	Purpose	Theory/Model	Justification for Rasch	Rasch Model	Rationale for Rasch Model
Occupational Self-Assessment (*OSA*; Kielhofner, & Forsyth, 2001)	SJOT, Mixed global data	"elicit client's perceptions and values concerning their own occupational competence and of the impact of their environment on their occupational behaviour" (p.132)	Model of Human Occupation (Kielhofner, 2008)	No clear justification	RMM	No clear justification
OSA (Kielhofner, Forsyth, Kramer, & Iyenger, 2009)	BJOT, Mixed global data	"guide collaborative treatment planning and to document therapy outcomes from the client's perspective" (p.94)	Model of Human Occupation (Kielhofner, 2008)	Yes, explained benefits of Rasch analysis only	RMM	Partial rationale, stated that RMM addresses issues with rating scales
Occupational Value instrument with predefined items (*OVal-pd*; Eklund, Erlandsson, Persson, & Hagell, 2009)	SJOT, Sweden	"targets overall perceptions of occupational value in everyday life" (p.119)	Value and Meaning in Occupations Model (ValMO; Persson, Erlandsson, Eklund, & Iwarsson, 2001)	Yes, explained benefits of Rasch analysis only	PCM	Yes, appropriateness of PCM for polytomous data
OSA (Kielhofner, Forsyth, & Kramer, 2010)	OTJR, United States	"guide collaborative treatment planning and measure client-reported change to document therapy outcomes) (p.11)	Model of Human Occupation (Kielhofner, 2008)	Yes, explain benefits of Rasch analysis and standardized difference approach for assessing sensitivity	RSM (calibrated twice)	Yes, appropriateness of RSM for rating scales
Modified Occupational Questionnaire (*MOQ*; Scanlan, & Bundy, 2011)	AJOT, Australia	"a measure of meaningful time use" (p.e11)	Based on another tool: Occupational Questionnaire (Smith, Kielhofner, & Watts, 1986)	Partially, stated assumptions of the Rasch model	MFRM	Yes, MFRM appropriate as several parameters of time across day combined into one analysis
Evaluation of Perceived Meaning in Day Centers (*EPM-DC*; Nilsson, Argentzell, Sandlund, Leufstadius, & Eklund, 2011)	SJOT, Sweden	"generate descriptive profiles concerning degree of perceived meaningfulness among visitors attending a day centre" (p.314)	Based on literature of daily life meaningfulness for those with mental illness and from a workshop	Partially, stated assumptions of the Rasch model	RSM	No clear justification
Recovery Assessment Scale (*RAS*; Hancock et al., 2011)	AJOT, Australia	"emphasizes personal recovery, it has items relating to other domains (i.e., symptom or clinical recovery, social recovery and, to a lesser extent, functional recovery) (p.e78)	Unclear	Partially, state Rasch analysis used increasingly in occupational therapy research	RSM	Yes, appropriateness of RSM for rating scales

Engagement in Meaningful Activities Survey (*EMAS*; Eakman, 2012)	AJOT, United States	"reflect the construct of meaningful activity participation" (p.e22)	Based on occupational therapy and human occupation literature	Yes, explained benefits of Rasch analysis only	RSM	No clear justification
Life Balance Inventory (*LBI*; Matuska, 2012)	OTJR, United States	"assess perceived congruence between how people want to spend their time in various activity categories and how they actually spend their time in those categories" (p.221)	Life Balance Model (Matuska, & Christiansen, 2008)	Partially, briefly state that Rasch analysis can provide information which Classical Test Theory cannot	Not specified	No clear justification
Mental Health Recovery Measure (*MHRM*; Chang et al., 2013)	AJOT, United States	"capture the complete recovery perspective" (p.470)	Young and Ensing's (1999) recovery model	Yes, explained the benefits of Rasch analysis over Classical Test Theory	RSM	Yes, appropriateness of RSM for rating scales
Mastery Scale-Chinese Version (*MS-C*; Chen, Hsiung, Chung, Chen, & Pan, 2013)	SJOT, Taiwan	"measure people's sense of mastery" (p.405)	Unclear	No clear justification	PCM	Yes, appropriateness of PCM to allow items to take on own unrestricted response structure
Occupational Gaps Questionnaire (*OGQ*; Eriksson, Tham, & Kottorp, 2013)	SJOT, Sweden	"measures how individuals themselves perceived their participation in everyday occupations" (p.152)	Based on another tool: Activity Card Sort	No explicit justification for Rasch analysis in current study, previously validated using Rasch analysis	RMM	Partial rationale, stated that data was dichotomous which is appropriate for RMM
Adult Sensory Processing Scale (*ASPS*; Blanche, Parham, Chang, & Mallinson, 2014)	AJOT, United States	"measure different patterns of responsiveness" (p.532)	Ayre's (1972) theory of sensory integration	No clear justification	Not specified	No clear justification
Taita Symptom Checklist (*TSCL*; Chen, Pan, Chung, & Chen, 2015)	Journal of the Formosan Medical Association, Taiwan	"measure the perceived disturbance of psychiatric symptoms for patients" (p.222)	Based on Symptom Distress Checklist-90 (Derogatis, Lipman, & Covi, 1973) and Psychoneurotic Symptom Checklist (Tsai, Wen, Lin, Soong, & Chen, 1978)	Yes, explained the benefits of Rasch analysis over Classical Test Theory	PCM	Yes, appropriateness of PCM to allow items to take on own unrestricted response structure
Recovery Assessment Scale – Domains and Stages (*RAS-DS*; Hancock, Scanlan, Honey, Bundy, & O'Shea, 2015)	Australian & New Zealand Journal of Psychiatry, Australia	"measure recovery-focused outcomes" (p.624)	Based on above RAS tool	No explicit justification for Rasch analysis in current study, previously validated using Rasch analysis	Not specified	No clear justification

Community Participation Domains Measure (*CPDM*; Chang, Coster, Salzer, Brusilovskiy, Ni, & Jette, 2016)	Disability and Rehabilitation, United States	"multidimensional measure of participation" (p.697)	Chang and Coster's (2014) model of participation	No clear justification	Multi-dimensional PCM	Partial rationale, using multidimensional model for tool which intends to be multidimensional
Assessment of Time Management Skills (*ATMS-S*; Janeslätt, Holmqvist, White, & Holmefur, 2018)	SJOT, Sweden	"measure how the clients actively uses tools, and time use strategies and relative levels of self-awareness concerning time management skills" (p.154)	White, Riley, & Flom's (2013) ten components of effective time management behaviour	No clear justification	RSM	Yes, appropriateness of RSM for rating scales
Self-reported Activities of Daily Living (*sf-ADLs*; Pan, Wu, Chung, & Chen, 2018)	Hong Kong Journal of Occupational Therapy, Taiwan	"Client's self-report their perceived level of difficulties (the level of assistance required)" (p.117)	Based on AOTA's uniform terminology-III (1994) and the Practice Framework (2014)	Yes, explained the benefits of Rasch analysis over Classical Test Theory	PCM	Yes, appropriateness of PCM to allow items to take on own unrestricted response structure
Occupational Balance Questionnaire (*OBQ*; Håkansson, Wagman, & Hagell, 2019, 2020)	SJOT, Sweden	"a generic instrument to evaluate occupational balance of individuals and groups" (p.2)	Based on results from previous research	Yes, explained the benefits of Rasch analysis over Classical Test Theory	PCM	Yes, appropriateness of PCM for polytomous data
PROMIS Depression items (*PROMIS*; Cleanthous, Barbic, Smith, & Regnault, 2019)	Journal of Patient-Reported Outcomes, United States	Patient reported depression	Unclear	Yes, explained the benefits of Rasch analysis over Classical Test Theory and Item Response Theory	RSM	Partial rationale, identified need for model for polytomous data

Key: SJOT = Scandinavian Journal of Occupational Therapy; BJOT = British Journal of Occupational Therapy; AJOT = America Journal of Occupational Therapy; OTJR = OTJR: Occupation, Participation and Health; RMM = Rasch Measurement Model; PCM = Partial Credit Model; RSM = Rating Scale Model; MFRM (Many-Faceted Rasch Model)

As can be seen in Table 2.3, the Rasch analysis techniques used in the included articles varied, with certain techniques being employed more frequently than others. Rating scale functioning (Linacre, 2004) can determine how well a Likert-style rating scale is being used by the intended users of the scale. Over half (65%, n=13) of the articles conducted an in-depth analysis on rating scale functioning using Rasch analysis, while a quarter (25%, n=5) did not assess rating scale functioning at all. Two (10%) articles on the *Occupational Self Assessment* (*OSA*; Kielhofner, & Forsyth, 2001; Kielhofner, Forsyth, Kramer, & Iyenger, 2009) reviewed only the frequency in which the rating scale categories were used which is not considered an in-depth Rasch analysis of rating scale functioning (Linacre, 2004).

For data-to-model fit, every article investigated item fit, with the exception of Kielhofner et al.'s (2010) on the *OSA*, as item fit of the *OSA* was investigated in earlier studies (Kielhofner, & Forsyth, 2001; Kielhofner et al., 2009). However, only nine (45%) articles investigated person fit. The decision-making process for dealing with misfitting items or persons included using fit statistics only, reviewing the clinical relevance of items, reviewing a measure's purpose/target construct, consulting experts or considering other measurement issues such as differential item functioning. Furthermore, fourteen (70%) articles produced person-item maps, which visually demonstrate the item difficulty hierarchy in relation to the ability distribution of the sample (Wolfe, & Smith, 2007a).

The structural validity (i.e., tool's scoring structure is reflective of the construct of interest; Wolfe, & Smith, 2007a) can be assessed using principal component analysis of residuals and local independence. Although these two techniques can be used to provide evidence for structural validity, the purpose of each technique varies slightly and hence they should be considered separate techniques. A principal component analysis of residuals assesses unidimensionality (i.e., tool is only measuring one construct) and can indicate if there is multidimensionality (i.e., items measuring more than one construct) within a tool (Bond, & Fox, 2015). On the other hand, local independence indicates if the items within the tool are independent. Some items may

be similarly worded or measuring very similar concepts, leading to local independence violations and ultimately redundancy in some items, some of which may be removed from a tool (Yen, 1993). Eleven (55%) articles conducted a principal component analysis of residuals, whereas four (20%) articles investigated local independence. Janeslätt et al.'s (2018) article on the *Assessment of Time Management Skills* was the only article to investigate principal component analysis of residuals and local independence separately.

As for reliability, the main statistics reported were Cronbach's alpha (35%, n=7) or the analogous Person Reliability Index (PRI; 55%, n=11) or Person Separation Index (PSI; 75%, n=15). Person Reliability Index determines if persons in a new sample would be ordered in a similar way, whereas Person Separation Index is concerned with how well the items can separate persons into various levels of the construct (Bond, & Fox, 2015). A small proportion of articles reported on the Item Reliability Index (IRI; 35%, n=7) and Item Separation Index (ISI; 20%, n=4) which are unique to Rasch analysis (Bond, & Fox, 2015). The Item Reliability Index demonstrates if items would be expected to have a similar hierarchy across samples, whereas the Item Separation Index indicates how many difficulty levels exist among the items (Bond, & Fox, 2015).

Differential item functioning (DIF) can be used to investigate if a measure is invariant over time and across samples (Engelhard, 2012). Twelve (60%) articles conducted at least one differential item functioning study (e.g., between health status groups, gender, age). The only study to investigate both stability and sensitivity across time was Kielhofner et al.'s (2010) study of the *OSA*, using the standardised difference formula (Wolfe, & Chiu, 1999). Hancock et al. (2015) used a paired t-test to investigate the sensitivity of the *Recovery Assessment Scale – Domains and Stages*, which is not a Rasch-specific technique.

Table 2.3: Rasch Analysis Methods Used (Chronological Order)

Measure (Author, Year)	Rating Scale Functioning	Item Fit	Person Fit	Principal Component Analysis	Local Independence	Hierarchy (person-item map)	Cronbach's alpha	PRI	PSI	IRI	ISI	DIF Analysis	Stability Analysis	Sensitivity Analysis
OSA (Kielhofner, & Forsyth, 2001)		✓	✓			✓			✓					
OSA (Kielhofner et al., 2009)		✓	✓			✓		✓	✓					
OVal-pd (Eklund et al., 2009)	✓	✓	✓	✓	✓		Reported PRI instead		✓			✓		
OSA (Kielhofner et al., 2010)													✓	✓
MOQ (Scanlan, & Bundy, 2011)	✓	✓	✓			✓	Reported PRI instead	✓	✓	✓		✓		
EPM-DC; (Nilsson et al., 2011)	✓	✓	✓	✓		✓		✓	✓	✓	✓			
RAS (Hancock et al., 2011)	✓	✓		✓		✓	Reported PRI instead	✓	✓			✓		
EMAS (Eakman, 2012)	✓	✓	✓	✓		✓		✓	✓			✓		
LBI (Matuska, 2012)		✓					✓							
MHRM (Chang et al., 2013)	✓	✓		✓		✓	✓	✓	✓	✓	✓			
MS-C (Chen et al., 2013)	✓	✓		✓		✓	✓		✓			✓		

OGQ (Eriksson et al., 2013)		✓	✓	✓		✓		✓	✓			✓		
ASPS (Blanche et al., 2014)		✓	✓	✓			✓	✓	✓					
TSCL (Chen et al., 2015)	✓	✓		✓		✓	✓	✓	✓	✓	✓	✓		
RAS-DS (Hancock et al., 2015)	✓	✓				✓	✓	✓	✓	✓				✓
CPDM (Chang et al., 2016)		✓				✓	✓					✓		
ATMS-S (Janeslätt et al., 2018)	✓	✓		✓	✓			✓		✓		✓		
sf-ADLs (Pan et al., 2018)	✓	✓		✓		✓				✓	✓	✓		
OBQ (Håkansson et al., 2019, 2020)	✓	✓			✓				✓			✓		
PROMIS (Cleanthous et al., 2019)	✓	✓	✓		✓	✓			✓			✓		

Key: Only results from Rasch analyses are included in this review (i.e., if an article conducted both Rasch analysis and Classical Test Theory, Classical Test Theory results are not included in this review). Readers are advised to consult an article directly for a detailed explanation of the techniques used. Ticks indicate that a technique was conducted in the study, dark shaded areas indicate that a technique was not conducted. PRI = Person Reliability Index; PSI = Person Separation Index; IRI = Item Reliability Index; ISI = Item Separation Index; DIF = Differential Item Functioning.

2.5.3 Implications for the current research

In this review, 20 articles were found in which Rasch analysis was wholly or partially used in the validation of a self-report mental health occupational therapy measure. These articles were published between 2001-2019, a span of 18 years, with a noticeable gap in research between 2001-2009. Much of the pioneering research within this area was focused on the *OSA* (Kielhofner, & Forsyth, 2001; Kielhofner et al., 2009; Kielhofner et al., 2010). Kielhofner was an early advocate for the use of Rasch analysis to develop rehabilitation assessment tools within occupational therapy (Velozo, Kielhofner and Lai [1999b]). As well as Velozo et al.'s (1999b) paper, previous papers have promoted the use of Rasch analysis to validate functional measures (Fisher, 1993) and measures of rehabilitation (Velozo et al., 2012) within occupational therapy. Since this review, a paper by Velozo (2021) has been published advocating for the use of Rasch analysis in wider measurement research to highlight occupational therapy's distinct value. Although there is no specific paper promoting the use of Rasch analysis for research of occupational therapy mental health self-report measures, this scoping review highlighted the growing utilisation of the methodology in the field over the last decade which is reflective of the increasing use of the methodology within the field of medicine and rehabilitation found in Aryadoust et al.'s (2019) scientometric review.

Smith et al.'s (2016) systematic review of item reduction methods for mental health measures in psychiatry found that no study justified the use of Rasch analysis over other methodologies such as CTT or IRT. However, this review demonstrated that nearly half of the articles justified why Rasch analysis was used, such as explaining its use over CTT and/or IRT or explaining the methodology's benefits. Moreover, the review also highlighted areas for potential improvement to strengthen the research within this field which are outlined below. In regard to the current research on the *TSP*, section 2.4 above clearly justified why Rasch analysis is being utilised, and the remainder of this section will outline the implications of the results of the review for the current research.

Many of the measures which were validated in the articles targeted constructs such as recovery, participation, meaningful time use and occupational balance, occupational

competence, and mastery. However, no measures focused on occupational roles, such as the worker role, family role, or in the case of the current research, the student role (AOTA, 2014). As described in section 2.4, Rasch analysis is ideally suited for developing measures of occupational roles, such as the student role within the *TSP*, as item difficulty hierarchies (Wright, & Masters, 1979) allow both researchers and practitioners to gain insights into the relative difficulty of the tasks, activities and occupations associated with these roles. Furthermore, less than half of the articles in the review explicitly stated the measure's underlying conceptual/theoretical model, while the remaining articles did not report the underlying model or were based on other measures, literature or research. De Vet, Terwee, Mokkink and Knol (2011) highlight the importance of measures being underpinned by a conceptual model for construct validity, as this upholds how the construct under investigation is manifested through the measure's items. Furthermore, not having a clear model can lead to unwarranted multidimensionality (Wright, & Masters, 1982). For the research conducted in this thesis on the *TSP*, understanding the underpinning PEO-Model (Law et al., 1996) as described in 'Chapter 1: Introduction' was imperative for investigating the congruence of the tool to this model.

This review found that there was variation in the Rasch analysis techniques used within psychometric research of occupational therapy mental health self-report measures. The majority of articles investigated the functioning of the rating scale to improve its validity for the target population. Smith et al. (2003) explain how clients may use rating scales idiosyncratically, particularly if categories are unlabelled, or if there are too many categories to differentiate between. This increases error variance (i.e., noise), leading to less valid and reliable measurements (Smith et al., 2003). Hence, assessing and optimising the rating scale using Rasch analysis can enhance a measure's psychometric properties as well as making it easier for clients to use the tool in practice. As discussed previously, the 6-point scale chosen for the *TSP* (Nolan, 2011) had not been validated with the target population of students with disabilities in higher education, indicating a need for this to be investigated in the current research.

Considering the Rasch requirement of data-to-model fit (Bond, & Fox, 2015), it is encouraging that every article assessed item fit (except for Kielhofner et al. [2010]).

Conversely, over half of the articles did not assess person fit. Person fit assesses the internal consistency of response patterns against the model's expectation (Wright, & Masters, 1982). For example, a person with lower construct levels is expected to choose lower rating scale categories compared to someone with higher construct levels and vice versa. If client response patterns 'fit' the model's expectations, this provides evidence that the target population is validly measured (Wright, & Masters, 1982). This finding indicates the importance of assessing person fit in the current Rasch analysis of the *TSP*, as large proportions of misfitting persons highlight issues with the rating scale or between the underlying model and the measure's items (Wolfe, & Smith, 2007a), potentially indicating the need for further development.

Although unidimensionality (i.e., that a tool is measuring only one construct of interest) and local independence (i.e., response on one item is independent of the response on another) are requirements of Rasch analysis, the methods used to investigate these, namely principal component analysis of residuals and local independence, were not used frequently in the articles considered. Within research, unidimensionality is an important concept for making accurate measurement inferences from a measure's results (Bond, & Fox, 2015). In terms of the current research on the *TSP*, a principal component analysis of residuals would provide evidence for the tool's structural validity within the context of occupational performance, the ultimate construct of the PEO Model (Law et al., 1996). As for local independence, items that violate this principle may have similar content or wording, indicating some items may be redundant and could potentially be removed (Christensen et al., 2017; Yen, 1993) which can also assist with item reduction of self-report measures (Smith et al., 2016). Hence, investigating local independence within the *TSP* in the current research can identify redundant items and may result in a shorter tool which still captures the same level of clinically relevant information.

Nearly every article reported a reliability indicator such as Cronbach's alpha or the analogous Person Reliability Index. On the other hand, Item Reliability Indices and Item Separation Indices were not reported as frequently. Item Reliability Indices and Item Separation Indices are unique to Rasch analysis (Bond, & Fox, 2015) and respectively

demonstrate the reliability of items being ordered in the same difficulty hierarchy across samples and identifying how many difficulty levels exist within the items. A true measure acts consistently across measurement events, such as a ruler (e.g., 6 inches is always greater than 5 inches regardless of the object measured). In regard to the *TSP* in the current research, it is important that the items retain their difficulty ordering across time and samples of students with disabilities in higher education for it to be confidently used in investigating the effectiveness of intervention in both research and practice. Hence, reporting on the Item Reliability Index and Item Separation Index would be beneficial for determining if the *TSP* could be used as an outcome measure.

Interestingly, this review found that only Kielhofner et al. (2010) utilised a Rasch-based method to determine the stability and sensitivity of the *OSA* over time, namely the standardised difference formula (Wolfe, & Chiu, 1999). This formula can be used to assess differential item functioning, particularly between estimates at different time points. A Rasch assumption is that items are invariant (Engelhard, 2012), meaning that their location on the difficulty hierarchy should be consistent across time. If item difficulty estimates demonstrate stability, this means that the measure is sensitive to detecting change in person measures (Wolfe, & Smith, 2007a). If a self-report tool such as the *TSP* is to be used as an outcome measure, it is imperative that its sensitivity across time is validated to reliably demonstrate the effectiveness of occupational therapy intervention, both in practice and research (Laver-Fawcett, 2012). Hence, the current research will investigate the stability and sensitivity of the *TSP* over time using the standardised difference formula (Wolfe, & Chiu, 1999).

2.5.4 Updated Literature since October 2019

The scoping review identified that no tool measuring occupational performance within the student role and that had been validated using Rasch analysis had been published by October 2019. It also highlighted variation in the methods utilised within research of self-report mental health occupational therapy measures. Hence, this review identified the gap in the literature for which this research on the *TSP* fulfils, and the findings

influenced the methods that will be employed (further details in 'Chapter 3: Methodology').

Nevertheless, it was important to establish any further literature that has been published demonstrating the use of Rasch analysis to validate self-report mental health occupational therapy measures since this review. In 2020, Pan, Chung, Chen and Hsiung (2020) validated the *Traditional Chinese version of the Occupational Self-Assessment* (*TC-OSA*) using Rasch analysis. In 2021, three self-report measures were validated using Rasch analysis, namely the *Life Satisfaction Index-Z* (*LSI-Z*; Choi, Sanghun, & Hong, 2021), the *Assessment Tool for Perceived Agency* (*ATPA-22*; Lautamo, Paltamaa, Moilanen, & Malinen, 2021), and the *ADL-Interview* (*ADL-I*; Wæhrens, Kottorp, & Nielsen, 2021). This body of literature continues to grow, as in 2022 four further papers were published that utilised Rasch analysis. These included the *Icelandic Occupational Self-Assessment* (*OSA-IS*; Sigurðardóttir, Fenger, & Schwartz, 2022), the *Occupational Experience Profile* (*OEP*; Atler, & Fisher, 2022); the *Relative Mastery Scale* (*RMS*; George-Paschal, Krusen, & Fan, 2022), and the *Occupational Balance Questionnaire Danish Version* (*OB-Quest/DK*; Hansen, Boll, Skaarup, Hansen, Dür, Stamm, & Kristensen, 2022). Furthermore, a subsequent search of the reference lists of these recent papers revealed a paper by Dür et al. (2014) on the *Occupational Balance-Questionnaire* (*OB-Quest*) published within *Health and Quality of Life Outcomes* which was not identified during the initial search. As with the original scoping review, none of these tools measured occupational performance within the student role.

This scoping review and the updated literature demonstrate how Rasch analysis is gaining traction and quickly becoming a more frequently utilised methodology in the field of psychometric studies of self-report measures in mental health occupational therapy. This trend is unsurprising, especially considering the benefits that Rasch analysis poses for these tools, subsequent reliability and validity for the tool to be used in practice and the impact of the advocacy work undertaken to-date on using Rasch analysis within wider occupational therapy psychometric research (Fisher, 1993; Velozo et al., 1999b; Velozo, 2021). Evidently, Rasch analysis is the most appropriate methodology to employ within this research of the *TSP*.

2.6 Conclusion

Currently, no other published tool of occupational performance adequately assesses the nuanced occupational performance difficulties within the student role in higher education for students with disabilities. Although the *TSP* (Nolan, 2011) fulfils this need, it requires further refinement of its psychometric properties. This literature review has justified how Rasch analysis methodology can support the refinement of the *TSP*'s psychometric properties within this thesis over other methodologies such as CTT or IRT. The scoping review conducted shed light on the extent to which Rasch analysis was being used within the field of self-report measures in mental health occupational therapy. It also positioned the current research on the *TSP* within this field, as there are no published self-report tools measuring occupational performance of the student role that have been validated using Rasch analysis. The scoping review revealed how Rasch techniques used in the research within this field varies greatly. Of note, person fit statistics, local independence analysis and sensitivity analysis are the least investigated areas within the research, and these techniques pose several benefits for the *TSP* such as assisting in shortening the tool, provide evidence for the use of the *TSP* as an outcome measure and making it easier to use in practice. As a result, the findings from the scoping review influenced the methods that were employed in the current research as will be discussed in 'Chapter 3: Methodology'.

3 Chapter 3: Methodology

3.1 Introduction

This chapter will provide a clear justification of the research design, methods and procedures that were used to achieve the aims and objectives of Stage One and Stage Two of the research. The chapter will begin with a justification for the use of an embedded mixed-methods research design (3.2). The methods used in each Stage of the research will then be discussed – Stage One was concerned with refining the 'Identifying Needs' section of the *TSP* using the quantitative psychometric research methods of Rasch analysis (3.3); whereas Stage Two was focused on affirming the face validity and clinical utility of the refined tool in practice using qualitative research methods (3.4). The chapter closes with a conclusion of the methodology employed in this research (3.5).

3.2 Research design: Embedded design approach

This research followed a mixed-methods design, namely an embedded design approach (Creswell, Plano Clark, Gutmann, & Hanson, 2003). In an embedded design (Figure 3.1), one dataset plays a supportive and supplemental role to another dataset and is especially useful when qualitative data is required to answer a research question within a larger quantitative study (Creswell, & Plano Clark, 2007). For this research, quantitative methods were needed to achieve Stage One's (3.3) aim and objectives which pertain to refining the psychometric properties of the 'Identifying Needs' section of the *TSP* using Rasch analysis. Whereas qualitative methods were deemed more appropriate for Stage Two's (3.4) aim and objectives in gathering practicing therapists' views of the face validity and clinical utility of the 2014 version of the *eTSP* and the refined 2021 version of the *eTSP* following Stage One of this research. The two datasets were collected sequentially, with the quantitative data being collected first and having a larger emphasis/weighting than the secondary qualitative data (Creswell, & Plano Clark, 2007). Furthermore, the results of this research are presented separately rather than

converged as they are focused on different research aims (Creswell, & Plano Clark, 2007).

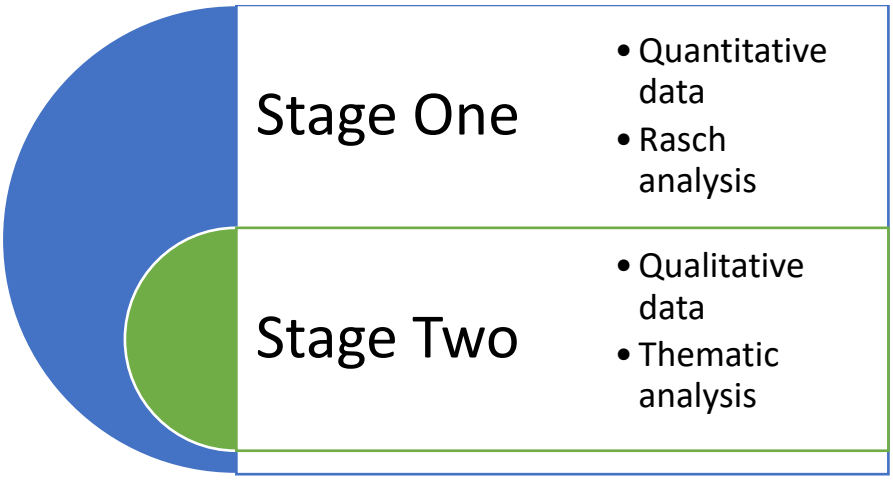


Figure 3.1: Embedded research design

3.3 Stage One (Quantitative)

Stage One Aim: To refine the psychometric properties of the 'Identifying Needs' section of the *TSP* using Rasch analysis.

Objectives:

(a) Determine if the 'Difficulty' scale demonstrates stronger psychometric properties as three separate 'Person', 'Environment', and 'Occupation' item-sets or as a combined item-set of occupational performance difficulty within the context of the Person-Environment-Occupation Model.

(b) Refine the psychometric properties of the 'Difficulty' scale using an iterative process of Rasch analysis.

(c) Establish preliminary evidence for the generalisability of the 'Difficulty' scale across measurement contexts (i.e., university, gender, administration format).

(d) Establish preliminary evidence that the 'Difficulty' scale can be used as an outcome measure (i.e., is sensitive to detecting change over time).

(e) Develop a keyform for the 'Difficulty' scale that can be used to estimate a student's measure of occupational performance difficulties in practice.

(f) Improve the rating scale functioning of the 'Importance' scale.

3.3.1 Sampling strategy (Stage One)

As Stage One was focused on improving the psychometric properties of the *TSP*, the target population was existing *TSP* data within the occupational therapy services in TCD and UCD, specifically the 'Identifying Needs' section. The target population encompasses both paper-based *TSP* data as well as Excel-based eTSP data. The 'Identifying Needs' section of the tool consists of 74 items split over three item-sets based on the PEO-Model (Law et al., 1996) - 'Person' (N=30), 'Environment' (N=20), and 'Occupation' (N=24) item-sets. Each item is rated on a 'Difficulty' scale, in which Nolan (2011) intended for students to indicate how difficult each item is to manage by rating them on a 6-point Likert-style scale (i.e., *0=No difficulty - 5=Extreme difficulty*). However, the adjectival descriptors of the middle categories are not displayed on the measure (i.e., *1=Some difficulty, 2=Small difficulty, 3=Medium difficulty, 4=Moderate difficulty*). Each item is also rated on a 6-point 'Importance' scale (i.e., *0=No importance – 5=Extreme importance*). Likewise, the adjectival descriptors of the middle categories are not displayed on the measure (i.e., *1=Some importance, 2=mild importance, 3=Medium importance, 4=Moderate importance*).

A brief description of the sample settings (i.e., TCD and UCD) is necessary to outline the commonalities and differences between them. For both colleges, the occupational therapy service is part of the respective college Disability Service. In TCD, the occupational therapy service was established within the TCD Disability Service (TCD DS) in 2003 by Dr Clodagh Nolan in response to the increasing number of students with mental health difficulties and physical/sensory disabilities who required practical support for managing their student role (Nolan, 2011). The Disability Service in TCD aims "to create an accessible, transformational, educational environmental in an interdependent University community and provide a platform for innovation and inclusion" (TCD DS, 2022c). The occupational therapy service has steadily grown in numbers from 21 students in 2004-2005 (Discipline of Occupational Therapy, 2009) to 576 students in 2021-22 (TCD DS, 2022d). TCD comprises of three main Faculties (i.e., Arts, Humanities and Social Sciences; Science, Technology, Engineering and Maths;

Health Sciences) with several Schools within each of these faculties (e.g., School of Social Sciences; School of Chemistry; School of Medicine etc.). TCD has followed a tri-semester format up until the academic year 2018/2019, in which the Trinity Education Project was implemented to create a semesterised system (Trinity Education Project, n.d.). Therefore, the TCD sample data collected for this research was completed by students who had one exam period at the end of the academic year (i.e., since the Trinity Education Project, exams are now held at the end of each semester) which may impact how items related to exams were answered. Furthermore, TCD runs a tutorial service in which all students are allocated a member of academic staff to provide information on academic progress, personal issues, referral to relevant services and to act as an advocate when necessary (Trinity Senior Tutor Services, 2022). This is important within the context of the *TSP* as an item asks students to rate how difficult they find managing this support service.

The occupational therapy service in UCD was established in 2012 through a shared-service model with TCD (Nolan et al., 2013) and was located in the in UCD Access and Lifelong Learning (UCD ALL). UCD ALL's (2021, p.7) vision is "that UCD will be a University for All, where all students, regardless of background or circumstances, feel welcome, belong and are valued. In doing so, all students can undertake their studies, participate fully in the life of the University, and realise their academic, professional, career and personal goals". UCD ALL advocates for universal design in higher education through its University for All initiative (e.g., '*University for All Toolkit for Inclusive Higher Education Institutions: From Vision to Practice*' [Kelly, & Padden, 2018]). The occupational therapy service in UCD ran on a part-time basis until it became fully embedded within UCD ALL in the academic year 2018/2019 with the appointment of two full-time occupational therapists. In comparison to TCD, UCD does not run a tutorial service for students but rather the Student Advisor service (UCD Student Advisers, n.d.) in which a Student Advisor is appointed to UCD programmes to provide students with information regarding academic and personal issues and referral on to relevant services. UCD has six Colleges (i.e., Arts and Humanities; Engineering and Architecture; Health and Agricultural Science; Law and Social Sciences; Business; Science). Furthermore, UCD

follows a trimesterised system in which an exam period is held at the end of every semester.

To access the *TSP* sample, purposeful (Dickerson, 2006) and convenience (Bailey, 1997) sampling methods were used. The inclusion criteria were *TSP/eTSP* files from 2007 - June 2017 in TCD and 2012 - June 2017 in UCD in which the 'Student Details' section (anonymised) and the 'Identifying Needs' section were complete or attempted (i.e., minimum of three answered items in the 'Difficulty' scale in the respective 'Person', 'Environment', and 'Occupation' item-sets). Exclusion criteria included *TSP/eTSP* files predating 2007, in which only the 'Student Details' section was completed, or which had insufficient information in the 'Identifying Needs' section (i.e., less than three items answered in the 'Difficulty' scales in the respective 'Person', 'Environment', and 'Occupation' item-sets).

As Stage One of this research was focused on the field-testing stage of the *TSP*, all available *TSP/eTSP* data was collected from both the TCD and UCD services (i.e., the maximum amount of available data was collected). To achieve stable person and item measures within Rasch analysis, Linacre (1994) and Azizan, Mahmud and Rambli (2020) outline how there should be as many items as there are persons. As the *TSP* has 74 items in total, it required a minimum of 74 persons to have completed the *TSP*. As will be discussed in the sample demographic section of 'Chapter 4', the sample gathered exceeded this minimum.

As will be discussed in 3.3.4.2, a preliminary differential item functioning (DIF) was conducted between some subgroups in the sample (e.g., gender, university context, administration format, and level of degree). The *COSMIN Study Design checklist for Patient-reported outcome measurement instruments* (Mokkink et al., 2019) outlines appropriate sample sizes for different groups and suggests that ≥200 subjects per group is 'very good', 150-199 is considered 'adequate', 100-149 is considered 'doubtful' and <100 subjects is considered 'inadequate'. There is debate regarding sample sizes needed for DIF analyses, as Scott et al. (2009) indicate that large sample sizes are needed (i.e., >300 subjects per group) to achieve adequate power, however Belzak (2019)

demonstrated how sample sizes as low as 50-100 subjects can be used especially in a 1-parameter logistic item response theory model which is mathematically identical to the Rasch model. The sample sizes for the DIF analyses will be discussed in 'Chapter 5'. As all available data was collected, it is acknowledged that some samples were below *COSMIN* guidelines and the DIF analyses were preliminary in nature meaning no changes were made to the tool as a result.

3.3.2 Data collection methods (Stage One)

In order to access the *TSP* samples described above, existing *TSP* data from TCD and UCD was collected using a retrospective audit approach (Cheng, & Philips, 2014; Classen, 2006). Grady, Cummings and Hulley (2013) describe how retrospectively collecting existing data enables a rapid and inexpensive method of data collection of a large real-life sample. Furthermore, using existing data meant that there was no need to involve human research participants within this Stage of the research, minimising potential ethical issues (Grady et al., 2013). The disadvantage of using existing data is that there is less control over the quality of the data that has been originally collected (Cheng, & Philips, 2014; Grady et al., 2013). For example, the ratings that students gave to *TSP* items could not be clarified, and it is not possible to ascertain if the instructions on how to complete the tool were described consistently by various occupational therapists who practised in the services between 2007 and June 2017.

Using Taylor and Kielhofner's (2006) data collection protocol questions as a guide, the researcher arranged to collect the data in a private space in the Disability Services in TCD and UCD at a time that was optimal for service resources (e.g., office space and laptops) in order to minimise service disruption. During data collection, the researcher coded and inputted the data onsite into the Statistical Package for Social Science (SPSS; IBM Corp, 2016) for Macintosh. The entered data was re-checked by the researcher to reduce human error in coding and increase the data's reliability.

3.3.3 Ethical considerations (Stage One)

To access data in TCD from 2007 - June 2016, ethical approval was obtained from the Research Ethics Committee of the School of Medicine and was amended and granted in October 2018 to access further data from July 2016 – June 2017 (Appendix 3.1). As for accessing data in UCD, ethical approval was obtained from the Human Research Ethics Committee in University College Dublin to access data from 2012 - June 2016 and was amended and granted in October 2018 to access data from July 2017 – June 2017 (Appendix 3.1). Only data up until June 2017 was collected, after which the researcher began clinical practice in UCD. This meant that no data collected was associated with the researcher, reducing researcher bias.

As this research involved retrospectively auditing previously existing and anonymised *TSP* data, no human research participants were involved. Nevertheless, measures were implemented to increase the confidentiality and anonymity of the data and to reduce researcher bias (Dickerson, 2006). All data that was collected was anonymised for identifiable information (i.e., names, student number, specific date of birth, specific university course of study and contact information such as telephone numbers and email addresses) for both students and occupational therapists by a gatekeeper within the Disability Services in TCD and UCD prior to the researcher gaining access to them. The only demographic data that was collected included gender, diagnosis, year of study, faculty of study, whether they were repeating the year, the referral source and year of birth, as this information was necessary to contextualise the data (Velozo et al., 2012). All coded data was stored on a password protected computer with only the researcher having knowledge of the password. No hard copy data was collected.

3.3.4 Data analysis strategy (Stage One): Rasch analysis

Rasch analysis was used to conduct the psychometric research on the 'Difficulty' scale in the 'Identifying Needs' section of the *TSP*. The Rasch model is a probabilistic (Rasch, 1960) and person-centred measurement model (Velozo, 2021) which enables the relative difficulty of each item (i.e., item difficulty measure) to be reflected on a hierarchy from 'less' to 'more', similar to a ruler (Bond, & Fox, 2015). Simultaneously,

Rasch analysis can determine where a student is situated (i.e., person measure) on the 'occupational performance difficulty' hierarchy (Velozo, 2021), even if there is missing data (Smith, & Wind, 2018). This is advantageous over traditional total raw scores which may suggest that a student has lower levels of occupational performance difficulty when in fact they have just left several items unanswered. Prior to this research, it was not possible to ascertain the relative difficulty of the items (i.e., hierarchy) within the *TSP* as the CTT methods used during its development (Nolan, 2011) only deal with ordinal test-level data compared to interval item-level data which is facilitated using Rasch analysis (Smith, & Wind, 2018).

3.3.4.1 Choosing the Rasch Model

In terms of the specific Rasch model to use for the analysis, the Rasch Rating Scale model (RSM; Andrich, 1978; Wright, & Masters, 1982) and the Partial Credit Model (PCM; Wright, & Masters, 1982) were considered as the 'Difficulty' scales are polytomous in nature. The RSM can be used for ratings scales that use the same response format for all items (e.g., the same Likert-style scale for all items in the tool), whereas the PCM is appropriate when different response formats are used within the same tool or in educational tests which have varying degrees of correctness between fail and success (e.g., ability to give partial marks for an answer that is not fully right or fully wrong). As all the items in the *TSP* follow a common 6-point Likert-style rating scale, the RSM was considered the most appropriate to utilise in this research.

Considering the *TSP*'s 6-point scale (i.e., *0=No difficulty - 5=Extreme difficulty),* the RSM (Andrich, 1978; Wright, & Masters, 1982) assumes that students experiencing high levels of occupational performance difficulty are more likely to choose higher rating scale categories especially for items which are considered more difficult to manage, whereas students who are not experiencing much occupational performance difficulties are more likely to choose lower rating scale categories to reflect this. A logit is the log-odds unit of measurement within the Rasch model. Within this research, the RSM (Andrich, 1978; Wright, & Masters, 1982) assumes that the log-odds of a student responding in category *k* rather than category *k*-1 on the *TSP* is represented by the difference between their

person measure (θ), an item measure (δ) and the category threshold/step calibrations (τ) on the logit scale (Figure 3.2, where *n* is the person identifier and *i* is the item identifier).

$$ln\left[\frac{P_{n_i}(x=k)}{P_{n_i}(x=k-1)}\right] = \theta_n - \delta_i - \tau_k$$

Figure 3.2: Rasch Rating Scale Model (Andrich, 1978). Adapted from *'Rasch Measurement Theory Analysis in R: Illustrations and Practical Guidance for Researchers and Practitioners'*, S. Wind, & C. Hua, 2022, p. 83. Boca Raton, FL: CRC Press. Reprinted with permission.

3.3.4.2 Rasch analysis methods

After the data was inputted into SPSS, the dataset was saved and then imported to WINSTEPS (Version 4.7.0, Linacre, 2020a) software for the Rasch analysis. The researcher completed the 'Rating Scale and Questionnaire Design and Analysis' module in the University of Chicago during spring 2019 in order to gain the necessary skills for conducting the Rasch analysis (Appendix 3.2). This section gives an overview of the specific analysis methods used on the *TSP* data.

The *TSP* data consisted of separate 'Person' (N=30), 'Environment' (N=20), and 'Occupation' (N=42) item-sets, rated on a 6-point 'Difficulty' scale and a 6-point 'Importance' scale. As explained in 'Chapter 1', the Rasch analysis methods outlined below primarily focused on the 'Difficulty' scale, whereas a full Rasch analysis of the 'Importance' scale was deemed to be redundant. This is because Nolan (2011) intended for the 'Importance' scale to be used as a means of prioritising the areas of difficulty rather than the scale measuring how much importance/value a student attaches to a particular item. Hence, students may rate an item as being extremely difficult, but may rate it as not important as they may be receiving support for it elsewhere or do not feel it is relevant to focus on in occupational therapy. Hence to make this easier to use in

practice, only the rating scale functioning of the 'Importance' scale was assessed after all other refinements had been made to the 'Difficulty' scale.

Furthermore, it was acknowledged that the ultimate construct of the underlying PEO-Model is occupational performance (Law et al., 1996). Hence, in addition to the separated item-sets, this research evaluated a combined item-set in which all 74 'Difficulty' items were analysed together to determine if the *TSP* demonstrates stronger psychometric properties as one combined scale of occupational performance difficulties or as separate 'Person', 'Environment', and 'Occupation' item-sets. In order to assess this and influence decision making regarding the tool's refinement, the following methods were utilised: item and person fit, rating scale functioning, dimensionality, reliability and separation, item difficulty hierarchy and targeting (Chapter 4). Once all major refinements were completed, preliminary differential item functioning, preliminary outcome measurement analysis and keyform development were conducted (Chapter 5).

Item and person fit: The Rasch model has expectations for how students respond to *TSP* items. For example, it expects students with high levels of occupational performance difficulties to choose higher rating scale categories for most items, whereas students who are managing well are expected to choose lower rating scale categories. Fit statistics (i.e., mean square fit statistics [*MnSq*] and standardised mean square fit statistics [*Zstd*]) indicate how well item-related data or person-related data fits these expectations. Fit statistics can be represented using infit statistics or outfit statistics. Infit statistics are information-weighted, meaning more weight is given to the response patterns of persons who sit close to the item difficulty measure and are more sensitive to on-target observations. On the other hand, outfit statistics are not weighted, meaning they are more sensitive to response patterns of those persons that are distant from the item difficulty measure (Bond, & Fox, 2015). Smith (1991, 2004) argues that unweighted fit indices demonstrate greater power than weighted fit indices. Hence, for the purposes of this research, both infit and outfit statistics are presented, however, outfit statistics are used as the indicator for making decisions. Data which has an outfit *MnSq* >1.4 and a *Zstd* >2.0 are considered to be misfitting (Bond, & Fox, 2015). Items that fit the model's

expectations provide evidence for the content aspect of validity (Messick, 1989), and an item might misfit if it is measuring a different construct to the rest of the items (i.e., multidimensionality). Persons that fit the model's expectation provide evidence for the substantive aspect of validity (Messick, 1989), and a person might misfit if they have an erratic response pattern, such as choosing '*0=No difficulty'* for very difficult items and '*5=Extreme difficulty'* for very easy items. It is expected that 5% of data misfits by chance (Smith, 2002) and can be dealt with by removal if warranted. This research also sought to determine the impact that misfitting persons had on item difficulty measures by assessing displacement (Linacre, 2020b). This process involves calibrating item difficulty measures while excluding misfitting persons, re-instating the misfitting persons into the analysis, re-calibrating the item difficulty measures and then determining by how much the item difficulty measures were moved or displaced by the misfitting persons. Any displacement between $\pm$0.5 logits is considered inconsequential, while displacements >0.5 logits or <-0.5 logits is considered significant (Linacre, 2020b).

Rating scale functioning: Within the context of the *TSP*, the RSM (Andrich, 1978; Wright, & Masters, 1982) assumes that students with increasingly higher levels of occupational performance difficulties will choose increasingly higher rating scale categories to reflect this. This is known as ordered categories. Evaluating the rating scale functioning of a Likert-scale provides evidence for the substantive aspect of validity (Messick, 1989). Disordering of categories can occur if there are too many categories for people to adequately differentiate between (Weng, 2004), or if some categories are not used frequently in practice (Linacre, 2001). Linacre (2004) outlines guidelines for assessing the functioning of a rating scale: assessing if each category satisfies the following (a) has >10 observations, (b) the average person measure increases as the categories increase, (c) the *MnSq* <2.0 and (d) that the threshold/step calibration between each category (i.e., the point at which a student has equal probability of choosing adjacent categories) increases as the categories increase. Categories may be collapsed together to remedy category disordering (Bond, & Fox, 2015). As explained previously, rating scale functioning was the only analysis completed on the 'Importance' scale.

Dimensionality: Unidimensionality indicates that items work together to measure one construct (Bond, & Fox, 2015), such as occupational performance difficulty for the *TSP*. Two methods of assessing dimensionality include conducting a principal component analysis of the residuals and assessing local independence, both of which provide evidence for the structural aspect of validity (Messick, 1989). The principal component analysis of residuals is used to determine if there were any unexpected patterns which would indicate multidimensionality, this would be indicated if there was >5% unexplained variance with an Eigenvalue >2.0 (Bond, & Fox, 2015). For *TSP* items to be locally independent (Yen, 1993), the response a student gives to one item should not influence the response they give to another item. Items may violate local independence if they are similarly worded or measure similar concepts and these violations can be remedied by removing redundant items (Bond, & Fox, 2015). Item pairs with an inter-item correlation >0.4 were further investigated (Linacre, 2020c).

Reliability and separation: In CTT, the reliability of a measure is represented by Cronbach's alpha, as in Nolan's (2011) pilot study of the *TSP*. In Rasch analysis a similar indicator, the Person Reliability Index, which ranges 0-1, is used (Bond, & Fox, 2015). Similarly, an Item Reliability Index, which also ranges 0-1, indicates the extent to which the item difficulty hierarchy would be perceived consistently across different samples (Bond, & Fox, 2015). For separation, the Person Separation Index indicates how well a measure can distinguish between differing levels of the construct within the sample, while the Item Separation Index indicates how many levels of difficulty exist among the items (Wolfe, & Smith, 2007a). For this research, a Person Reliability Index >0.80 with a Person Separation Index >2 and an Item Reliability Index >0.90 with an Item Separation Index >3 is considered acceptable (Bond, & Fox, 2015). Cronbach's alpha between 0.7-0.95 was considered acceptable (Terwee et al., 2007).

Item difficulty hierarchy and targeting: In Rasch analysis, an item difficulty hierarchy can be generated which empirically orders items from 'less' to 'more' of a construct (Wolfe, & Smith, 2007a) providing evidence for the substantive aspect of validity (Messick, 1989). For the *TSP*, the item difficulty hierarchy is ideal for providing insight into the relative difficulty of the items which reflect occupational performance difficulties

associated with the occupational role of being a student as explained in 'Chapter 2'. The item difficulty hierarchy can be illustrated using a person-item map. This map allows for the identification of ceiling or floor effects and to determine if the range of difficulty of the items sufficiently captures the range of occupational performance difficulties experienced by the students in the sample, also known as targeting (Bond, & Fox, 2015).

Preliminary Differential item functioning (DIF): For exploratory purposes, preliminary DIF analyses were conducted across university context, gender, level of degree, and administration format to provide evidence for the generalisability of the *TSP* (Messick, 1989). As explained in 3.3.1, it is acknowledged that although all available data was collected, some samples did not meet Mokkink et al.'s (2019) guidelines. No changes were made to the tool as a result of these analyses, they were simply conducted for exploratory purposes. For the analyses, a reference group and a focal group were used (e.g., for gender, the Male group was the reference, and the Female group was the focal). As per the WINSTEPS manual (Linacre, 2020a), DIF of item difficulty measures between groups was determined by investigating the following: Rasch-Welch logistic regression t-test ($|t|>1.96$, $p<0.05$), Mantel Chi-square test ($p<0.05$) and size (i.e., absolute value) cumulative log of odds ratio (i.e., size CUMLOR). Zwick, Thayer and Lewis's (1999) guidelines for size CUMLOR were used, with $|CUMLOR| \leq 0.43$ logits being negligible, slight-moderate DIF indicated by $|CUMLOR|=0.43$-0.63 logits and moderate-large DIF indicated by $|CUMLOR| \geq 0.64$ logits. Only items that were statistically significant on Rasch-Welch and Mantel tests were discussed if they also demonstrated a size $|CUMLOR| > 0.43$ logits, otherwise items were not deemed to be demonstrating DIF.

Preliminary Outcome measurement analysis: The *TSP* is regularly administered with students over time but its utility as an outcome measure, or responsiveness (MOT, 1995), had not been investigated prior to this research. Using Wolfe and Chiu's (1999) standardised difference formula (Figure 3.3), it was possible to evaluate the *TSP*'s stability (i.e., if the items and rating scale categories function the same across time) and subsequent sensitivity (i.e., ability to detect change in person measures across time). In this formula, *z* represents the standardised mean square outfit statistic, *SE* represents

the standard error, while $\hat{\theta}_1$ and $\hat{\theta}_2$ represent two parameter estimates (i.e., item difficulty measures, category thresholds, or person measures) from two different points in time. The first step involved conducting separate RSM (Andrich, 1978; Wright, & Masters, 1982) analyses on the first administration (i.e., '*TSP* 1') and follow-up administration (i.e., '*TSP* 2') data. To determine the stability of the tool, the threshold/step calibrations and item difficulty measures from these analyses were analysed using Wolfe and Chiu's (1999) standardised difference formula. Significant differences (e.g., |z| > 1.96) in item difficulty measures indicate that items are interpreted differently across time, whereas differences in step calibrations indicate that the rating scale is used differently across time. Any differences were anchored to create a common set of estimates between '*TSP* 1' and '*TSP* 2' administrations. Once a common set of estimates was created, the person measures from the separate administrations were subjected to the standardised difference formula, with significant differences (e.g., |z| > 1.96) indicating that a person experienced a significant difference between '*TSP* 1' and '*TSP* 2' time points (Wolfe, & Chiu, 1999).

$$z = \frac{\hat{\theta}_1 - \hat{\theta}_2}{\sqrt{[SE(\hat{\theta}_1)]^2 + [SE(\hat{\theta}_2)]^2}}$$

Figure 3.3: Standardised difference formula (Wolfe, & Chiu, 1999). Adapted from 'Measuring Change across Multiple Occasions Using the Rasch Rating Scale Model', E. W. Wolfe, & C. W. T. Chiu, 1999, *Journal of Outcome Measurement, 3*(4), p. 365. Copyright 1999 by JAM Press. Reprinted with permission.

Keyform development: The ordinal-level raw scores generated from the *TSP* can be meaningfully ordered but cannot be quantified or added together into an accurate 'total score' due to the subjective interpretations imposed by respondents (Bond, & Fox, 2015; Wright, & Masters, 1982). Moreover, students may leave items unanswered resulting in a lower total raw score which may not accurately reflect their level of occupational performance difficulty. For these reasons, it is not appropriate to generate total raw scores by adding up ordinal ratings generated in the *TSP*. Instead, interval-level data can be added together, can appropriately represent the relative difficulty of the *TSP* items

and is robust to missing data if students do not answer certain items (Bond, & Fox, 2015). In practice, therapists may wish to estimate a student's overall level of occupational performance difficulty (i.e., person measure) to appropriately compare changes across time or to assess the effectiveness of an intervention. However, access and use of complex software such as WINSTEPS is not practical nor feasible for practising occupational therapists. Hence, a keyform was developed as it is a paper-and-pencil form which displays the item difficulty hierarchy and can generate instantaneous person measures regardless of missing data without needing to use Rasch software (Linacre, n.d.). To improve the interpretability of the *TSP* measures (MOT, 1995) to be used in practice by those unfamiliar with psychometrics, the logits on the keyform were converted to a 0-100 (i.e., 0 = lowest level of occupational performance difficulty, 100 = highest level of occupational performance difficulty) scale using a linear transformation (Wolfe, & Smith, 2007b). The linear transformation used was $Y=m+sX$, where Y represents the converted scale value, X represents the logit scale, s represents the (desired range)/(current range), and m is the (desired minimum)-(current minimum)(s).

3.4 Stage Two (Qualitative)

Stage Two Aim: To affirm the face validity and clinical utility of the refined tool in practice.

Objectives:

(a) Gather the experiences of occupational therapists in using each section of the 2014 version of the *e*TSP in practice to identify if refinements of other section of the tool are warranted.

(b) Train the occupational therapists in using the refined 'Identifying Needs' section and gather their experiences after a period of using this in practice.

(c) Make final refinements to each section of the tool and devise an administration manual on how to use the tool that is accessible by occupational therapists wishing to use the tool in their practice.

3.4.1 Theoretical framework: Qualitative Description & Naturalistic Inquiry

The approach chosen to guide Stage Two was qualitative description. Neergaard, Olesen, Andersen and Sondergaard (2009) outline how qualitative description aims to gain an understanding of a phenomenon by describing participant's experiences and perceptions of said phenomenon. There has been debate regarding the role qualitative description plays in qualitative research. Sandelowski (2000) highlights how researchers may feel obliged to present qualitative research as something more than straight description (i.e., low level of interpretation) and do so by designating their research as grounded theory, ethnography, narrative study or phenomenology when it is not. Furthermore, qualitative description has received criticism for being too simple (Sandelowski, 2000) or lacking rigor (Milne, & Oberle, 2005). Nevertheless, Neergaard et al. (2009) highlight the benefits of qualitative description, including being a useful method when the research question seeks a straight description of a phenomenon, being a useful approach when time and resources are limited, and it can be used as part of mixed-methods research. In terms of the current mixed-methods research, Stage Two aimed to gain a straight description of the perceptions and experiences of occupational therapists in using the 2014 version of the *eTSP* in practice as well as using the refined 2021 version of the *eTSP* in practice following the Rasch analysis in Stage One, hence qualitative description was considered the most appropriate approach to guide Stage Two.

With regard to the theoretical underpinnings of qualitative description, Bradshaw, Atkinson and Doody (2017) describe how naturalistic inquiry underpins this approach, meaning that comprehension of phenomena is established by undercovering the meanings participants hold about said phenomena. Lincoln and Guba (1982) describe how naturalistic paradigms hold the view that there are multiple and intangible realities which are studied holistically. Where feasible, research using naturalistic inquiry should be conducted with participants within their natural context (Lincoln, & Guba, 1985). Due to this, naturalistic inquiry means that researchers do not pre-select or manipulate variables prior to conducting research or ascribe to any single theoretical stance

regarding phenomena of interest (Sandelowski, 2000). Furthermore, within naturalistic inquiry the researcher needs to be cognisant of the fact that they play an active role in the research as there is an interrelated relationship between the participants and the researcher themselves (Lincoln, & Guba, 1982), and hence they must acknowledge the subjectivity of both the participants and their own experiences and preconceptions about phenomena (Bradshaw et al., 2017). Details of how this was achieved in Stage Two of the current research is described in section 3.4.6.

3.4.2 Sampling strategy (Stage Two)

The target population for Stage Two was occupational therapists practising in occupational therapy services in TCD, UCD, and TUDublin as they have the required knowledge and experience (Neergaard et al., 2009) of the phenomenon under investigation (i.e., how the *eTSP* is used in practice) which is necessary for a qualitative descriptive approach to be successful. To access the sample, purposeful (Dickerson, 2006) and convenience (Bailey, 1997) sampling were utilised. The inclusion criteria for this research were that participants would be practising occupational therapists in TCD, UCD and TUDublin who have any length of experience of using the *TSP* and/or the *eTSP*. Exclusion criteria included occupational therapists who did not currently practise in higher education or who were practising in higher education but did not use the *TSP/eTSP* within their practice. The researcher aimed to invite occupational therapists from the TCD, UCD, and TUDublin services as not only do they have the required knowledge and experience of using the tool in practice, but it is also a cost-effective method of quickly accessing an appropriate sample (Bailey, 1997).

Several steps were taken during recruitment to ensure informed and explicit consent was gathered in accordance with General Data Protection Regulation (GDPR) and the Health Research Regulations (2016). The legal basis for processing data under GDPR for this project is scientific research (Article 9(2)(j)) in the public interest (Article 6(1)(e)). Gatekeepers (i.e., members of the administrative team) from the Disability Services in TCD, UCD, and TUDublin were used to access the sample in December 2020. Each gatekeeper contacted the occupational therapists with the letter of invitation (Appendix

3.3), participation information letter (PIL; Appendix 3.4) and consent form (Appendix 3.5). These documents clearly outlined what data was being gathered, how this data would be processed and securely stored, the risks and benefits of engaging in this research and outlined their data protection rights. Furthermore, they also outlined how the research would take place either in-person or virtually if necessary due to COVID-19 and public health guidelines, and participants were asked to consent to participating both in-person or virtually. Any occupational therapists who agreed to partake in the research were informed to contact the researcher directly with their signed consent form so that the researcher had their contact details for setting up the focus groups. The researcher requested that the gatekeepers re-send the invitation to the occupational therapists three weeks after the initial invitation as a reminder for any therapist who wished to partake but had not sent on their consent form or who had missed the previous invitation to the study.

3.4.3 Data collection methods (Stage Two)

Post ethical approval, the participants were recruited, and data collection began. Table 3.1 outlines the timing and purpose of each research activity that took place in Stage Two of the research. Reflecting on Stage Two's aim and objectives, it was determined that semi-structured focus groups were the most appropriate method of collecting data on a specific topic (i.e., face validity and clinical utility of the 2014 version of the *eTSP* and the refined 2021 version of the *eTSP* in practice) from people who have experience of the topic (i.e., occupational therapists with experience of using the tools in practice) (Kreuger, & Casey, 2009). Focus groups were chosen over individual interviews as the most appropriate data collection method as it was an efficient method of gathering data from several occupational therapists simultaneously and identifying the collective perspective on the use of the tool in practice due to the group nature of focus groups (Lysack, Luborsky, & Dillaway, 2017). It is acknowledged that focus groups also poses some challenges which individual interviews may mitigate, such as the need to reduce the number of questions asked as more time is needed to gather all participants perspectives and participants may provide more socially desirable answers (Lysack et al., 2017). However, for the purposes of this research, the benefits of focus groups were

deemed to outweigh the challenges and hence were utilised in Stage Two. Furthermore, the researcher facilitated training sessions on using the refined version of the tool in practice during Stage Two.

Table 3.1: Stage Two Research Activities

Timing	Research Activity	Purpose
January 2021	Initial focus group (FG1)	• Gather the experiences of occupational therapists in using each section of the 2014 version of the *eTSP* in practice to identify if refinements of other sections of the tool are warranted.
January 2021	Initial training session	• Train the occupational therapists in using the 2021 version of the *eTSP* with a particular focus on the refined 'Identifying Needs' section.
June 2021	Follow-up focus group (FG2)	• Gather the experiences of occupational therapists in using the 2021 version of the *eTSP* after a period of using this in practice.
June 2021	Follow-up training	• Inform the occupational therapists about the results of the differential item functioning and outcome measurement analyses and train them on how to use the keyform in practice.

The initial intention was to carry out the Stage Two research activities in-person, but due to the impact of COVID-19 and public health guidelines, the focus groups and training sessions needed to be held virtually, for which the participants had already consented. As the researcher had not conducted virtual focus groups previously, Fox's (2017) guide for running real-time online focus groups were followed. Furthermore, the researcher became familiar with the video conferencing software used and trialled the use of its features and functions (e.g., share-screen, troubleshoot audio and visual issues etc.) with peers within the Discipline of Occupational Therapy in advance of the focus groups. The researcher sent several reminders about the focus groups to the participants (i.e., two weeks, one week, the day before and morning of) and kindly asked the participants to participate in a private space free from distractions where possible as suggested by

Fox (2017). However, the researcher acknowledged that COVID-19 resulted in some participant's family members working from home or needing to be home-schooled.

The initial focus group (FG1) was held in January 2021 prior to the start of the second semester. The purpose of FG1 was to gain insight into occupational therapists' experiences in using the 2014 version of the *eTSP* in practice to-date. As per FG1 interview guide (Appendix 3.6.1), open-ended questions were asked as each section of the tool was shown on screen (i.e., 'Student Details', 'Experiences & Expectations', 'Identifying Needs', and 'Goal Setting'). FG1 lasted 1 hour and 15 minutes. After a ten-minute break, the researcher facilitated a training session for the occupational therapists on the 2021 version of the *eTSP* following the refinements made to the 'Identifying Needs' section and how to use this in practice (no data was collected from the training session). The occupational therapists then had an opportunity to use this 2021 version of the tool in their practice during semester two of the Academic Year 2020-2021. The researcher described that during this time further analyses would be conducted (i.e., differential item functioning, outcome measurement analysis, and keyform development) but assured the participants that these analyses would not alter the 2021 version of the *eTSP* and hence it could be used in practice. After the session, the 2021 version of the tool and training slides were shared with the occupational therapists and they were advised that they could contact the researcher with any questions prior to the follow-up focus group (i.e., two therapists contacted with queries relating to the item difficulty hierarchy and the accessibility of the Excel format).

Following a similar procedure to FG1, a follow-up focus group (FG2) was held in June 2021 to gain insights into the occupational therapists' experiences of using the 2021 version of the *eTSP* in practice after the refinements that had been made from the Rasch analysis in Stage One. The main open-ended question asked was "Tell me about how you have found using the new *eTSP* over the semester", with other questions (Appendix 3.6.2) held on reserve if discussion about certain refinements did not come up naturally in the conversation. FG2 lasted one hour. After a ten-minute break, the researcher facilitated an additional training session in which the results of the differential item functioning, outcome measurement analysis and keyform development were discussed.

For the keyform, the therapists were shown how an automatically-populating item difficulty hierarchy has been added to the *eTSP* based on student's answers in the 'Identifying Needs' section, and a demonstration on how to complete paper-based keyform to get an estimate of a student's level of occupational performance difficulty in the student role and how this can identify if a change has occurred across time (no data was collected from the training session).

3.4.3.1 Role of the Moderator in Focus Groups

To ensure that the focus groups were conducted successfully, the researcher acted as a moderator for the discussion which involves respecting the participants, having a clear understanding of the purpose of the research and the topic of discussion, engage in clear communication and ensuring to be open and not defensive (Kreuger, & Casey, 2009). As discussed in 'Chapter 1', and will be discussed further in section 3.4.6, the researcher was also a practising occupational therapist and had developed professional relationships with other occupational therapists practising in occupational therapy services in higher education. Due to these professional relationships, the focus groups were able to run smoothly and enabled productive discussions about the topic at hand. The researcher/moderator attempted to set an open and comfortable tone for the focus groups by communicating with participants and providing opportunities to ask questions prior to the virtual focus groups, giving instructions on how to use video conferencing software, ensuring that breaks were provided throughout the focus groups and giving participants flexibility if they needed to tend to family demands as they were engaging in the focus groups remotely during the COVID-19 pandemic.

At the beginning of each focus group, the researcher/moderator gave a short introduction to the purpose of the research and how the occupational therapists could contribute. The researcher/moderator ensured that participants were able to contact them at any time during semester two so that they could ask questions or discuss any concerns they had on using the refined tool in practice. To ensure that the researcher/moderator maintained an open discussion and did not become defensive, they asked open-ended questions at the beginning and throughout the discussion. To

further enable debate and discussion, the researcher/moderator used the strategies of probing, sharing, steering, and responding to questions (Kreuger, & Casey, 2009). Probing involved asking questions of what participants had said to gain a deeper understanding of their experiences. Sharing was enabled as both the participants and the researcher/moderator shared their experiences of using the tool and ideas for enhancing the *eTSP*. The researcher/moderator steered the focus of the discussion back on track where necessary. Finally, the researcher/moderator ensured that participants had ample opportunities to ask questions before, during and after the focus groups.

3.4.4 Ethical considerations (Stage Two)

Separate to the ethical approval which was previously sought for Stage One of the research, ethical approval was obtained from the School of Medicine Research Ethics Committee in TCD and the Human Research Ethics Committee in UCD for Stage Two of the research in August/September 2020 (Appendix 3.7). The chair of the Research Ethics Committee in TUDublin accepted ethical approval from TCD along with an insurance letter and advised the researcher to contact the Disability Service directly to gain access to the sample of occupational therapists for the focus groups (Appendix 3.7). The researcher followed Workman and Kielhofner's (2006) ethical principles for research studies, including respect for the person (e.g., informed consent, anonymity and confidentiality), beneficence (e.g., minimising risks and maximising benefits for participants to engage in the research) and justice (e.g., protecting vulnerable individuals). In addition to the consent form and PIL, the participants were informed of their right to withdraw from the research at any time. In order to protect participant confidentiality and anonymity, all identifiable information was anonymised in the transcripts. Participants were informed that they had the right to restrict or object to processing of their data up until the time when the focus group transcripts were anonymised after which time it would not be possible to remove their contributions due to anonymisation. Furthermore, participants were kindly asked to respect the privacy of fellow participants and not repeat what was said in any focus group to others. The participants were informed that they were being invited to participate within their professional capacity and hence no sensitive or special category data (e.g., data relating

to physical and mental health, financial information, biometric data, religious beliefs etc.) was being gathered about either themselves or their clients as part of this research.

3.4.5 Data analysis strategy (Stage Two): Thematic analysis

Thematic analysis (Braun, & Clarke, 2012) was used during Stage Two data analysis as it systematically identifies and organises qualitative data, leading to insight into themes or patterns of meaning. Thematic analysis is suitable for qualitative description which aims to stay close to the data (Neergaard et al., 2009) and hence requires a low level of interpretation (Vaismoradi, Turunen, & Bondas, 2013). Braun and Clarke (2012) originally describe how thematic analysis can be inductive (i.e., codes/themes created from the data using a bottom-up approach and closely reflects semantic content of the data) or deductive (i.e., top-down approach in which pre-determined concepts, themes of frameworks are used to code the data). However, in more recent reflections, Braun and Clarke (2019) advocate that researchers should not view these as 'either or' choices and consider what is most appropriate for the project. Considering the aims of Stage Two, an emphasis on inductive thematic analysis was considered most appropriate, meaning codes were generated directly from the transcripts and remained as close to what the participants described in the focus groups.

Microsoft Excel was used to code and thematically analyse the qualitative data from FG1 and FG2 independently (Bree, & Gallagher, 2016; Microsoft Corporation, 2017). Bree and Gallagher (2016) have demonstrated how Microsoft Excel is a simple and cost-effective way of conducting thematic analysis using Braun and Clarke's (2012) method. Braun and Clarke (2012) outline a six-step approach to conducting thematic analysis: 1) familiarising yourself with the data, 2) generating initial codes, 3) searching for themes (in recent reflections, Braun and Clarke [2019] suggest the term 'generating' to replace 'searching'), 4) reviewing potential themes, 5) defining and naming themes, and 6) producing the report. The transcripts from FG1 and FG2 were analysed separately using this six-step approach.

In the first step of becoming familiar with the data, the researcher transcribed the audio recordings of the focus groups and checked them against the recordings for accuracy. The researcher immersed herself in the data by reading the transcripts, listening over the audio recordings several times, making notes on the transcripts, underlining portions of the data and reflecting in their reflexive journal (Braun, & Clarke, 2012) which is discussed further in section 3.4.6. After reading through the transcript several times, the researcher then started transcribing individual units of data from the transcript into Microsoft Excel (Bree, & Gallagher, 2016). This resulted in two Excel columns which consisted of typing up individual piece of data and identifying which participant made the comment using anonymisation (i.e., participant 1, participant 2, etc.). In FG1, 269 individual pieces of data were typed up. In FG2, 177 individual pieces of data were typed up.

The second step involved generating initial codes. Braun and Clarke (2012) explain how codes help to identify labels for elements of the data which are pertinent to the research questions, and they may be semantic codes (i.e., close to the content of the data) or interpretative codes (i.e., codes that go beyond participant's descriptions to find latent meaning). The aim of Stage Two was to stay close to the data using a low level of interpretation to ensure that the participant's descriptions were gathered, hence codes were more semantic in nature. Based on the notes made in step one, the researcher started to make initial codes while reading through the Excel data several times. Braun and Clarke (2012) suggest writing down the code and marking the text associated with the code. By using Excel, the researcher was able to type up a code, assign it a colour, and colour-code the corresponding text data. If a piece of data was relevant to more than one code, the researcher duplicated the text and colour-coded each piece of data accordingly. After this duplication process, there were 286 pieces of colour-coded text data from FG1, whereas there was 179 for FG2. As this process progressed, the researcher reviewed the codes and made modifications to better incorporate new material (Braun, & Clarke, 2012). Once all the data was coded, the researcher read through all the data again to ensure that all pieces of data were being accurately captured in the codes. Altogether, there were 20 codes which were generated and modified during FG1, and there were 13 codes generated for FG2. Once the initial coding

process was complete, the researcher was able to sort all of the data by colour (i.e., code) on Excel (Bree, & Gallagher, 2016). Once the data was sorted according to colour, all the data pertaining to each individual code was copied and pasted into respective blank sheets on Excel. The researcher then went through each of these sheets to consolidate the data. This involved comparing pieces of data to find similarities to collate the data. As this process progressed, codes became more refined. If a piece of data belonged to more than one refined code, it was duplicated and added to the appropriate code.

The third step, searching for themes (or rather, 'generating themes' as per Braun and Clarke [2019]), involved trying to find patterns of meaning within the data which are important and relevant to the research question (Braun, & Clarke, 2012). During this step, all of the codes and coded data were reviewed with the aim of trying to identify similarities or differences between the codes. As this process progressed, the researcher clustered relevant codes together, indicating a unifying feature or theme. Furthermore, Braun and Clarke (2012, 2019) suggest trying to capture the overall story of the data by exploring the relationship between the themes. Any codes that did not neatly fit into a theme were put into a miscellaneous theme (Braun, & Clarke, 2012) which the researcher later reviewed to determine if the coded data could be included in an existing theme, if another theme needed to be created, or if the coded data needed to be discarded as it was not relevant to the research questions. Each potential theme and its relevant data were collated into thematic tables ready to be reviewed, a process which was aided by the use of Excel.

Step four involved reviewing the potential themes identified in step three. Braun and Clarke (2012) recommend this step for novice researchers as a way of quality-checking the data. During this step, the researcher reviewed the potential themes by evaluating them against the coded data and the entire dataset to determine if the themes are capturing the data accurately. Braun and Clarke (2012) suggest asking questions of the themes such as 'is it a theme or just a code? Do the themes capture a useful part of the data? What data should be included/excluded from this theme? Does the theme have enough data to back it up? Does the theme demonstrate coherence in the context of

the dataset?' As a result of these questions, the researcher decided to split one of the potential themes from FG1 data into two themes as this better captured the data. Finally, the researcher also reviewed these themes within the context of the entire dataset by re-reading the transcripts alongside the potential themes. This task ensured that the potential themes were accurately capturing the most relevant aspects of the original dataset (Braun, & Clarke, 2012).

The fifth step involved defining and naming the themes, and subthemes if applicable. As one starts to define and name a theme, it is imperative that each theme has a singular focus, relates to other themes but does not overlap, and clearly contributes to answering a research question (Braun, & Clarke, 2012). During this step, the researcher spent time ensuring that the themes were creating a coherent story to capture the data and selected extracts from the text to illustrate each theme. This step involved analytic work in which the researcher needed to highlight what is interesting and relevant about a particular extract rather than just paraphrasing it and demonstrating how the data connects to the research questions (Braun, & Clarke, 2012). As discussed previously, a low level of interpretation was used where possible and hence the analysis stayed close to the data. Nevertheless, the researcher acknowledged that interpretation always results in moving beyond the data itself (Braun, & Clarke, 2006).

The final step (Braun, & Clarke, 2006) involved reporting the findings from the thematic analysis by describing and connecting each theme and using data extracts to back up the themes, all of which can be found in 'Chapter 6'.

3.4.6 Enhancing reflexivity & rigor in Stage Two

Reflexivity can be defined as *"a set of continuous collaborative, and multifaceted practices through which researchers self-consciously critique, appraise, and evaluate how their subjectivity and context influence the research processes"* (Olmos-Vega, Stalmeijar, Varpio, & Kahlke, 2023, p.242). Reflexivity makes explicit the researcher's positionality (Dodgson, 2019) and acknowledges that qualitative research is positioning within a context (Braun, & Clarke, 2019). Reflexivity is an essential component of

enhancing rigor in qualitative research. Olmos-Vega et al. (2023) suggest that reflexivity goes beyond researchers merely acknowledging and explaining their influence on the research, but rather capitalising on the identities and knowledge they inevitably bring to the research process. This reflects Braun and Clarke's (2019) stance on how the role the researcher plays in knowledge production is central to thematic analysis. Reflexivity can be further understood through Walsh's (2003) four dimensions of reflexivity, namely personal reflexivity (i.e., expectations, assumptions, conscious and unconscious biases towards the research), interpersonal reflexivity (i.e., how the research is influenced by the relationships around it, power dynamics), methodological reflexivity (i.e., reflecting on the methodological decisions and alignment with theoretical framework) and contextual reflexivity (i.e., positioning the research in cultural, social, historical contexts). The researcher engaged with reflexive writing through a reflexive journal (Bradshaw et al., 2017; Olmos-Vega et al., 2023) in order to document and acknowledge their reflections and biases throughout Stage Two. Excerpts from this reflexive journal are outlined below.

The researcher was fulfilling a role dual as a clinician and a researcher (Milne, & Oberle, 2005) during this project. Engaging in clinical practice within UCD gave the researcher insights into the knowledge and understanding of the occupational performance difficulties experienced by students with disabilities in higher education, as well as gaining an appreciation for how the *TSP* is administered in practice. One benefit of completing the PhD research in a part-time manner was that it provided the researcher with appropriate time to develop her clinical reasoning skills which subsequently improved her ability to engage with this research. Due to this, the researcher had pre-existing professional relationships with the occupational therapists who were recruited for Stage Two as each service that used the *TSP* in practice followed the Unilink shared service approach (Nolan et al., 2013). Nolan (2011) also reflected how to manage this dual clinician-researcher relationship with co-therapists at the time of her own research. As documented in the reflexive journal, the researcher aimed to create an environment where therapists felt comfortable giving honest accounts about their experiences by asking more open-ended questions in the focus groups or probing further into something specific which a therapist mentioned. As the researcher also had relevant

clinical experience of using the *TSP*, she contributed at appropriate times to the discussions with their own insights of using it in practice in FG1, especially when agreeing with points other therapists brought up if relevant. As for FG2, the researcher was conscious not to contribute or ask leading questions so that the therapists could provide honest answers regarding their experiences of using the 2021 version of the *eTSP* following Stage One.

> *I am conscious that I have two roles here – therapist and researcher. On the one hand, I have experience in using the TSP myself. There are some elements I have found being an issue in practice which the Rasch analysis is picking up on statistically, for example, the 6-point Likert-style rating scale. At the same time, I don't want to influence or ask the therapists any leading questions based on my own experience. The best way for me to avoid this and allow the therapists the opportunity to give their own views is by asking them more open-ended questions. [Excerpt from reflexive journal* ***December 2020****]*

> *I have just finished transcribing the initial focus group. I am able to see the level of contribution I had myself during the session. Most of my contributions seem to be agreeing with or validating other therapist's experiences by giving an example of my own. At times I have provided alternative opinions or remarks on the tool. I need to be aware about this especially for the follow-up focus group, as I want the therapists to give me their honest opinions about the changes made to the tool, I want them to feel comfortable to provide constructive criticism on how the changes have impacted the tool's use in practice. [Excerpt from reflexive journal* ***February 2021****]*

The reflexive journal was also necessary when analysing the focus group data. As mentioned, it was the intention of this Stage to have a low level of interpretation and to describe the data in the most direct way possible. As the researcher was also a clinician, they were conscious not to over-emphasise or dilute any particular element of what the therapists said but to ensure that a rich description was given of all elements of the data pertinent to the research questions and to acknowledge and rectify the researcher

imposing her own professional perspectives upon the data instead of listening to the voices of the participants (Neegaard et al., 2009):

> *All the data pieces are typed up and ready to be analysed. I am aware that there are many comments that I agree with and some others which I don't. However, as a researcher I need to put this aside and look at the data, all of the data, with an open a mind as possible. This will ensure my analysis is rich, and most importantly accurate of all angles. [Excerpt from reflexive journal* ***April 2021****]*

> *During supervision discussion on the themes, it became apparent that I was incorporating theory relating to occupational formulation when presenting the findings, meaning I was imposing theory which was not there. I need to ensure that when presenting the findings that I am describing the occupational therapists' experiences matter-of-factly. [Excerpt from reflective journal* ***December 2021****]*

Beyond engaging with reflexivity, several strategies were employed to enhance the overall rigor of Stage Two. Rigor in qualitative studies is also known as trustworthiness, which Lincoln and Guba (1985) describe is comprised of credibility, dependability, confirmability, and transferability. Within qualitative description specifically, Milne and Oberle (2005) describe rigor as comprising of authenticity, credibility, criticality, and integrity. To enhance the authenticity and credibility of the research, the researcher purposely recruited therapists who had experience of the *TSP* and established a rapport with participants which involved demonstrating respect for their time and contributions. The researcher checked both focus group transcripts against the audio recordings several times to ensure that the data was properly captured, and used the strategy of member checking which involves gathering the perceptions of the credibility of the findings from the participants themselves (Creswell, 2007). Participants were sent summary findings for member checking as advised in the PIL. The aim of this was to ensure that participants had the opportunity to evaluate if the researcher's early analysis of each focus group was an accurate account of the focus group discussion from

their perspective. All participants were satisfied with the summary findings and no participants asked for these to be modified.

Confirmability (Lincoln, & Guba, 1985) is similar to integrity (Milne, & Oberle, 2005). A key tenet of integrity is reflecting on researcher bias, especially the dual role of clinician-researcher (Milne, & Oberle, 2005). The reflexive journal described above aided this, especially during the thematic analysis. This journal alongside the Excel sheet provided an audit trail for the decisions made during the analysis (Bradshaw et al., 2017). The co-supervisors of the project interrogated and peer-reviewed the data analysis process (Milne, & Oberle, 2005) and the researcher included direct quotations from the transcripts when reporting the findings as a means of reducing researcher bias (Bradshaw et al., 2017).

As for dependability (Lincoln, & Guba, 1985) and criticality (Milne, & Oberle, 2005), any decisions or changes made during the process were accounted for in the reflexive journal, creating an audit trail. Finally, Lincoln and Guba (1985) explain how transferability of the research can be achieved by using purposeful sampling, keeping a reflexive journal, outlining all processes and procedures accurately to improve repeatability and ensuring a rich description is provided. As explained previously, purposeful sampling was used for this Stage, a reflexive journal was kept throughout the process and the researcher has aimed to give a clear and accurate description of the procedures used in this chapter. The description of findings can be found in 'Chapter 6'.

3.5 Conclusion

This chapter provided a justification for using a mixed-methods embedded design to guide the research conducted in this thesis. The sampling methods, ethical considerations, data collection and analysis methods that were used to achieve the aims and objectives of each Stage were outlined in full. Stage One was quantitative in nature and focused on refining the *TSP* using Rasch analysis, with the results from this Stage outlined in 'Chapter 4' and 'Chapter 5'. Stage Two was qualitative in nature and focused

on affirming the face validity and clinical utility of the refined tool in practice, and the findings are outlined in ‘Chapter 6’ and ‘Chapter 7’.

4 Chapter 4: Rasch Analysis Refinement of the *TSP* 'Difficulty' Scale (Stage One)

4.1 Introduction

This chapter outlines the Rasch analysis refinement of the *TSP* 'Difficulty' item-set with the aim of achieving the first two research objectives of Stage One:

(a) Determine if the 'Difficulty' scale demonstrates stronger psychometric properties as three separate 'Person', 'Environment', and 'Occupation' item-sets or as a combined item-set of occupational performance difficulty within the context of the Person-Environment-Occupation Model.

(b) Refine the psychometric properties of the 'Difficulty' scale using an iterative process of Rasch analysis.

This chapter begins by outlining the sample demographics and data completion rates (4.2). The results of the initial Rasch analysis of the respective 'Person' (N=30), 'Environment' (N=20), and 'Occupation' (N=24) item-sets as well as the combined (N=74) item-set are presented (4.3). Based on this initial psychometric evidence and the theoretical context of the PEO-Model (Law et al., 1996), this section also provides rationale and justification proceeding with the combined item-set for the remainder of the refinement process. Thereafter, the iterative refinement process of the combined item-set is outlined, resulting in a 54-item 4-point *TSP* 'Difficulty' item-set measuring occupational performance difficulties within the student role (4.4), after which the chapter concludes (4.5). The results presented in this chapter have been published within the *British Journal of Occupational* Therapy (Appendix 4.1; Lombard, Nolan, & Heron, 2023).

4.2 Sample demographics & data completion rates

This research retrospectively collected 667 irrevocably anonymised 'Identifying Needs' sections created between 2007-2017 from the disability services in TCD and UCD (Table 4.1). For measures to be produced within ±1 logits with a 95% confidence interval, there needs to be as many persons as there are items (Azizan et al., 2020; Linacre, 1994) – in total there were 74 items and 667 persons in the sample. It must be noted that the occupational therapy service in TCD (85.3%, N=569) was established in 2004 and was prioritised for students with mental health difficulties, whereas the service in UCD (14.7%, N=98) was only established in 2012 on a part-time basis and was prioritised for autistic students/students with autism.

Table 4.1: Sample demographics (N=667)

Sample demographics	**N=667**
Gender	
Male	323 (48.4%)
Female	341 (51.1%)
Missing	3 (0.5%)
University	
TCD	569 (85.3%)
UCD	98 (14.7%)
Format	
Paper (*TSP*)	444 (66.6%)
Excel (*eTSP*)	223 (33.4%)
Age	
Median (Range) in years	21 years (17-46 years)
Mean (SD) in years	22.85 years (5.7 years)
Mode in years	19 years
Level of degree	
Undergraduate	594 (89.1%)
Postgraduate	68 (10.2%)
Missing	5 (0.7%)
Disability	
Depression	170 (25.5%)
Autism	114 (17.1%)
Attention Deficit Hyperactivity Disorder	76 (11.4%)

Anxiety	67 (10.0%)
Mental Health Other	101 (15.1%)
Dyspraxia/Specific Learning Difficulty	61 (9.2%)
Other (physical, sensory, significant ongoing illness, neurological, speech & language)	75 (11.2%)
Missing	3 (0.5%)
Repeating (e.g., modules, entire year)	
No	505 (75.7%)
Yes	115 (17.2%)
Missing	47 (7.1%)
Faculty	
Arts, Humanities, Social Science, Law, Business	401 (60.2%)
Science, Engineering, Mathematics, Architecture	163 (24.4%)
Health, Agricultural Sciences	95 (14.2%)
Missing	8 (1.2%)
Year of study	
Junior Fresh/1st year/Access course	312 (46.8%)
Senior Fresh/2nd year	116 (17.4%)
Junior Sophistor/3rd year	99 (14.8%)
Senior Sophistor/4th year/5th year medicine	64 (9.6%)
Postgrad Masters/PhD/Diploma	68 (10.2%)
Missing	8 (1.2%)

Data completion is concerned with how many students answered each item on the *TSP* 'Difficulty' scale. The completion rates ranged from 93.4%-98.8% of 'Person' item-set, 80.2%-97.9% for the 'Environment' item-set, and 70.0%-97.8% for the 'Occupation' item-set (Appendix 4.2). It was expected that items related to placement and lab activities would have lower completion rates as these items are not applicable to all students, only to students who conduct placement and labs without their course. However, as the *TSP* used in practice prior to conducting this research did not have a 'Not applicable' category option, it is possible that students for which these items are not applicable have rated them with category '*0=No difficulty'*, which must be appreciated when completing the Rasch analysis for these items.

4.3 Initial Rasch Analysis of the 'Difficulty' item-sets

This section outlines the initial Rasch analysis conducted on the 'Person', 'Environment', 'Occupation' and combined item-sets. The Rasch analysis methods employed (i.e., rating scale functioning; reliability, separation and targeting; fit; dimensionality; local independence) are fully outlined in 3.3.4.2 in 'Chapter 3'.

4.3.1 Rating scale functioning

The 6-point rating scale did not function optimally across any of the item-sets (Tables 4.2-4.5). According to the Andrich Thresholds, there was evidence of disordering between categories *'1=Some difficulty'* and '*2=Small difficulty'* in all item-sets, indicating that students found it difficult to differentiate between these two categories.

Table 4.2: Rating Scale Functioning – 6-point 'Person' Item-set

Category	Count	%	Observed Average Measure	Outfit *MnSq*	Andrich Threshold
0 No difficulty	3186	17	-0.47	1.07	NONE
1 Some difficulty	2377	12	-0.26	1.02	**-0.08**
2 Small difficulty	2777	14	-0.08	0.90	**-0.31**
3 Medium difficulty	3583	19	0.14	0.93	-0.21
4 Moderate difficulty	3418	18	0.31	1.09	0.29
5 Extreme difficulty	3909	20	0.37	1.03	0.31

Key: Bold = decrease in Andrich Threshold indicating disordered categories; *MnSq* = mean square fit statistic

Table 4.3: Rating Scale Functioning – 6-point 'Environment' Item-set

Category	Count	%	Observed Average Measure	Outfit *MnSq*	Andrich Threshold
0 No difficulty	5278	43	-0.95	0.92	NONE
1 Some difficulty	1694	14	-0.54	0.87	**0.34**
2 Small difficulty	1611	13	-0.36	0.90	**-0.48**
3 Medium difficulty	1684	14	-0.26	1.10	-0.38
4 Moderate difficulty	1285	10	-0.10	1.12	0.10
5 Extreme difficulty	850	7	0.01	1.43	0.41

Key: Bold = decrease in Andrich Threshold indicating disordered categories; *MnSq* = mean square fit statistic

Table 4.4: Rating Scale Functioning – 6-point 'Occupation' Item-set

Category	Count	%	Observed Average Measure	Outfit *MnSq*	Andrich Threshold
0 No difficulty	2922	20	-0.52	1.06	NONE
1 Some difficulty	1376	9	-0.30	0.95	**0.33**
2 Small difficulty	1939	13	-0.11	0.90	**-0.54**
3 Medium difficulty	2611	18	0.09	1.03	-0.29
4 Moderate difficulty	2817	19	0.31	1.04	0.13
5 Extreme difficulty	3005	20	0.58	1.06	0.37

Key: Bold = decrease in Andrich Threshold indicating disordered categories; *MnSq* = mean square fit statistic

Table 4.5: Rating Scale Functioning – 6-point Combined Item-set

Category	Count	%	Observed Average Measure	Outfit *MnSq*	Andrich Threshold
0 No difficulty	11386	25	-0.58	0.97	NONE
1 Some difficulty	5447	12	-0.31	1.06	**0.28**
2 Small difficulty	6327	14	-0.15	0.91	**-0.40**
3 Medium difficulty	7878	17	0.02	0.99	-0.28
4 Moderate difficulty	7520	16	0.18	1.09	0.16
5 Extreme difficulty	7764	17	0.37	1.08	0.25

Key: Bold = decrease in Andrich Threshold indicating disordered categories; *MnSq* = mean square fit statistic

4.3.2 Reliability, separation and targeting

Summary statistics for students and items are provided for the 'Person' item-set (Tables 4.6 and 4.7), 'Environment' (Tables 4.8 and 4.9), 'Occupation' (Tables 4.10 and 4.11), and combined item-set (Tables 4.12 and 4.13) below. The combined item-set demonstrated the strongest Person Reliability Index (0.94) and Person Separation Index (3.91), whereas the 'Environment' item-set demonstrated an inadequate Person Reliability Index (0.76) and Person Separation Index (1.80) (Appendix 4.3.2). Cronbach's alpha is high among all of the item-sets, highest within the combined item-set (0.95, SEM 12.40). However, this is likely due to the fact that Cronbach's alpha generally increases as the number of items increases (Nunnally, & Bernstein, 1994; Tavakol, & Dennick, 2011). Item reliability and separation indices were strong for all item-sets.

Table 4.6: Student (Non-extreme) Summary Statistics – 6-point 'Person' Item-set (N=665)

	Total score	Count	Measure	Model Error
Mean	78.0	28.9	0.07	0.14
SEM	0.9	0.1	0.02	0.00
P. SD	24.1	2.6	0.44	0.02
S. SD	24.1	2.6	0.44	0.02
MAX.	140.0	30.0	1.72	0.46
MIN.	8.0	11.0	-1.81	0.13
Real	**Person Separation**	2.65	**Person reliability**	0.88
Model	**Person Separation**	2.93	**Person reliability**	0.90

S.E. of mean = 0.02

Student raw score-to-measure correlation = 0.94

Cronbach alpha person raw score "test" reliability = 0.90 (SEM 7.59)

Key: SEM = standard error of measurement; MAX. = maximum value; MIN. = minimum value; P. SD = Population standard deviation; S.SD = Sample standard deviation; S.E. = standard error

Table 4.7: Item Summary Statistics – 6-point 'Person' Item-set (N=30)

	Total score	Count	Measure	Model Error
Mean	1729.9	641.7	0.00	0.03
SEM	88.5	2.2	0.07	0.00
P. SD	476.8	11.6	0.38	0.00
S. SD	484.9	11.8	0.38	0.00
MAX.	2438.0	659.0	0.76	0.03
MIN.	805.0	619.0	-0.62	0.03
Real	**Item Separation**	12.40	**Item reliability**	0.99
Model	**Item Separation**	12.88	**Item reliability**	0.99

S.E. of mean = 0.07

Item raw score-to-measure correlation = -1.00

Key: SEM = standard error of measurement; MAX. = maximum value; MIN. = minimum value; P. SD = Population standard deviation; S.SD = Sample standard deviation; S.E. = standard error

Table 4.8: Student (Extreme & Non-extreme) Summary Statistics – 6-point 'Environment' Item-set (N=662)

	Total score	Count	Measure	Model Error
Mean	29.2	18.7	-0.60	0.21
SEM	0.6	0.1	0.02	0.01
P. SD	15.6	2.3	0.61	0.18
S. SD	15.6	2.3	0.61	0.18
MAX.	80.0	20.0	1.15	1.78
MIN.	0.0	4.0	-3.96	0.15
Real	**Person Separation**	1.80	**Person reliability**	0.76
Model	**Person Separation**	1.97	**Person reliability**	0.79

S.E. of mean = 0.02

Student raw score-to-measure correlation = 0.85

Cronbach alpha person raw score "test" reliability = 0.84 (SEM 6.29)

Key: SEM = standard error of measurement; MAX. = maximum value; MIN. = minimum value; P. SD = Population standard deviation; S.SD = Sample standard deviation; S.E. = standard error

Table 4.9: Item Summary Statistics – 6-point 'Environment' Item-set (N=20)

	Total score	Count	Measure	Model Error
Mean	967.9	620.1	0.00	0.03
SEM	87.2	7.9	0.07	0.00
P. SD	380.0	34.3	0.33	0.00
S. SD	389.9	35.3	0.33	0.00
MAX.	1601.0	653.0	0.76	0.05
MIN.	306.0	535.0	-0.48	0.03
Real	**Item Separation**	9.80	**Item reliability**	0.99
Model	**Item Separation**	10.34	**Item reliability**	0.99

S.E. of mean = 0.07

Item raw score-to-measure correlation = -0.98

Key: SEM = standard error of measurement; MAX. = maximum value; MIN. = minimum value; P. SD = Population standard deviation; S.SD = Sample standard deviation; S.E. = standard error

Table 4.10: Student (Extreme & Non-extreme) Summary Statistics – 6-point 'Occupation' Item-set (N=661)

	Total score	Count	Measure	Model Error
Mean	59.6	22.2	0.03	0.17
SEM	0.9	0.1	0.02	0.00
P. SD	22.8	3.1	0.56	0.08
S. SD	22.8	3.1	0.56	0.08
MAX.	116.0	24.0	3.35	1.78
MIN.	0.0	2.0	-4.08	0.13
Real	**Person Separation**	2.49	**Person reliability**	0.86
Model	**Person Separation**	2.79	**Person reliability**	0.89

S.E. of mean = 0.02

Student raw score-to-measure correlation = 0.89

Cronbach alpha person raw score "test" reliability = 0.91 (SEM 6.97)

Key: SEM = standard error of measurement; MAX. = maximum value; MIN. = minimum value; P. SD = Population standard deviation; S.SD = Sample standard deviation; S.E. = standard error

Table 4.11: Item Summary Statistics – 6-point 'Occupation' Item-set (N=24)

	Total score	Count	Measure	Model Error
Mean	164.8	611.3	0.00	0.03
SEM	97.3	11.5	0.07	0.00
P. SD	466.7	55.3	0.33	0.00
S. SD	476.7	56.5	0.33	0.00
MAX.	2491.0	652.0	0.61	0.04
MIN.	724.0	459.0	-0.71	0.03
Real	**Item Separation**	10.55	**Item reliability**	0.99
Model	**Item Separation**	10.92	**Item reliability**	0.99

S.E. of mean = 0.07

Item raw score-to-measure correlation = -0.98

Key: SEM = standard error of measurement; MAX. = maximum value; MIN. = minimum value; P. SD = Population standard deviation; S.SD = Sample standard deviation; S.E. = standard error

Table 4.12: Student (Extreme & Non-extreme) Summary Statistics – 6-point Combined Item-set (N=667)

	Total score	Count	Measure	Model Error
Mean	165.9	69.4	-0.12	0.09
SEM	2.1	0.3	0.01	0.00
P. SD	55.2	7.5	0.38	0.01
S. SD	55.2	7.5	0.38	0.01
MAX.	310.0	74.0	0.94	0.31
MIN.	8.0	19.0	-2.27	0.08
Real	**Person Separation**	3.91	**Person reliability**	0.94
Model	**Person Separation**	4.24	**Person reliability**	0.95

S.E. of mean = 0.01

Student raw score-to-measure correlation = 0.94

Cronbach alpha person raw score "test" reliability = 0.95 (SEM 12.40)

Key: SEM = standard error of measurement; MAX. = maximum value; MIN. = minimum value; P. SD = Population standard deviation; S.SD = Sample standard deviation; S.E. = standard error

Table 4.13: Item Summary Statistics – 6-point Combined Item-set (N=74)

	Total score	Count	Measure	Model Error
Mean	1495.1	626.0	0.00	0.03
SEM	64.8	4.6	0.05	0.00
P. SD	553.3	39.3	0.40	0.00
S. SD	557.1	39.6	0.41	0.00
MAX.	2491.0	659.0	1.15	0.05
MIN.	306.0	459.0	-0.78	0.03
Real	**Item Separation**	13.46	**Item reliability**	0.99
Model	**Item Separation**	14.00	**Item reliability**	0.99

S.E. of mean = 0.05

Item raw score-to-measure correlation = -0.99

Key: SEM = standard error of measurement; MAX. = maximum value; MIN. = minimum value; P. SD = Population standard deviation; S.SD = Sample standard deviation; S.E. = standard error

4.3.3 Fit

Item fit was assessed according to outfit *MnSq* and outfit *Zstd*. Greater than 5% of items misfit in the separate 'Person' (2/30 items, 6.7%, Table 4.14), 'Environment' (1/20 items, 5%, Table 4.15), and 'Occupation' (2/24 items, 8.3%, Table 4.16) item-sets, indicating multidimensionality in all three item-sets. In comparison, the combined item-set (Table 4.17) demonstrated no evidence of item misfit, indicating that all 74 items worked well

together to measure the construct of occupational performance difficulty in the student role. The issue with keeping the item-sets separate is that these misfitting items may be removed to remedy the misfit, potentially removing items that are clinically relevant and valuable. Whereas these items contribute towards the measurement of the construct of occupational performance difficulty within the combined *TSP* item-set and do not demonstrate any misfit. Person misfit was an issue for each item-set.

Table 4.14: Item Fit Statistics – 6-point 'Person' Item-set (N=30)

Item Number	Item Codes*	Measure	S. E.	Outfit *MnSq*	Outfit *Zstd*	Infit *MnSq*	Infit *Zstd*	Item-measure
4	LIBSYSTE	0.76	0.03	**1.46**	**6.04**	1.28	4.64	0.29
9	HANDWORK	-0.04	0.03	**1.45**	**7.84**	1.39	7.36	0.41
1	ONTIMECO	0.38	0.03	1.38	6.57	1.35	6.79	0.37
5	RETRIEVE	0.72	0.03	1.35	4.94	1.23	3.99	0.34
29	SWITCHOF	0.03	0.03	1.30	5.55	1.29	5.81	0.42
12	PROCRAST	-0.62	0.03	1.29	3.94	1.23	3.50	0.45
28	PERFECTI	-0.15	0.03	1.24	4.28	1.21	4.01	0.42
30	QUALSLEE	-0.26	0.03	1.24	4.05	1.23	4.30	0.43
8	COURSTRU	0.52	0.03	1.05	0.89	1.02	0.36	0.44
27	MANANGER	0.44	0.03	1.04	0.74	1.04	0.94	0.45
11	GETSTART	-0.47	0.03	1.03	0.55	1.06	1.09	0.51
7	DEPARTEX	0.22	0.03	1.02	0.33	0.99	-0.10	0.47
26	MANCONFL	0.20	0.03	1.02	0.51	1.02	0.53	0.50
2	CONCENLE	-0.05	0.03	1.00	0.03	0.97	-0.64	0.41
6	TOPIC	0.40	0.03	0.96	-0.71	0.92	-1.63	0.47
15	MANSTREE	-0.18	0.03	0.96	-0.75	0.96	-0.85	0.59
19	FEARFAIL	-0.07	0.03	0.94	-1.14	-.94	-1.19	0.59
25	BECONFID	-0.28	0.03	0.92	-1.39	0.94	-1.14	0.56
3	UNDERCON	0.37	0.03	0.91	-1.84	0.84	-3.50	0.42
18	MANPANIC	0.01	0.03	0.91	-1.83	0.90	-2.10	0.61
13	KNOWBEST	-0.21	0.03	0.87	-2.43	0.89	-2.29	0.55
14	REMSTUDY	0.00	0.03	0.86	-2.78	0.87	-2.90	0.56
20	RECBADRE	-0.02	0.03	0.86	-2.94	0.87	-2.90	0.57
22	MANNEGTH	-0.47	0.03	0.85	-2.48	-.92	-1.55	0.62
17	RECALLMA	0.13	0.03	0.84	-3.37	0.83	-3.85	0.54
21	MANANXIE	-0.49	0.03	0.83	-2.90	0.89	-2.06	0.60
16	DECQUES	0.48	0.03	0.81	-3.65	0.81	-4.04	0.54
24	MENSTAMI	-0.40	0.03	0.79	-3.66	0.81	-3.80	0.63
23	MANSTRES	-0.39	0.03	0.77	-4.25	0.81	-3.83	0.63
10	CONCENST	-0.56	0.03	0.73	-4.57	0.78	-4.12	0.59

Key: * = full item names in Appendix 1.2; S. E. = Standard error; *MnSq* = Mean square fit statistic; *Zstd* = standardised mean square fit statistic. Note: Items arranged in descending order according to outfit *MnSq,* bold = *MnSq* >1.4 with *Zstd* > 2.0.

Table 4.15: Item Fit Statistics – 6-point 'Environment' Item-set (N=20)

Item Number	Item Codes*	Measure	S. E.	Outfit *MnSq*	Outfit *Zstd*	Infit *MnSq*	Infit *Zstd*	Item-measure
31	TOLERATE	-0.48	0.03	**1.47**	**7.31**	1.31	6.09	0.36
49	MANALCOH	0.33	0.03	1.38	3.90	1.25	3.66	0.32
50	MANSUBST	0.76	0.05	1.34	2.56	1.41	3.94	0.25
47	MEDICATI	0.25	0.03	1.24	2.63	1.11	1.80	0.38
34	USECOMPU	0.43	0.04	1.23	2.30	1.21	2.82	0.33
33	GETEXAMH	0.48	0.04	1.16	1.52	1.06	0.79	0.37
46	NUTRITNE	-0.34	0.03	1.16	2.69	1.09	1.91	0.46
45	MANFINAN	-0.20	0.03	1.14	2.27	1.03	0.64	0.45
43	MANHOUSE	0.22	0.03	1.13	1.41	1.12	1.81	0.41
32	MANLABPL	0.09	0.03	1.10	1.28	1.05	0.88	0.42
37	INVOLVES	-0.39	0.03	1.06	1.08	1.09	1.90	0.51
44	MANFAMIL	-0.23	0.03	1.06	0.99	1.03	0.61	0.49
48	SHOPHOUS	0.02	0.03	1.05	0.70	1.01	0.16	0.46
36	MANTUTOR	0.11	0.03	0.96	-0.45	0.93	-1.17	0.47
42	FRIEOUTCOL	-0.20	0.03	0.92	-1.38	0.97	-0.67	0.54
39	COMMSUPE	-0.13	0.03	0.91	-1.45	0.86	-2.88	0.51
35	MANSUPSE	0.11	0.03	0.82	-2.41	0.84	-3.07	0.48
41	FRIEINCOL	-0.30	0.03	0.79	-3.86	0.83	-3.82	0.59
38	COMMPEOP	-0.29	0.03	0.74	-5.03	0.73	-6.52	0.60
40	COMMSTUD	-0.24	0.03	0.71	-5.53	0.71	-6.97	0.60

Key: * = full item names in Appendix 1.2; S. E. = Standard error; *MnSq* = Mean square fit statistic; *Zstd* = standardised mean square fit statistic. Note: Items arranged in descending order according to outfit *MnSq,* bold = *MnSq* >1.4 with *Zstd* > 2.0.

Table 4.16: Item Fit Statistics – 6-point 'Occupation' Item-set (N=24)

Item Number	Item Codes*	Measure	S. E.	Outfit *MnSq*	Outfit *Zstd*	Infit *MnSq*	Infit *Zstd*	Item-measure
69	STAYDOEX	0.58	0.03	**1.43**	**5.44**	1.28	4.70	0.42
63	PRACTICA	0.51	0.03	**1.41**	**4.83**	1.17	2.68	0.44
54	PRESENTA	-0.03	0.03	1.30	4.78	1.26	4.81	0.46
51	PARTDISC	0.12	0.03	1.21	3.51	1.15	3.10	0.49
64	MANWORKL	0.19	0.03	1.20	2.91	1.23	3.99	0.50
70	TAKENOTE	0.17	0.03	1.14	2.32	1.10	2.02	0.49
71	REFERENC	0.24	0.03	1.14	2.38	1.12	2.34	0.49
65	COMPLREP	0.30	0.03	1.13	1.82	1.17	2.85	0.55
56	ASKHELP	0.05	0.03	1.11	1.86	0.99	-0.20	0.54
62	MANFREET	-0.29	0.03	1.11	1.84	1.06	1.17	0.50
52	ASKQUEST	0.18	0.03	1.07	1.22	1.06	1.28	0.54
61	BALCOLLI	-0.42	0.03	1.05	0.82	1.03	0.62	0.49
53	WORKGROU	0.22	0.03	1.00	0.03	0.97	-0.69	0.54
72	NOTESAFT	-0.06	0.03	1.00	0.06	1.03	0.62	0.58
55	TALKLECT	0.32	0.03	0.99	-0.15	0.88	-2.55	0.56
73	ORGANISE	-0.07	0.03	0.94	-1.09	0.95	-1.08	0.60
67	WRITERSB	-0.18	0.03	0.92	-1.33	0.91	-1.76	0.59
68	FINISHWO	-0.14	0.03	0.90	-1.70	0.92	-1.54	0.62
58	GOALSET	-0.23	0.03	0.88	-2.07	0.88	2.43	0.57
66	GETDOWNW	-0.40	0.03	0.87	-2.14	0.89	-2.07	0.61
57	PRESSDEA	-0.52	0.03	0.80	-3.14	0.84	-2.82	0.63
59	ACHIEVEG	-0.44	0.03	0.79	-3.53	0.80	-3.88	0.60
74	STRUCTPL	-0.17	0.03	0.79	-3.87	0.79	-4.34	0.62
60	WORKOVER	-0.74	0.04	0.72	-4.21	0.76	-4.01	0.60

Key: * = full item names in Appendix 1.2; S. E. = Standard error; *MnSq* = Mean square fit statistic; *Zstd* = standardised mean square fit statistic. Note: Items arranged in descending order according to outfit *MnSq,* bold = *MnSq* >1.4 with *Zstd* > 2.0.

Table 4.17: Item Fit Statistics – 6-point Combined item-set (N=74)

Item Number	Item Codes*	Measure	S. E.	Outfit *MnSq*	Outfit *Zstd*	Infit *MnSq*	Infit *Zstd*	Item-measure
43	MANHOUSE	0.62	0.03	1.33	3.84	1.26	3.88	0.31
50	MANSUBST	1.15	0.05	1.33	2.71	1.45	4.18	0.25
29	SWITCHOF	-0.13	0.03	1.31	5.74	1.27	5.57	0.34
49	MANALCOH	0.72	0.03	1.28	3.32	1.26	3.78	0.31
30	QUALSLEE	-0.40	0.03	1.26	4.34	1.23	4.32	0.35
34	USECOMPU	0.81	0.04	1.25	2.71	1.21	2.89	0.31
4	LIBSYSTE	0.53	0.03	1.24	3.39	1.10	1.86	0.31
28	PERFECTI	-0.29	0.03	1.24	4.19	1.18	3.57	0.35
1	ON TIMECO	0.19	0.03	1.21	3.92	1.18	3.87	0.38
69	STAYDOEX	0.41	0.03	1.21	3.15	1.21	3.86	0.39
9	HANDWORK	-0.19	0.03	1.19	3.53	1.18	3.81	0.47
12	PROCRAST	-0.72	0.03	1.19	2.56	1.17	2.53	0.45
31	TOLERATE	-0.05	0.03	1.19	3.76	1.18	3.83	0.34
42	FRIEOUTCOL	0.22	0.03	1.19	3.36	1.19	3.92	0.42
54	PRESENTA	-0.13	0.03	1.19	3.51	1.18	3.59	0.43
65	COMPLREP	0.16	0.03	1.19	2.97	1.20	3.56	0.47
37	INVOLVES	0.04	0.03	1.18	3.53	1.19	4.07	0.43
47	MEDICATI	0.64	0.03	1.18	2.27	1.17	2.68	0.35
64	MANWORKL	0.06	0.03	1.16	2.68	1.18	3.34	0.44
5	RETRIEVE	0.48	0.03	1.15	2.17	1.08	1.46	0.36
15	MANSTREE	-0.32	0.03	1.13	2.29	1.08	1.56	0.43
46	NUTRITNE	0.08	0.03	1.13	2.53	1.11	2.52	0.39
33	GETEXAMH	0.87	0.04	1.12	1.25	1.12	1.57	0.37
63	PRACTICA	0.35	0.03	1.12	1.78	1.07	1.20	0.42
45	MANFINAN	0.22	0.03	1.09	1.63	1.08	1.76	0.39
48	SHOPHOUS	0.42	0.03	1.09	1.41	1.09	1.73	0.42
51	PARTDISC	0.00	0.03	1.09	1.83	1.08	1.73	0.46
32	MANLABPL	0.49	0.03	1.08	1.09	1.07	1.14	0.42
71	REFERENC	0.10	0.03	1.07	1.32	1.05	1.17	0.46
41	FRIEINCOL	0.12	0.03	1.06	1.25	1.07	1.52	0.45
70	TAKENOTE	0.04	0.03	1.05	1.03	1.05	1.14	0.45
19	FEARFAIL	-0.22	0.03	1.04	0.76	1.01	0.12	0.47
36	MANTUTOR	0.51	0.03	1.04	0.60	1.03	0.51	0.44
44	MANFAMIL	0.18	0.03	1.04	0.86	1.05	1.14	0.47
52	ASKQUEST	0.06	0.03	1.03	0.62	1.04	1.00	0.50
72	NOTESAFT	-0.16	0.03	1.02	0.31	1.03	0.74	0.55
68	FINISHWO	-0.24	0.03	1.01	0.28	1.02	0.48	0.53
27	MANANGER	0.24	0.03	0.99	-0.23	0.96	-0.98	0.41
8	COURSTRU	0.31	0.03	0.98	-0.27	0.93	-1.59	0.41
11	GETSTART	-0.59	0.03	0.98	-0.26	1.01	0.12	0.49
62	MANFREET	-0.37	0.03	0.98	-0.38	0.99	-0.25	0.49
18	MANPANIC	-0.15	0.03	0.96	-0.83	0.94	-1.28	0.52
7	DEPARTEX	0.04	0.03	0.95	-1.05	0.91	-1.97	0.45

66	GETDOWNW	-0.47	0.03	0.95	-0.83	0.96	-0.71	0.55
67	WRITERSB	-0.28	0.03	0.95	-1.02	0.95	-0.93	0.53
73	ORGANISE	-0.17	0.03	0.95	-0.90	0.97	-0.70	0.56
26	MANCONFL	0.02	0.03	0.93	-1.43	0.94	-1.33	0.49
35	MANSUPSE	0.50	0.03	0.93	-1.05	0.90	-1.84	0.46
56	ASKHELP	-0.06	0.03	0.93	-1.37	0.94	-1.40	0.54
22	MANNEGTH	-0.59	0.03	0.92	-1.27	0.99	-0.22	0.53
25	BECONFID	-0.41	0.03	0.92	-1.51	0.93	-1.42	0.52
2	CONCENLE	-0.20	0.03	0.91	-1.78	0.90	-2.13	0.39
21	MANANXIE	-0.60	0.03	0.91	-1.44	0.96	-0.77	0.50
38	COMMPEOP	0.13	0.03	0.91	-1.86	0.90	-2.23	0.50
40	COMMSTUD	0.18	0.03	0.91	-1.77	0.90	-2.38	0.50
61	BALCOLLI	-0.49	0.03	0.91	-1.51	0.91	-1.78	0.52
20	RECBADRE	-0.17	0.03	0.90	-1.96	0.88	-2.66	0.49
6	TOPIC	0.20	0.03	0.88	-2.35	0.85	-3.46	0.45
14	REMSTUDY	-0.16	0.03	0.88	-2.42	0.87	-2.98	0.49
39	COMMSUPE	0.28	0.03	0.88	-2.10	0.87	-2.78	0.53
58	GOALSET	-0.32	0.03	0.88	-2.30	0.89	-2.31	0.53
17	RECALLMA	-0.04	0.03	0.87	-2.71	0.85	-3.54	0.46
57	PRESSDEA	-0.58	0.03	0.87	-2.20	0.90	-1.80	0.59
53	WORKGROU	0.09	0.03	0.86	-2.82	0.86	-3.21	0.56
3	UNDERCON	0.17	0.03	0.85	-3.05	0.79	-5.18	0.39
13	KNOWBEST	-0.35	0.03	0.85	-2.76	0.85	-3.12	0.51
55	TALKLECT	0.18	0.03	0.85	-2.94	0.86	-3.20	0.54
74	STRUCTPL	-0.26	0.03	0.85	-3.03	0.86	-2.99	0.55
16	DECQUES	0.28	0.03	0.82	-3.39	0.80	-4.57	0.48
23	MANSTRES	-0.51	0.03	0.82	-3.16	0.84	-3.13	0.56
24	MENSTAMI	-0.52	0.03	0.82	-3.17	0.83	-3.20	0.58
59	ACHIEVEG	-0.50	0.03	0.81	-3.26	0.81	-3.65	0.57
10	CONCENST	-0.67	0.03	0.74	-4.32	0.78	-4.04	0.54
60	WORKOVER	-0.78	0.03	0.72	-4.34	0.76	-4.00	0.60

Key: * = full item names in Appendix 1.2; S. E. = Standard error; *MnSq* = Mean square fit statistic; *Zstd* = standardised mean square fit statistic. Note: Items arranged in descending order according to outfit *MnSq*.

4.3.4 Dimensionality

The multidimensionality of the separate 'Person' (Table 4.18), 'Environment' (Table 4.19), and 'Occupation' (Table 4.20) item-sets was further evidenced by the principal component analysis of the residuals. Considering the underlying components of the person, environment and occupation within the PEO-Model (Law et al., 1996), this variance is not unexpected. On the other hand, the combined item-set (Table 4.21) demonstrated unidimensionality with no contrasts having an Eigenvalue >2.0 with unexplained variance >5%. Within the PEO-Model, the person consists of cognitive, affective, and physical components; the environment consists of physical, social, cultural, and institutional components; and the occupation comprises of tasks, activities, and occupations (CAOT, 1997; Law et al., 1996). Although there are items that clustered within the respective item-sets related to these components, they are not strong enough to be stand-alone item sets. With the combined *TSP* item-set, the principal component analysis of residuals did not cleanly identify the person, environment, and occupation concepts, but demonstrated an overlap between items within these scales (e.g., items pertaining to the social environment from the 'Environment' item-set loading with items pertaining to social activity on the 'Occupation' item-set). Considering the transactive nature of the PEO-Model (Law et al., 1996), this indicates that the items are working together to measure the construct of occupational performance of the student role which is the fundamental aim of the PEO-Model (Law et al., 1996) and the *TSP* (Nolan, 2011).

Table 4.18: Principal Component Analysis – 6-point 'Person' Item-set (N=30)

	Eigenvalue	Observed (%)	Expected (%)
Total raw variance explained in observations	48.68	100.00	100.00
Raw variance explained by measures	18.68	38.4	39.0
Raw variance explained by students	4.24	8.7	8.8
Raw variance explained by items	14.44	29.7	30.1
Raw unexplained variance (total)	30.00	61.6	61.0
Unexplained variance in 1st contrast	**4.40**	**9.0**	
Unexplained variance in 2nd contrast	**2.63**	**5.4**	
Unexplained variance in 3rd contrast	**2.52**	**5.2**	
Unexplained variance in 4th contrast	1.59	3.3	
Unexplained variance in 5th contrast	1.45	3.0	

Key: Bold = Contrasts with an eigenvalue > 2.0 with observed variance > 5%.

Table 4.19: Principal Component Analysis – 6-point 'Environment' Item-set (N=20)

	Eigenvalue	Observed (%)	Expected (%)
Total raw variance explained in observations	31.22	100.00	100.00
Raw variance explained by measures	11.22	35.9	36.4
Raw variance explained by students	7.29	23.3	23.7
Raw variance explained by items	3.93	12.6	12.8
Raw unexplained variance (total)	20.00	64.1	63.6
Unexplained variance in 1st contrast	**3.34**	**10.7**	
Unexplained variance in 2nd contrast	1.95	6.2	
Unexplained variance in 3rd contrast	1.56	5.0	
Unexplained variance in 4th contrast	1.35	4.3	
Unexplained variance in 5th contrast	1.17	3.7	

Key: Bold = Contrasts with an eigenvalue > 2.0 with observed variance > 5%.

Table 4.20: Principal Component Analysis – 6-point 'Occupation' Item-Set (N=24)

	Eigenvalue	Observed (%)	Expected (%)
Total raw variance explained in observations	40.43	100.00	100.00
Raw variance explained by measures	16.43	40.6	41.1
Raw variance explained by students	13.64	33.7	34.1
Raw variance explained by items	2.79	6.9	7.0
Raw unexplained variance (total)	24.00	59.4	58.9
Unexplained variance in 1st contrast	**3.78**	**9.3**	
Unexplained variance in 2nd contrast	**2.28**	**5.6**	
Unexplained variance in 3rd contrast	**2.03**	**5.0**	
Unexplained variance in 4th contrast	1.83	4.5	
Unexplained variance in 5th contrast	1.34	3.3	

Key: Bold = Contrasts with an eigenvalue > 2.0 with observed variance > 5%.

Table 4.21: Principal Component Analysis – 6-point Combined item-set (N=74)

	Eigenvalue	Observed (%)	Expected (%)
Total raw variance explained in observations	119.58	100.00	100.00
Raw variance explained by measures	45.58	38.1	38.6
Raw variance explained by students	21.1	17.6	17.9
Raw variance explained by items	24.5	20.5	20.7
Raw unexplained variance (total)	74.00	61.9	61.4
Unexplained variance in 1st contrast	5.87	4.9	
Unexplained variance in 2nd contrast	5.10	4.3	
Unexplained variance in 3rd contrast	3.83	3.2	
Unexplained variance in 4th contrast	3.40	2.8	
Unexplained variance in 5th contrast	2.53	2.1	

Key: Bold = Contrasts with an eigenvalue > 2.0 with observed variance > 5%.

4.3.5 Local independence

As for local independence, all item-sets demonstrated item pairs that violated local independence (Tables 4.22-4.25). However, by combining the *TSP* items together, it was possible to identify the local independence issues which arose between items across the 'Person', 'Environment', and 'Occupation' item-sets due to the transactive nature of the PEO-Model (Law et al., 1996), which would otherwise not have been identified. For example, '*Handing up work on time [HANDWORK]*' ('Person' item-set) violated local independence with '*Dealing with time pressures and deadlines [PRESSDEA]*' ('Occupation' item-set). Considering the item content, this violation of local independence is not surprising. This supports the argument that the *TSP* 'Difficulty' item-set demonstrates stronger psychometric properties as one combined scale of occupational performance of the student role in comparison to separate 'Person', 'Environment', and 'Occupation' scales because of the transactive relationship between the person, environment, and occupation within the PEO-Model (Law et al., 1996).

Table 4.22: Principal Component Analysis – 6-point Combined item-set (N=74)

Correlation	Item Pairs	
0.72	4 Understanding the Library System	5 Retrieving information/books
0.63	11 Geeting started with studying	12 Procrastination
0.58	14 Remembering what I have studied	17 Recalling material
0.49	21 Managing anxiety	23 Managing stressful situations
0.47	21 Managing anxiety	22 Managing negative thoughts
0.44	26 Managing conflict	27 Managing anger
0.43	22 Managing negative thoughts	23 Managing stressful situations
0.42	15 Managing stressful situations	19 Managing fear that I may fail exams
0.41	7 Understanding your department's expectations/standards (e.g., Length, style etc.)	8 Understanding the course structure and content

Table 4.23: Inter-item Correlations >0.4 – 6-point 'Environment' Item-set (N=20)

Correlation	Item Pairs	
0.64	38 Communicating with people	40 Communicating with other students
0.56	40 Communicating with other students	41 Making friends within college
0.49	41 Making friends within college	42 Making friends outside college
0.43	38 Communicating with people	41 Making friends within college
0.40	49 Managing alcohol intake	50 Managing/avoiding other substances

Table 4.24: Inter-item Correlations >0.4 – 6-point 'Occupation' Item-set (N=24)

Correlation	Item Pairs	
0.59	51 Participating in discussion	52 Asking questions
0.56	64 Managing work load	65 Completing reports
0.52	55 Talking to lecturers and tutors	56 Asking for help
0.51	63 Doing practical work	64 Managing work load
0.45	61 Balancing college work and life	62 Managing my free time
0.44	63 Doing practical work	65 Completing reports
0.43	67 Continuing writing, avoiding "writer's block"	68 Finishing the work

Table 4.25: Inter-item Correlations >0.4 – 6-point Combined item-set (N=74)

Correlation	Item Pairs	
0.73	38 Communicating with people [E]	40 Communicating with other students [E]
0.71	4 Understanding the Library System [P]	5 Retrieving information/books [P]
0.68	40 Communicating with other students [E]	41 Making friends within college [E]
0.64	11 Getting started with studying [P]	12 Procrastination [P]
0.62	14 Remembering what I have studied [P]	17 Recalling material [P]
0.62	41 Making friends within college [E]	42 Making friends outside college [E]
0.62	51 Participating in discussion [O]	52 Asking questions [O]
0.61	64 Managing work load [O]	65 Completing reports [O]
0.59	38 Communicating with people [E]	41 Making friends within college [E]
0.55	55 Talking to lecturers and tutors [O]	56 Asking for help [O]
0.55	21 Managing anxiety [P]	23 Managing stressful situations [P]
0.55	21 Managing anxiety [P]	22 Managing negative thoughts [P]
0.52	63 Doing practical work [O]	64 Managing work load [O]
0.52	67 Continuing writing, avoiding "writer's block" [O]	68 Finishing the work [O]
0.52	15 Managing the stress before an exam [P]	19 Managing fear that I may fail exams [P]
0.50	22 Managing negative thoughts [P]	23 Managing stressful situations [P]
0.49*	9 Handing up work on time [P]	57 Dealing with time pressures and deadlines [O]
0.48	63 Doing practical work [O]	65 Completing reports [O]
0.47	38 Communicating with people [E]	42 Making friends outside college [E]
0.46	40 Communicating with other students [E]	42 Making friends outside college [E]
0.45	61 Balancing college work and life [O]	62 Managing my free time [O]
0.45	26 Managing conflict [P]	27 Managing anger [P]
0.43*	39 Communicating with my supervisor [E]	55 Talking to lecturers and tutors [O]
0.43	35 Managing student support services [E]	36 Managing Tutor system [E]
0.43	22 Managing negative thoughts [P]	25 Being confident [P]
0.43	58 Goal - setting [O]	59 Achieving goals [O]
0.43	66 Getting down to writing [O]	68 Finishing the work [O]
0.42	7 Understanding my department's expectations/standards (e.g., Length, style etc.) [P]	8 Understanding the course structure and content [P]
0.42	66 Getting down to writing [O]	67 Continuing writing, avoiding "writer's block" [O]
0.42	37 Getting involved in societies [E]	41 Making friends within college [E]
0.41	18 Managing panic and "writer's block" [P]	19 Managing the fear that I may fail exams [P]
0.41	72 Writing study notes after class [O]	73 Organising information [O]
0.41	3 Understanding the content of lectures [P]	6 Understanding topic/question [P]
0.41	51 Participating in discussion [O]	54 Doing presentations [O]
0.40	49 Managing alcohol intake [E]	50 Managing/avoiding other substances [E]
0.40*	9 Handing up work on time [P]	68 Finishing the work [O]
0.40	15 Managing the stress before an exam [P]	18 Managing panic and "writer's block" [P]

Key: [ ] = item originated from the 'Person' [P], 'Environment' [E], or 'Occupation' [O] item-set, * = items violated local independence from across item-sets

4.3.6 Practical considerations & Rationale for Refinement Next Steps

Table 4.26 provides a summary of the main results of the initial Rasch analysis of the 'Difficulty' scale for the 'Person', 'Environment', 'Occupation' and combined item-sets. When considering the next steps in the refinement of the *TSP*, it is important to return to the underpinning conceptual model (de Vet et al., 2011) from which the tool was developed alongside considering the above psychometric evidence. When developing and piloting the tool, Nolan (2011) determined that the PEO-Model (Law et al., 1996) was the most appropriate model to underpin a self-report measure of occupational performance within the student role due to the transactive relationship between the person, meaningful roles and occupations and the environments in which they engage. From this, Nolan (2011) established the respective 'Person', 'Environment', and 'Occupation' item-sets. However, as the *TSP* item-sets are separate, the tool currently does not provide one numerical measure of a student's occupational performance within their student role. From a practical perspective, gaining a measure of a student's occupational performance difficulty is beneficial for identifying just-right challenges for intervention (Velozo, 2021) and for determining if a change has occurred across time (Wolfe, & Chiu, 1999). Conversely, combining all 74 items within the *TSP* demonstrated stronger psychometric properties than the separate 'Person', 'Environment', and 'Occupation' item-sets, and produces a singular measure of a student's occupational performance difficulty within their student role.

To explain this point further, take the construct of arithmetic within education as an exemplar. Arithmetic consists of different calculation operations, including addition, subtraction, multiplication, and division. For grade advancement, a single numerical result for 'arithmetic' ability is appropriate for assessing a student's progress within this construct. For this, it is necessary for a test to consist of an array of arithmetic problems including addition, subtraction, multiplication, and division. As students' progress through education and their ability in arithmetic strengthens, arithmetic tests tend to be more difficult to appropriately assess a student's progression. However, one may wish to understand or diagnose learning difficulties, which may require more specific

detail regarding the arithmetic difficulties the student is struggling with. This may require further detail related to the specific dimensions of addition, subtraction, multiplication, and division. However, these dimensions are not stand-alone measures within themselves, but rather provide a deeper understanding of the specific challenges a student is facing within the construct of arithmetic. Hence, an arithmetic test may include questions related to the dimensions of addition, subtraction, multiplication and division but provides an overall measure of a student's ability level. Within the context of the *TSP*, combining the items together provides this overall measure of occupational performance difficulty within the student role which is better aligned with the ultimate construct of the PEO-Model (Law et al., 1996), while still being underpinned by the person, environment, and occupation concepts. Therefore, combining the items into one item-set makes sense both psychometrically and practically, achieving the first research objective of Stage One. Hence, subsequent analyses focus on remedying the issues associated with this combined scale.

Table 4.26: Initial Rasch Analysis of the 'Difficulty' Item-sets

	Item-set	Person (N=30)	Environment (N=20)	Occupation (N=24)	Combined (N=74)
	Sample size	665	662	661	667
	Rating scale categories	6	6	6	6
Rating scale functioning (Linacre 2004)	>10 observations/category	Yes	Yes	Yes	Yes
	Average measure increases	Yes	Yes	Yes	Yes
	MnSq <2.0	Yes	Yes	Yes	Yes
	Andrich Threshold increases	**No**	**No**	**No**	**No**
Reliability & Separation	Person reliability (>0.80)	0.88	**0.76**	0.86	0.94
	Person separation (>2)	2.65	**1.80**	2.49	3.91
	SE of person mean	0.02	0.02	0.02	0.01
	Cronbach's alpha	0.90 (SEM 7.59)	0.84 (SEM 6.29)	0.91 (SEM 6.97)	0.95 (SEM 12.40)
	Item reliability (>0.90)	0.99	0.99	0.99	0.99
	Item separation (>3)	12.4	9.80	10.55	13.46
	SE of item mean	0.07	0.07	0.07	0.05
Item fit	Misfitting items (Outfit *MnSq* >1.4, *Zstd* >2.0)	**2/30 (6.7%)**	**1/20 (5%)**	**2/24 (8.3%)**	0
Person fit	Misfitting persons (Outfit *MnSq* >1.4, *Zstd* >2.0)	**75 (11.3%)**	**60 (9.1%)**	**69 (10.4%)**	**98 (14.7%)**
Dimensionality & Local independence	Inter-item correlation >0.40	**9 item pairs**	**5 item pairs**	**7 item pairs**	**37 item pairs**
	PCA: Unexplained variance >5% and eigenvalue >2.0	**3**	**1**	**3**	0

Key: Bold = issues with psychometric properties; *MnSq* = mean square fit statistic; *Zstd* = standardised mean square fit statistic; SE = standard error; SEM = standard error of measurement; PCA = principal component analysis

4.4 Iterative refinement process of the Combined 'Difficulty' items-set

This section outlines the iterative Rasch analyses and decisions taken to remedy and refine the problems existing within the combined 74-item 6-point *TSP* item-set. Figure 4.1 and Table 4.27 illustrate the relevant measurement problems identified at each iteration and the subsequent analyses and refinements made to the *TSP* to solve these issues. After each iteration (e.g., changing the rating scale, removing an item etc.), a new Rasch analysis was conducted to determine what impact each iteration had on the scale and to ensure that the most appropriate problematic areas of the scale were being remedied. Where appropriate, the reader is advised to consult the appendices for full details of the statistical analyses.

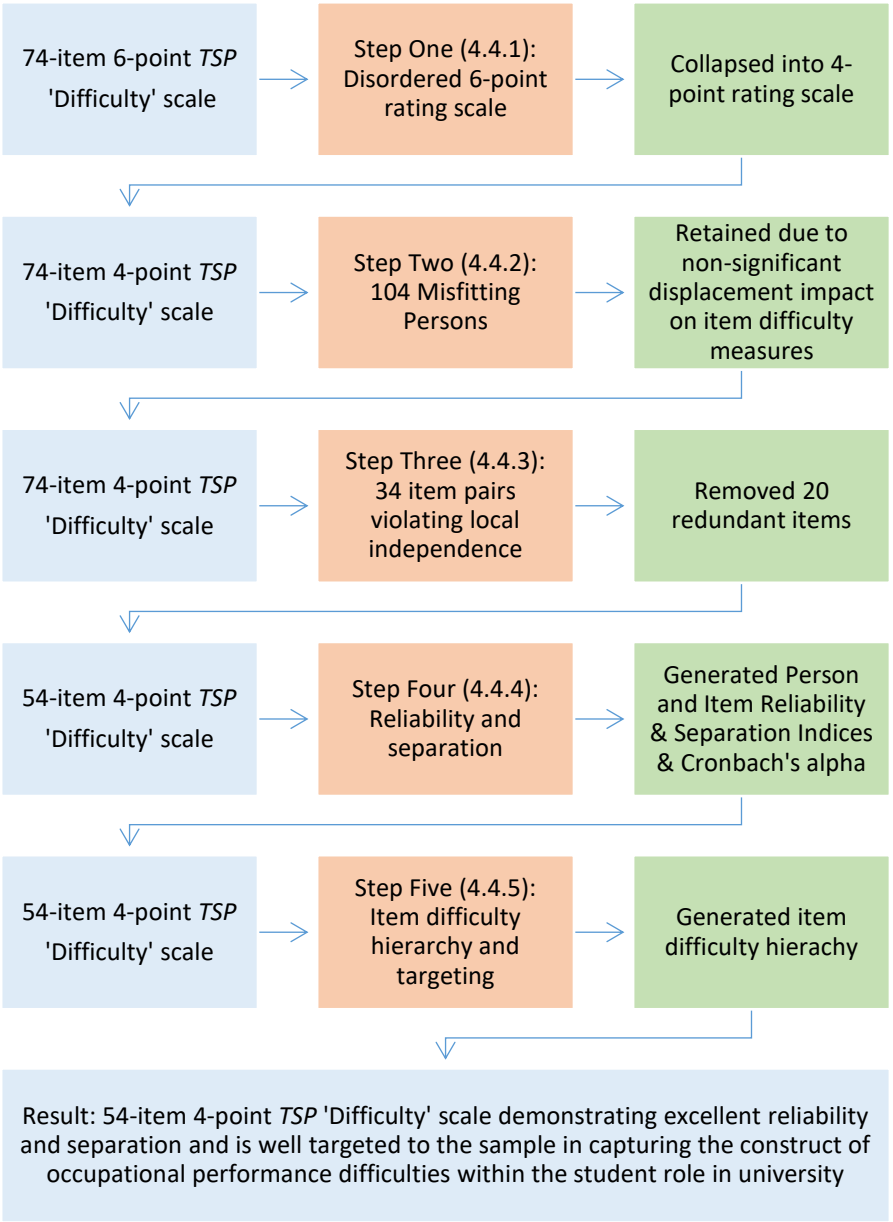


Figure 4.1: Iterative Rasch analysis refinement process of the combined item-set

Table 4.27: Iterative Rasch analysis refinement process of the combined item-set

	Item-set	Combined (N=74)	Combined w/4-point scale (N=74)	Refined 4-point scale (N=54)
	Sample size	667	667	667
	Rating scale categories	6	4	4
Rating scale (Linacre 2004)	>10 observations/category	Yes	Yes	Yes
	Average measure increases	Yes	Yes	Yes
	MnSq <2.0	Yes	Yes	Yes
	Andrich Threshold increases	**No**	Yes	Yes
Reliability & Separation	Person reliability	0.94	0.93	0.91
	Person separation	3.91	3.79	3.15
	SE of person mean	0.01	0.02	0.02
	Cronbach's alpha	0.95 (SEM 12.40)	0.93 (SEM 7.14)	0.91 (SEM 6.06)
	Item reliability	0.99	0.99	0.99
	Item separation	13.46	13.25	13.90
	SE of item mean	0.05	0.08	0.10
Item fit	Misfitting items (Outfit *MnSq* >1.4, *Zstd* >2.0)	0	0	0
Person fit	Misfitting persons (Outfit *MnSq* >1.4, *Zstd* >2.0)	**98 (14.7%)**	**104 (15.6%)**	102 (15.3%) (accepted)
Dimensionality & Local independence	Inter-item correlation >0.40	**37 item pairs**	**34 item pairs**	2 item pairs (accepted)
	PCA: Unexplained variance >5% and eigenvalue >2.0	0	**1**	0

Key: Bold = issues with psychometric properties; *MnSq* = mean square fit statistic; *Zstd* = standardised mean square fit statistic; SE = standard error; SEM = standard error of measurement; PCA = principal component analysis

4.4.1 Step One

The 6-point Likert-style 'Difficulty' rating scale demonstrated evidence of category disordering (Table 4.27), as the Andrich Thresholds were disordered between categories '*1=Some difficulty'* and '*2=Small difficulty'*. It is possible that students may have difficulty differentiating between these two categories due to their similar qualitative category labels, hence why these categories are disordered. Furthermore, this indicates that six categories may be too many for students to accurately differentiate between when rating their occupational difficulty within their student role. To remedy this issue, Table 4.28 and Figure 4.2 outline how the 6-point Likert scale was collapsed into a 4-point Likert scale which meets Linacre's (2004) rating scale functioning requirements.

Another challenge faced by the original *TSP* rating scale is that there is no 'Not applicable' option for students to choose should an item not be applicable to them (e.g., placement/lab related items for students on courses which do not have placement or labs, exam-related items for postgraduate students who do not have exams). Ideally, students should only choose category '*0=No difficulty'* if they are in fact experiencing no difficulty with an applicable item. Whereas, by choosing category '*0=No difficulty'* to represent an item that is not applicable to them, this affects the structural validity of this rating scale category (Messick, 1989; Wolfe, & Smith, 2007a) and impacts the item difficulty measure. However, in practice, as students did not have an option to indicate which items are not applicable (apart from leaving an item blank), it increased the likelihood that students will use category *'0=No difficulty'* to indicate that an item is not applicable. Hence, a '*NA=Not applicable'* option has been added to the refined version of the tool to give students the ability to indicate items which are not applicable to their specific course.

Table 4.28: Summary of Rating Scale Functioning of the 74-item 'Difficulty' Scale - 6-, 5-, and 4-point scales

	6-point rating scale						5-point rating scale					4-point rating scale			
	0	1	2	3	4	5	0	1	2	3	4	0	1	2	3
Frequency	11386	5447	6327	7878	7520	7764	11386	11774	7878	7520	7764	11386	11774	15398	7764
N (%)	(25%)	(12%)	(14%)	(17%)	(16%)	(17%)	(25%)	(25%)	(17%)	(16%)	(17%)	(25%)	(25%)	(33%)	(17%)
Average Measure	-0.58	-0.31	-0.15	0.02	0.18	0.37	-0.78	-0.35	-0.04	0.18	0.44	-0.99	-0.36	0.15	0.63
MnSq <2.0	0.97	1.06	0.91	0.99	1.09	1.08	0.96	0.98	0.92	1.10	1.13	0.98	0.95	1.01	1.09
Andrich Threshold	None	**0.28**	**-0.40**	-0.28	0.16	0.25	None	-0.59	**0.18**	**0.11**	0.30	None	-0.71	-0.38	1.09

Key: Bold = decrease in Andrich Threshold indicating disordered categories; *MnSq* = mean square fit statistic

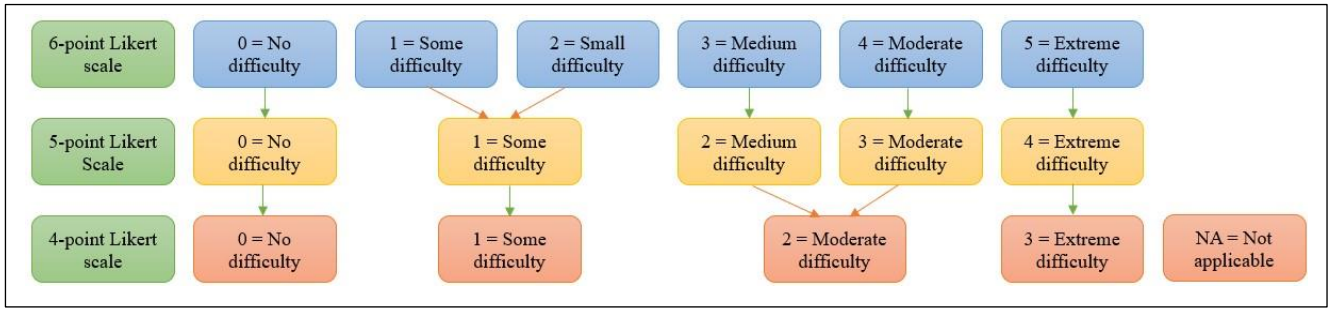


Figure 4.2: Refinement of 6-point 'Difficulty' Likert scale to a 4-point 'Difficulty' Likert scale

4.4.2 Step Two

After the rating scale was remedied, 104 (15.6%) persons misfit (Table 4.27) as per outfit *MnSq* >1.4 and outfit *Zstd* >2.0. A descriptive analysis did not highlight major differences between these misfitting persons and the remainder of the sample (Appendix 4.3). When determining the impact of misfitting persons on the item difficulty measures, an anchoring approach was used. This involved removing misfitting persons from the sample and generating item difficulty hierarchy measures, anchoring these item difficulty measures, then reinstating the misfitting persons into the analysis to determine if any displacements had occurred (Linacre, 2020b). It was found that the item difficulty measure displacements ranged from -0.28 logits to 0.16 logits (Table 4.29), and Spearman's rho between the item difficulty hierarchies when excluding and including the misfitting persons was 0.998 (Figure 4.3). All of this evidence is considered inconsequential (Linacre, 2020b), indicating that misfitting persons did not substantially change the item difficulty measures. Hence, all misfitting persons were retained for subsequent analyses.

Table 4.29: Displacements of 74-Item 4-Point Anchored Estimates – 104 Misfitting Persons Included (Ordered by displacement value)

Item Number	Item Codes*	Item Difficulty (Anchored)	Standard Error	Displacement (logits)
12	PROCRAST	-1.44A	0.06	0.16
66	GETDOWNW	-.95A	0.05	0.13
67	WRITERSB	-.61A	0.05	0.13
11	GETSTART	-1.19A	0.05	0.12
57	PRESSDEA	-1.13A	0.05	0.12
59	ACHIEVEG	-.97A	0.05	0.10
68	FINISHWO	-.50A	0.05	0.10
10	CONCENST	-1.20A	0.05	0.09
74	STRUCTPL	-.55A	0.05	0.08
18	MANPANIC	-.36A	0.05	0.08
73	ORGANISE	-.38A	0.05	0.08
58	GOALSET	-.62A	0.05	0.08
13	KNOWBEST	-.69A	0.05	0.07
22	MANNEGTH	-1.12A	0.05	0.06
72	NOTESAFT	-.33A	0.05	0.06
28	PERFECTI	-.61A	0.05	0.06
60	WORKOVER	-1.37A	0.06	0.06
25	BECONFID	-.80A	0.05	0.06
15	MANSTREE	-.66A	0.05	0.06

19	FEARFAIL	-.46A	0.05	0.06
62	MANFREET	-.69A	0.05	0.05
20	RECBADRE	-.35A	0.05	0.05
21	MANANXIE	-1.13A	0.05	0.05
30	QUALSLEE	-.74A	0.05	0.04
61	BALCOLLI	-.87A	0.05	0.03
9	HANDWORK	-.38A	0.05	0.03
56	ASKHELP	-.14A	0.05	0.03
23	MANSTRES	-.94A	0.05	0.02
54	PRESENTA	-.27A	0.05	0.02
38	COMMPEOP	.20A	0.05	0.02
24	MENSTAMI	-.95A	0.05	0.02
16	DECQUES	.42A	0.05	0.02
29	SWITCHOF	-.27A	0.05	0.01
14	REMSTUDY	-.29A	0.05	0.00
64	MANWORKL	.13A	0.05	-0.01
17	RECALLMA	-.08A	0.05	-0.01
3	UNDERCON	.27A	0.05	-0.01
42	FRIEOUTCOL	.41A	0.05	-0.01
65	COMPLREP	.32A	0.06	-0.01
37	INVOLVES	.09A	0.05	-0.01
6	TOPIC	.33A	0.05	-0.01
71	REFERENC	.22A	0.05	-0.01
55	TALKLECT	.35A	0.05	-0.02
1	ONTIMECO	.35A	0.05	-0.02
41	FRIEINCOL	.26A	0.05	-0.02
7	DEPARTEX	.09A	0.05	-0.02
40	COMMSTUD	.37A	0.05	-0.03
52	ASKQUEST	.13A	0.05	-0.03
39	COMMSUPE	.55A	0.05	-0.03
45	MANFINAN	.41A	0.05	-0.04
2	CONCENLE	-.32A	0.05	-0.04
51	PARTDISC	.02A	0.05	-0.04
63	PRACTICA	.69A	0.06	-0.04
8	COURSTRU	.54A	0.05	-0.05
70	TAKENOTE	.11A	0.05	-0.05
46	NUTRITNE	.21A	0.05	-0.05
53	WORKGROU	.20A	0.05	-0.05
26	MANCONFL	.08A	0.05	-0.05
69	STAYDOEX	.79A	0.05	-0.05
31	TOLERATE	-.02A	0.05	-0.06
35	MANSUPSE	.92A	0.05	-0.07
27	MANANGER	.47A	0.05	-0.07
47	MEDICATI	1.19A	0.06	-0.07
36	MANTUTOR	.96A	0.06	-0.07
44	MANFAMIL	.41A	0.05	-0.08

5	RETRIEVE	.96A	0.05	-0.10
34	USECOMPU	1.52A	0.06	-0.11
32	MANLABPL	.97A	0.06	-0.11
43	MANHOUSE	1.24A	0.06	-0.12
4	LIBSYSTE	1.04A	0.05	-0.12
48	SHOPHOUS	.89A	0.05	-0.13
33	GETEXAMH	1.61A	0.07	-0.14
49	MANALCOH	1.41A	0.06	-0.15
50	MANSUBST	2.22A	0.08	-0.28

Key: * = full item names in Appendix 1.2.

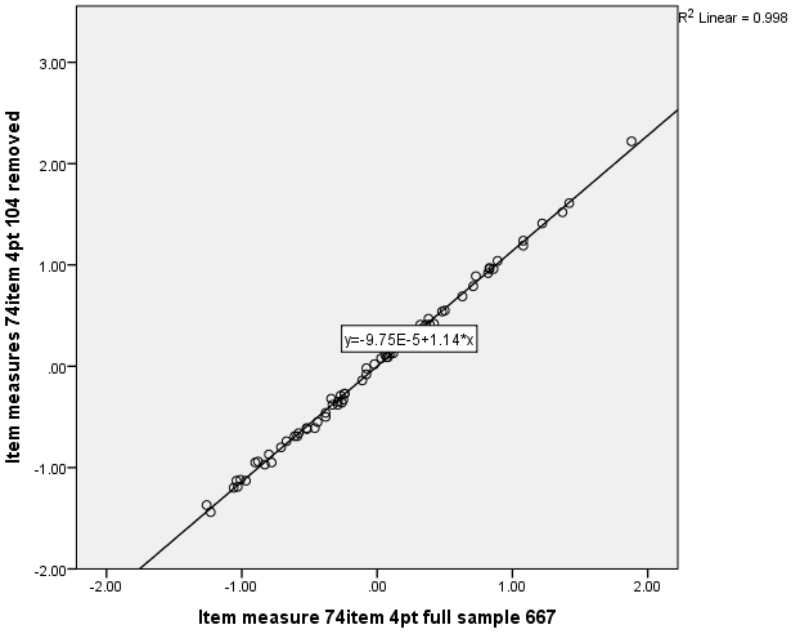


Figure 4.3: Item Measure Comparison between 74-item 4-Point Including Misfitting persons (N=667) & 74-Item 4-Point Excluding 104 Misfitting Persons (N=563)

4.4.3 Step Three

The first contrast in the principal component analysis of the residuals of the 4-point 74-item 'Difficulty' scale had an eigenvalue of 5.85 with unexplained variance of 5.0% (Table 4.30), indicating potential multidimensionality (Bond, & Fox, 2015). Moreover, thirty-four item pairs violated local independence with inter-item correlations ranging 0.4-0.71 which contributed to this multidimensionality (Table 4.31).

Table 4.30: Principal Component Analysis of the 74-item 4-point 'Difficulty' Item-set

	Eigenvalue	Observed (%)	Expected (%)
Total raw variance explained in observations	117.29	100.00	100.00
Raw variance explained by measures	43.29	36.9	37.2
Raw variance explained by students	20.08	17.1	17.3
Raw variance explained by items	23.21	19.8	20.0
Raw unexplained variance (total)	74.00	63.1	62.8
Unexplained variance in 1st contrast	**5.85**	**5.0**	
Unexplained variance in 2nd contrast	5.04	4.3	
Unexplained variance in 3rd contrast	3.79	3.2	
Unexplained variance in 4th contrast	3.40	2.9	
Unexplained variance in 5th contrast	2.48	2.1	

Key: Bold = Contrasts with an eigenvalue > 2.0 with observed variance > 5%.

Table 4.31: Item pairs violating local independence in the 74-item 4-point *TSP* 'Difficulty' scale (prior to any item removal)

Correlation	Item Pairs	
0.71	38 Communicating with people [E]	40 Communicating with other students [E]
0.71	4 Understanding the Library System [P]	5 Retrieving information/books [P]
0.67	40 Communicating with other students [E]	41 Making friends within college [E]
0.61	51 Participating in discussion [O]	52 Asking questions [O]
0.61	11 Getting started with study [P]	12 Procrastination [P]
0.61	41 Making friends within college [E]	42 Making friends outside college [E]
0.60	64 Managing work load [O]	65 Completing reports [O]
0.59	14 Remembering what I have studied [P]	17 Recalling material [P]
0.56	38 Communicating with people [E]	41 Making friends within college [E]
0.54	21 Managing anxiety [P]	22 Managing negative thoughts [P]
0.54	55 Talking to lecturers and tutors [O]	56 Asking for help [O]
0.53	21 Managing anxiety [P]	23 Managing stressful situations [P]
0.52	15 Managing stress before exams [P]	19 Managing fear that I may fail exams [P]
0.51	63 Doing practical work [O]	64 Managing work load [O]
0.50	67 Continuing writing, avoiding "writer's block" [O]	68 Finishing the work [O]
0.49	22 Managing negative thoughts [P]	23 Managing stressful situations [P]
0.49	9 Handing up work on time [P]	57 Dealing with time pressures and deadlines [O]
0.47	61 Balancing college work and life [O]	62 Managing my free time [O]
0.46	63 Doing practical work [O]	65 Completing reports [O]
0.45	40 Communicating with other students [E]	42 Making friends outside college [E]
0.45	38 Communicating with people [E]	42 Making friends outside college [E]
0.44	26 Managing conflict [P]	27 Managing anger [P]
0.44	35 Managing student support services [E]	36 Managing Tutor system [E]
0.43	49 Managing alcohol intake [E]	50 Managing / avoiding other substances [E]

0.42	58 Goal – setting [O]	59 Achieving goals [O]
0.42	22 Managing negative thoughts [P]	25 Being confident [P]
0.41	39 Communicating with my supervisor [E]	55 Talking to lecturers and tutors [O]
0.41	66 Getting down to writing [O]	67 Continuing writing, avoiding "writer's block" [O]
0.41	9 Handing up work on time [P]	68 Finishing the work [O]
0.41	18 Managing panic and "writer's block [P]	19 Managing fear that I may fail exams [P]
0.41	37 Getting involved in societies [E]	41 Making friends within college [E]
0.41	66 Getting down to writing [O]	68 Finishing the work [O]
0.40	34 Using computers [E]	35 Managing student support services [E]
0.40	51 Participating in discussion [O]	54 Doing presentations [O]

Key: [ ] = item originated from the 'Person' [P], 'Environment' [E], or 'Occupation' [O] item-set, * = items violated local independence from across item-sets

The decision was made to remedy these local independence violations first to determine if it had any impact on the principal component analysis of the residuals. To remedy these violations, redundant items were removed stepwise (Table 4.32). To determine which item was redundant within an item pair, each item was respectively removed and a full Rasch analysis was conducted, after which one item from each pair was removed. A total of 20 items were removed resulting in a 54-item scale (see Appendix 4.4 for full Rasch analysis conducted after each item removal).

Table 4.32: Stepwise item removals to resolve local independence violations

Iteration	Items violating local independence	Inter-item correlation	Resolution
1	40 – Communicating with other students [E]	0.71	Removed item 40
	38 – Communicating with people [E]		
2	5 – Retrieving information/books [P]	0.71	Removed item 5
	4 – Understanding the Library System [P]		
3	51 – Participating in discussion [O]	0.62	Removed item 52
	52 – Asking questions [O]		
4	41 – Making friends within college [E]	0.62	Removed item 41
	42 – Making friends outside college [E]		
5	11 – Getting started with studying [P]	0.61	Removed item 11
	12 – Procrastination [P]		
6	64 – Managing work load [O]	0.60 (items 64 & 63)	Removed items 64 & 65
	65 – Completing reports [O]	0.51 (items 64 & 65)	
	63 – Doing practical work [O]	0.46 (items 63 & 65)	
7	17 – Recall material [P]	0.59	Removed item 17
	14 – Remembering what I have studied [P]		

8	55 – Talking to lecturers and tutors [O] 56 – Asking for help [O]	0.54	Removed item 55
9	21 – Managing anxiety [P] 22 – Managing negative thoughts [P]	0.53	Removed item 22
10	21 – Managing anxiety [P] 23 – Managing stressful situations [P]	0.53	Removed item 23
11	15 – Managing the stress before an exam [P] 19 – Managing fear that I may fail exams [P]	0.52	Removed item 19
12	68 – Finishing the work [O] 67 – Continuing writing, avoiding "writer's block" [O]	0.49	Removed item 68
13	9 – Handing up work on time [P] 57 – Dealing with time pressures and deadlines [O]	0.48	Removed item 9
14	38 – Communicating with people [E] 42 – Making friends outside of college [E]	0.46	Removed item 42
15	61 – Balancing college work and life [O] 62 – Managing my free time [O]	0.46	Removed item 61
16	26 – Managing conflict [P] 27 – Managing anger [P]	0.44	Removed item 26
17	35 – Managing student support services [E] 36 – Managing Tutor system [E]	0.43	Removed item 35
18	58 – Goal setting [O] 59 – Achieving goal [O]	0.42	Removed item 58
19	49 – Managing alcohol intake [E] 50 – Managing/avoiding other substances [E]	0.42	Both items retained due to clinical relevance
20	66 – Getting down to writing [O] 67 – Continuing writing, avoiding "writer's block" [O]	0.41	Removed item 67
21	51 – Participating in discussion [O] 54 – Doing presentations [O]	0.41	Both items retained due to clinical relevance

Key: [ ] = item originated from the 'Person' [P], 'Environment' [E], or 'Occupation' [O] item-set

Items from two pairs which violated local independence were retained as they were deemed to be clinically relevant (Table 4.33; i.e., '*Managing alcohol intake [MANALCOH]*' and '*Managing/avoiding other substances [MANSUBST]*'and '*Participating in discussion [PARTDISC]*' and '*Doing presentations [PRESENTA]*').

Table 4.33: Item pairs with inter-item correlation in 54-item 4-point *TSP* 'Difficulty' item-set (all retained due to clinical relevance)

Correlation	Item Pairs		
0.42	49 Managing alcohol intake [E]	50 Managing/ avoiding other substances [E]	Retained due to clinical relevance
0.40	51 Participating in discussion [O]	54 Doing presentations [O]	Retained due to clinical relevance

Key: [ ] = item originated from the 'Person' [P], 'Environment' [E], or 'Occupation' [O] item-set

Remedying the local independence violations subsequently remedied the potential multidimensionality, with the principal component analysis of the residuals of the 54-item *TSP* 'Difficulty' scale being within acceptable ranges (Table 4.34), providing evidence for the structural aspect of validity (Messick, 1989).

Table 4.34: Principal Component Analysis of residuals – 54-item 4-point *TSP* 'Difficulty' item-set

	Eigenvalue	Observed (%)	Expected (%)
Total raw variance explained in observations	86.96	100.00	100.00
Raw variance explained by measures	32.96	37.9	38.2
Raw variance explained by students	14.45	16.6	16.8
Raw variance explained by items	18.51	21.3	21.5
Raw unexplained variance (total)	54.00	62.1	61.8
Unexplained variance in 1st contrast	3.87	4.5	-
Unexplained variance in 2nd contrast	3.75	4.3	-
Unexplained variance in 3rd contrast	2.92	3.4	-
Unexplained variance in 4th contrast	2.49	2.9	-
Unexplained variance in 5th contrast	2.00	2.3	-

Subsequently, all 54 items fit the model's expectations (Table 4.35) as per outfit *MnSq* and *Zstd*, providing evidence for the content aspect of validity (Messick, 1989). As a quality check, the rating scale functioning of the 4-point rating scale was re-checked on the 54-item scale and was found to still meet Linacre's (2004) criteria for optimally functioning rating scales (Table 4.36).

Table 4.35: Item information in resulting 54-item 4-point *TSP* 'Difficulty' Scale in order of logit measure

	Item	Item Label	Item Measure	Standard Error	Outfit *MnSq*	Outfit *Zstd*	Infit *MnSq*	Infit *Zstd*
Items which are less difficult to manage	Managing/avoiding other substances	MANSUBST [E]	1.85	0.07	1.23	2.22	1.31	3.61
	Getting to the exam hall	GETEXAMH [E]	1.39	0.06	1.06	0.75	1.09	1.38
	Using computers	USECOMP [E]	1.33	0.06	1.13	1.72	1.14	2.14
	Managing alcohol intake	MANALCOH [E]	1.18	0.06	1.21	2.85	1.21	3.40
	Managing housemates	MANHOUSE [E]	1.04	0.06	1.21	2.83	1.20	3.20
	Managing medication	MEDICATI [E]	1.04	0.05	1.11	1.68	1.12	2.11
	Understanding the Library system	LIBSYSTE [P]	0.84	0.05	1.17	2.70	1.07	1.33
	Managing Tutor System/Student Adviser system	MANTUTOR [E]	0.81	0.05	1.04	0.68	1.03	0.52
	Managing lab/placement environments	MANLABPL [E]	0.79	0.05	1.06	1.01	1.07	1.30
	Managing shopping, housework etc.	SHOPHOUSE [E]	0.69	0.05	1.04	0.74	1.06	1.27
	Staying and doing the exam	STAYDOEX [O]	0.67	0.05	1.18	3.04	1.20	3.77
	Doing practical work on placement (i.e., on placement, in labs)	PRACTICA [O]	0.59	0.06	1.14	2.12	1.10	1.78
	Communicating with supervisor	COMMSUPE [E]	0.46	0.05	0.92	-1.52	0.91	-1.92
	Understanding the course structure and content	COURSTRU [P]	0.44	0.05	0.94	-1.17	0.90	-2.16
	Deciding which question to do	DECQUES [P]	0.38	0.05	0.80	-4.14	0.78	-4.97
	Managing anger	MANANGER [P]	0.34	0.05	0.95	-0.95	0.93	-1.45
	Managing finances	MANFINAN [E]	0.32	0.05	1.04	0.87	1.05	1.03
	Being on time for college (lectures, labs etc.)	ONTIMECO [P]	0.28	0.05	1.15	3.06	1.13	2.77
	Managing family	MANFAMIL [E]	0.27	0.05	1.03	0.71	1.04	0.90
	Understanding topic/question	TOPIC [P]	0.27	0.05	0.84	-3.37	0.81	-4.23
	Understanding the content of lectures	UNDERCON [P]	0.21	0.05	0.75	-5.52	0.71	-7.03
	Communicating with people	COMMPEOP [E]	0.17	0.05	0.96	-0.80	0.95	-1.00
	Referencing	REFERENC [O]	0.16	0.05	1.03	0.54	1.03	0.59
	Managing nutritional needs	NUTRITNE [E]	0.11	0.05	1.07	1.38	1.07	1.47
	Working in groups	WORKGROU [O]	0.10	0.05	0.93	-1.41	0.93	-1.46
	Getting involved in societies	INVOLVES [E]	0.04	0.05	1.23	4.44	1.23	4.69
	Understanding your departments expectations/standards (e.g., length, style etc.)	DEPARTEX [P]	0.02	0.05	0.90	-2.17	0.87	-2.88
	Taking notes in class	TAKENOTE [O]	0.02	0.05	1.04	0.78	1.04	0.80
	Participating in discussion	PARTDISC [O]	-0.06	0.05	1.14	2.69	1.13	2.78
	Tolerating external distractions e.g., noise, light	TOLERATE [E]	-0.12	0.05	1.14	2.81	1.14	2.89
	Asking for help	ASKHELP [O]	-0.15	0.05	0.97	-0.57	0.97	-0.55
	Doing presentations	PRESENTA [O]	-0.28	0.05	1.22	4.10	1.21	4.08
	Switching off and relaxing	SWITCHOF [P]	-0.29	0.05	1.25	4.73	1.23	4.51

Items which are more difficult to manage	Writing study notes after class	NOTEASFT [O]	-0.30	0.05	1.04	0.78	1.06	1.13
	Managing panic and writer's block	MANPANIC [P]	-0.31	0.05	0.97	-0.55	0.96	-0.87
	Remembering what I have studied	REMSTUDY [P]	-0.32	0.05	0.88	-1.43	0.88	-2.67
	Organising information	ORGANISE [O]	-0.33	0.05	0.98	-0.49	0.98	-0.40
	Receiving and coping with bad results	RECBADRE [P]	-0.33	0.05	0.92	-1.68	0.91	-1.94
	Concentrating during lectures and tutorials	CONCENLE [P]	-0.39	0.05	0.82	-3.96	0.82	-4.10
	Structuring and planning the essay or project	STRUCTPL [O]	-0.49	0.05	0.87	-2.63	0.88	-2.50
	Being a perfectionist	PERFECTI [P]	-0.57	0.05	1.21	3.96	1.19	3.58
	Managing stress before an exam	MANSTREE [P]	-0.62	0.05	1.07	1.35	1.05	0.97
	Knowing best how to study	KNOWBEST [P]	-0.64	0.05	0.82	-3.65	0.83	-3.51
	Managing my free time	MANFREET [O]	-0.66	0.05	1.00	-0.03	1.00	0.07
	Getting enough good quality sleep	QUALSLEE [P]	-0.72	0.05	1.19	3.48	1.19	3.58
	Being confident	BECONFID [P]	-0.76	0.05	0.94	-1.12	0.95	-1.03
	Getting down to writing	GETDOWNW [O]	-0.83	0.05	0.97	-0.60	0.98	-0.46
	Achieving goals	ACHIEVEG [O]	-0.88	0.05	0.84	-3.05	0.85	-3.04
	Maintaining mental stamina/ endurance	MENSTAMI [P]	-0.94	0.05	0.82	-3.39	0.84	-3.13
	Dealing with time pressures and deadlines	PRESSDEA [O]	-1.02	0.05	0.91	-1.70	0.93	-1.30
	Managing anxiety	MANANXIE [P]	-1.09	0.05	0.95	-0.92	0.99	-0.15
	Maintaining concentration during study	CONCENST [P]	-1.11	0.05	0.77	-4.47	0.79	-4.18
	Procrastination	PROCRAST [P]	-1.28	0.05	1.17	2.75	1.17	2.77
	Dealing with work overload	WORKOVER [O]	-1.31	0.05	0.75	-4.57	0.77	-4.31

Key: *MnSq* = mean square fit statistics; *Zstd* = standardised mean square fit statistics; [ ] = item originated from the 'Person' [P], 'Environment' [E], or 'Occupation' [O] item-set

Table 4.36: Rating Scale Functioning – 54-item 4-point *TSP* 'Difficulty' item-set

Category	Count	%	Observed Average Measure	Outfit *MnSq*	Andrich Threshold
0 No difficulty	8667	26	-1.06	0.98	NONE
1 Some difficulty	8700	26	-0.39	0.95	-0.72
2 Moderate difficulty	11051	33	0.14	1.01	-0.37
3 Extreme difficulty	5480	16	0.63	1.09	1.10
NA Not applicable*	-	-	-	-	-

Key: *MnSq* = mean square fit statistic; * = suggested new category

4.4.4 Step Four

As per Tables 4.37 and 4.38, the refined 4-point 54-item *TSP* 'Difficulty' scale had a Person Reliability Index of 0.91 (acceptable = >0.80) and Person Separation Index of 3.15 (acceptable = >2), while the Item Reliability Index was 0.99 (acceptable = >0.90) and Item Separation Index was 13.90 (acceptable = >3), all indicating excellent reliability and separation (Bond, & Fox, 2015). Cronbach's alpha was 0.91 (SEM 6.06) which is considered strong (Terwee et al., 2007).

Table 4.37: Student (Non-extreme) Summary Statistics – 54-item 4-point *TSP* 'Difficulty' item-set

	Total score	Count	Measure	Model Error
Mean	70.8	50.8	-0.24	0.17
SEM	0.9	0.2	0.02	0.00
P. SD	22.5	5.4	0.63	0.02
S. SD	22.5	5.4	0.63	0.02
MAX.	129.0	54.0	1.66	0.40
MIN.	6.0	14.0	-3.14	0.16
Real	**Person Separation**	3.15	**Person reliability**	0.91
Model	**Person Separation**	3.45	**Person reliability**	0.92

S.E. of mean = 0.02

Student raw score-to-measure correlation = 0.94

Cronbach alpha person raw score "test" reliability = 0.93 (SEM 6.06)

Key: SEM = standard error of measurement; MAX. = maximum value; MIN. = minimum value; P. SD = Population standard deviation; S.SD = Sample standard deviation; S.E. = standard error

Table 4.38: Item Summary Statistics – 54-item 4-point *TSP* 'Difficulty' item-set

	Total score	Count	Measure	Model Error
Mean	874.9	627.7	0.00	0.05
SEM	44.5	4.6	0.10	0.00
P. SD	323.9	33.4	0.72	0.00
S. SD	326.9	33.7	0.73	0.00
MAX.	1441.0	659.0	1.85	0.07
MIN.	205.0	467.0	-1.31	0.05
Real	**Item Separation**	13.90	**Item reliability**	0.99
Model	**Item Separation**	14.41	**Item reliability**	1.00

S.E. of mean = 0.10

Item raw score-to-measure correlation = -1.00

Key: SEM = standard error of measurement; MAX. = maximum value; MIN. = minimum value; P. SD = Population standard deviation; S.SD = Sample standard deviation; S.E. = standard error

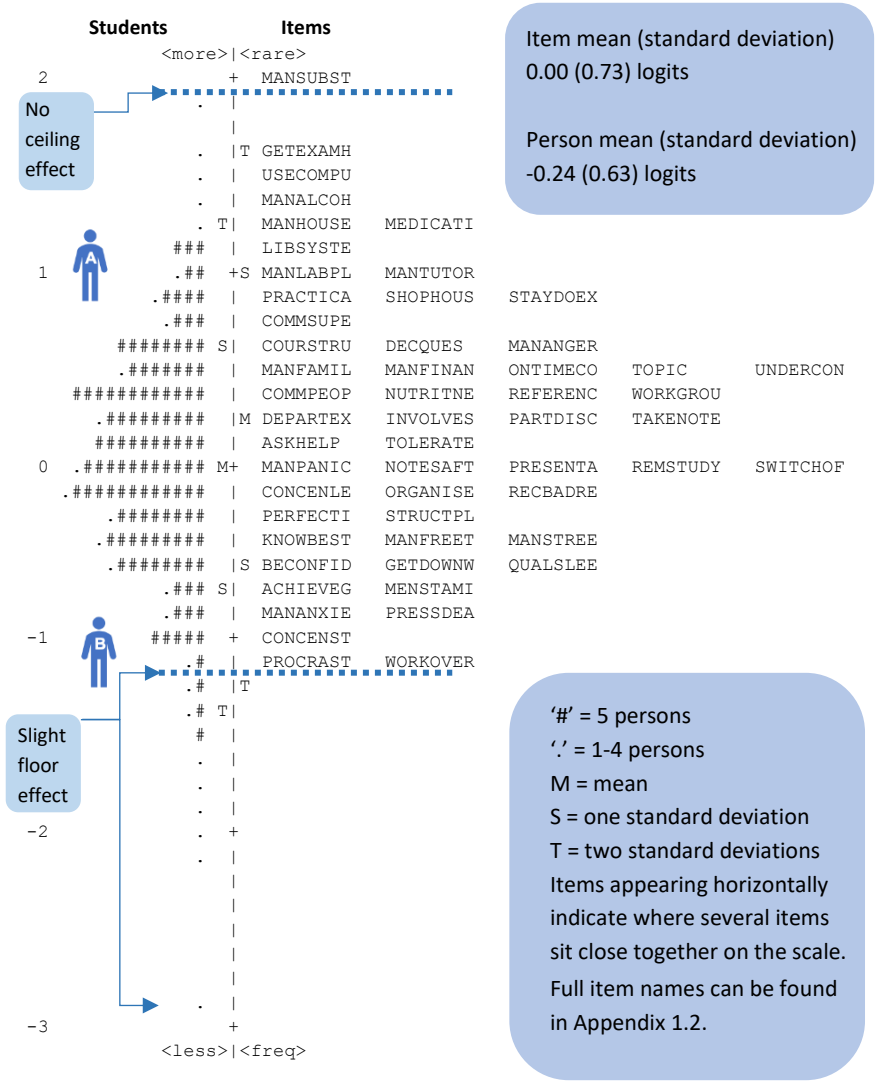
4.4.5 Step Five

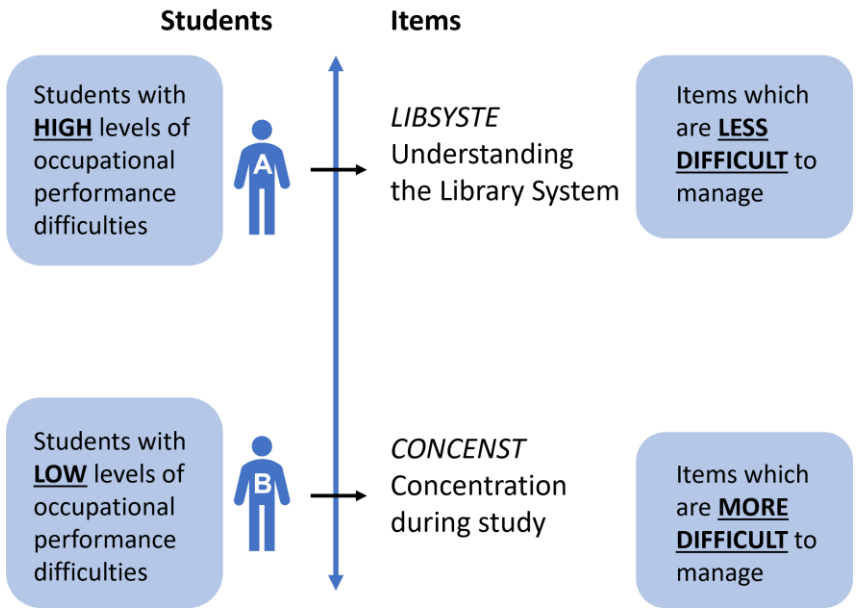
To provide evidence of the substantive aspect of validity (Messick, 1989), the item difficulty hierarchy was illustrated using a person-item map (Figure 4.4). This map demonstrates the relative level of occupational performance difficulties of students in the sample on the left-hand side and the relative difficulty of the items on the right-hand side. The example provided demonstrates that student A is experiencing high levels of occupational performance difficulties in comparison to student B. Student A is finding the item '*Understanding the Library System [LIBSYSTE]*' difficult to manage and hence it is likely that they are experiencing difficulty with all items that fall below this item. Whereas Student B is managing most of the items but is having difficulty managing some of the most difficult items such as '*Concentration during study [CONCENST]*'. The item difficulty hierarchy for the *TSP* 'Difficulty' item-set demonstrates how items related to the original 'Person' and 'Occupation' item-sets were found at the higher end of the scale. For example, some of the hardest items that came from the original 'Person' item-set included '*Procrastination [PROCRAST]*' (1.28 logits), '*Maintaining concentration during study [CONCENST]'* (-1.11 logits), and '*Managing anxiety [MANANXIE]*' (-1.09 logits). As for the items at the higher end of the scale that came from the original 'Occupation' item-set, this included '*Dealing with work overload [WORKOVER]*' (-1.31 logits), '*Dealing with time pressures and deadlines [PRESSDEA]*' (-1.02 logits), and '*Achieving goals [ACHIEVEG]*' (-0.88 logits). Whereas the majority of items that came from the original 'Environment' item-set were some of the easiest to manage, such as '*Managing/avoiding other substances [MANSUBST]*' (1.85 logits), '*Getting to the exam hall [GETEXAMH]*' (1.39 logits), and '*Using computers [USECOMP]*' (1.33 logits).

This person-item map demonstrates that the *TSP* 'Difficulty' item-set is well targeted to the sample as there is a sufficient spread of items along the scale (i.e., right-hand side) to adequately capture the range of occupational performance difficulties experienced by students in the sample (i.e., left-hand side). There is no evidence of a ceiling effect in the items, as the item *'Managing/avoiding other substances [MANSUBST]'* is calibrated higher than the person with the highest level of occupational performance difficulties. Moreover, as the 'Difficulty' scale is a polytomous scale, the range of the rating scale categories further captures the range of occupational performance difficulties within

the sample (Appendix 4.5). Although there is a slight floor effect, it is likely that students falling at this end of the scale are experiencing low levels of occupational performance difficulties and would not require occupational therapy intervention. Hence, this slight floor effect is not a concern from a clinical perspective.

Figure 4.4: Person-item map (i.e., item difficulty hierarchy) of the 54-item 4-point *TSP* 'Difficulty' scale





4.5 Conclusion

This chapter outlined the iterative Rasch analysis refinement process of the *TSP* 'Difficulty' scale. Due to strong psychometric evidence and alignment with the construct of occupational performance within the student role (Law et al., 1996), the decision was made to continue refining the 74-item combined item-set rather than separate 'Person', 'Environment', and 'Occupation' item-sets. This combined item-set underwent an iterative process which resulted in a 54-item 4-point *TSP* 'Difficulty' item-set which demonstrates excellent Person and Item Reliability and Separation and is well targeted to the sample, meaning it adequately captures the occupational performance difficulties within the student role in higher education. This 54-item 4-point *TSP* 'Difficulty' item-set is the basis for further analyses outlined in 'Chapter 5', including preliminary differential item functioning and outcome measurement analysis, keyform development, and refinement of the 'Importance' rating scale functioning.

5 Chapter 5: Further Analysis using the 54-item *TSP* (Stage One)

5.1 Introduction

Using the 54-item *TSP* established in the previous chapter as a basis, this chapter details the analyses that were conducted to achieve the remainder of the research objectives of Stage One:

(c) Establish preliminary evidence for the generalisability of the 'Difficulty' scale across measurement contexts (i.e., university, gender, level of degree, administration format).

(d) Establish preliminary evidence that the 'Difficulty' scale can be used as an outcome measure (i.e., is sensitive to detecting change over time).

(e) Develop a keyform for the 'Difficulty' scale that can be used to estimate a student's measure of occupational performance difficulties in practice.

(f) Improve the rating scale functioning of the 'Importance' scale.

The chapter begins by outlining the preliminary differential item functioning analyses conducted across university context, gender, level of degree, and administration format (5.2). Next, the preliminary outcome measurement analysis is outlined to determine if the 'Difficulty' scale is stable across time and is sensitive to detecting changes in person measures (5.3). A paper-and pencil keyform is developed for use in practice (5.4) Moreover, the rating scale functioning of the 'Importance' scale was improved to make it easier to use in practice (5.5). Finally, the chapter concludes (5.6).

5.2 Preliminary Differential Item Functioning Analysis

Preliminary differential item function (DIF) analyses were conducted on the 54-item 4-point *TSP* 'Difficulty' item-set to provide evidence of generalisability across contexts (Messick, 1989). DIF was investigated across university context (i.e., TCD/UCD), gender (i.e., male/female), level of degree (i.e., undergraduate/postgraduate), and

administration format (i.e., paper/Excel). Mokkink et al. (2019) outlines appropriate sample sizes for DIF analyses, and suggests that ≥200 subjects per group is 'very good', 150-199 is considered 'adequate', 100-149 is considered 'doubtful' and <100 subjects are considered 'inadequate'. Although all available data was collected, it is acknowledged that some samples were below *COSMIN* guidelines (Mokkink et al., 2019). No changes were made to the tool as a result of these analyses, they were simply conducted for exploratory purposes. Figure 5.1 provides an overview of the DIF indicators (Linacre, 2020a; Zwick et al., 1999) described in 'Chapter 3'. Full outputs for the DIF analyses can be found in Appendix 5.1.

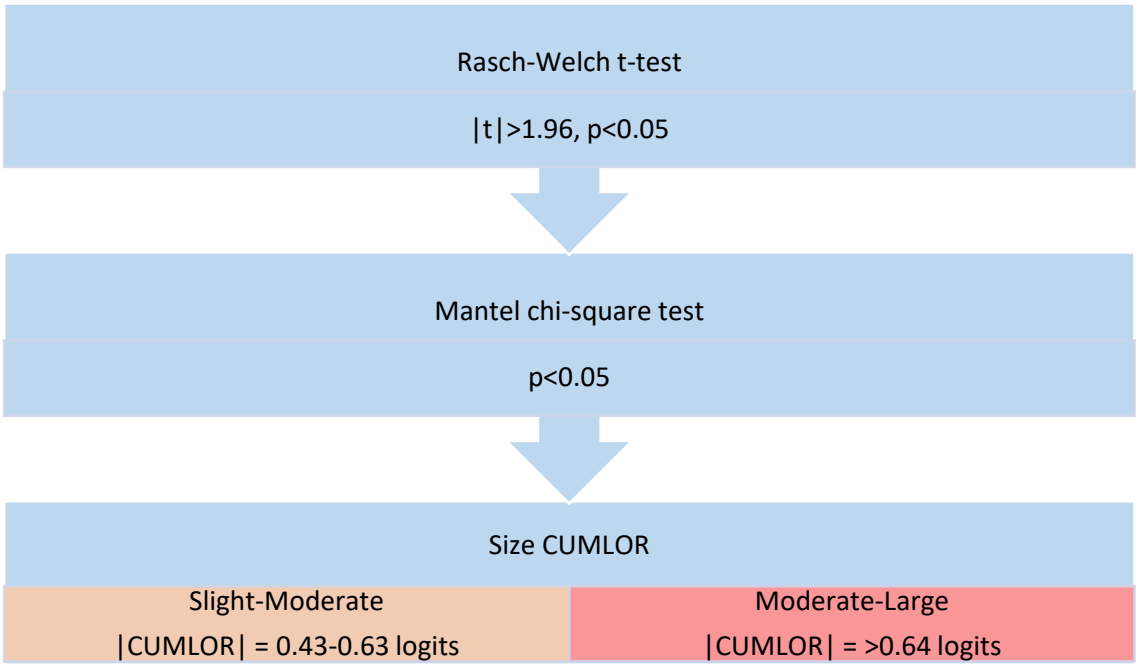


Figure 5.1: Differential item functioning indicators

5.2.1 DIF – across University Context (i.e., TCD/UCD)

The TCD group was the reference group (N=569), while UCD was the focal group (N=98). *'Being on time for College (lectures, labs etc.) [ONTIMECO]'* was the only item to demonstrate a DIF between the TCD and UCD groups, with the TCD group reporting higher levels of occupational difficulty with this item than UCD (Table 5.1). However, this DIF is considered slight-moderate with a size CUMLOR of -0.59.

Table 5.1: DIF Analysis Across University Context - TCD (N=569*) vs UCD (N=98)**

Item	Rasch-Welch t-test	Mantel chi-square	Size CUMLOR	Interpretation
ONTIMECO	*t*(129)=-3.01 *p*=0.0032	4.3133 *p*=0.0378	-0.59	TCD group reported higher levels of occupational performance difficulty

* = Very good (Mokkink et al., 2019); ** = Inadequate (Mokkink et al., 2019); Size CUMLOR = cumulative log of odds ratio. Interpretation: |CUMLOR|=0.43-0.63 logits is slight-moderate (orange); |CUMLOR|=>0.64 logits is moderate-large (red).

5.2.2 DIF – across Gender (i.e., Male/Female)

The Male group was the reference group (N=323), and the Female group was the focal group (N=341) (Table 5.2). As for the items in which Females reported higher levels of occupational performance difficulties, those demonstrating a moderate-large DIF size included *'Managing stress before an exam [MANSTREE]'* and *'Managing anxiety [MANANXIE]'*, while those demonstrating a slight-moderate DIF size included *'Managing panic and 'writer's block' [MANPANIC]'*, *'Receiving and coping with bad results RECBADRE]',* and *'Switching off and relaxing [SWITCHOF]'*. As for the items in which Males reported higher levels of occupational performance difficulties, those demonstrating a moderate-large DIF size included *'Managing alcohol intake [MANALCOH]*', *'Taking notes in class [TAKENOTE]*', and *'Organising information [ORGANISE]*', while those demonstrating a slight-moderate DIF size included '*Managing finances/bills [MANFINAN]*' and *'Writing study notes after class [NOTESAFT]*'.

Table 5.2: DIF Analysis Across Gender - Male (N=323*) vs Female (N=341*)

Item	Rasch-Welch t-test	Mantel chi-square	Size CUMLOR	Interpretation
MANSTREE	*t*(621)=5.93	22.0858	0.89	Females reported
	p=0.0000	*p*=0.0000		higher levels of
MANANXIE	*t*(641)=6.00	15.4553	0.72	occupational
	p=0.0000	*p*=0.0001		performance
MANPANIC	*t*(616)=3.37	11.4076	0.62	difficulties
	p=0.0008	*p*=0.0007		
RECBADRE	*t*(631)=3.65	6.1291	0.46	
	p=0.0003	*p*=0.0133		
SWITCHOF	*t*(644)=4.20	7.4183	0.49	
	p=0.0000	*p*=0.0065		
MANALCOH	*t*(632)=-3.27	12.9947	-0.74	Males reported
	p=0.0001	*p*=0.0003		higher levels of
TAKENOTE	*t*(626)=-4.30	12.7473	-0.66	occupational
	p=0.0000	*p*=0.0004		performance
ORGANISE	*t*(628)=-4.43	17.3665	-0.79	difficulties
	p=0.0000	*p*=0.0000		
MANFINAN	*t*(631)=-2.72	9.4608	-0.58	
	p=0.0067	*p*=0.0021		
NOTESAFT	*t*(609)=-3.10	8.2326	-0.53	
	p=0.0020	*p*=0.0040		

* = Very good (Mokkink et al., 2019); Size CUMLOR = cumulative log of odds ratio. Interpretation: |CUMLOR|=0.43-0.63 logits is slight-moderate (orange); |CUMLOR|=>0.64 logits is moderate-large (red).

5.2.3 DIF – Across Level of Degree (i.e., Undergraduate/ Postgraduate)

The Undergraduate group was the reference group (N=594), while the Postgraduate group was the focal group (N=68) (Table 5.3). As for the items in which Undergraduates reported higher levels of occupational performance difficulties, those which demonstrated a moderate-large DIF size included *'Understanding the content of lectures [UNDERCON]'*, '*Understanding the course structure and content [COURSTRU]'*, *'Using computers [USECOMP]'*, and *'Managing Tutor/Student Advisor System [MANTUTOR]'*,

with one item demonstrating a slight-moderate DIF size, *'Knowing how best to study [KNOWBEST]'*. There were three items in which Postgraduates reported higher levels of occupational performance difficulties which demonstrated a moderate-large DIF size including *'Switching off and relaxing [SWTICHOF]*', *'Dealing with time pressures and deadlines [PRESSDEA]'*, and *'Achieving goals [ACHIEVEG]'*.

Table 5.3: DIF Analysis Across Level of Degree - Undergraduates (N=594*) vs Postgraduates (N=68)**

Item	Rasch-Welch t-test	Mantel chi-square	Size CUMLOR	Interpretation
UNDERCON	*t*(69)=-2.69	7.0803	-0.80	Undergraduates
	p=0.0090	*p*=0.0078		reported higher
COURSTRU	*t*(71)=-2.59	4.0732	-0.64	levels of
	p=0.0117	*p*=0.0436		occupational
USECOMP	*t*(61)=-2.54	4.8771	-1.12	performance
	p=0.0492	*p*=0.0272		difficulties
MANTUTOR	*t*(47)=-3.76	13.7109	-1.74	
	p=0.0005	*p*=0.0002		
KNOWBEST	*t*(62)=-2.05	4.2724	-0.60	
	p=0.0445	*p*=0.0387		
SWITCHOF	*t*(76)=3.84	8.4433	0.91	Postgraduates
	p=0.0003	*p*=0.0037		reported higher
PRESSDEA	*t*(74)=3.03	12.5528	1.25	levels of
	p=0.0033	*p*=0.0004		occupational
ACHIEVEG	*t*(74)=2.27	9.1681	0.99	performance
	p=0.0264	*p*=0.0025		difficulties

* = Very good (Mokkink et al., 2019); ** = Inadequate (Mokkink et al., 2019); Size CUMLOR = cumulative log of odds ratio. Interpretation: |CUMLOR|=0.43-0.63 logits is slight-moderate (orange); |CUMLOR|=>0.64 logits is moderate-large (red).

5.2.4 DIF – across Administration Format (i.e., paper-based *TSP*/Excel-based *eTSP*)

The Paper-based *TSP* group was the reference group (N=444), while the Excel-based *eTSP* group was the focal group (N=223) (Table 5.4). *'Managing flatmates/housemates [MANHOUSE]'* was the only item to demonstrate a DIF, with the Excel-based *eTSP* group reporting higher levels of occupational difficulty with this item than the Paper-based *TSP*. However, this DIF is considered slight-moderate with a size CUMLOR of 0.55.

Table 5.4: DIF Analysis Across Administration Formats - Paper-based *TSP* (N=444*) vs Excel-based *eTSP* (N=223*)

Item	Rasch-Welch t-test	Mantel chi-square	Size CUMLOR	Interpretation
MANHOUSE	*t*(338)=2.05	5.7273	0.55	Excel-based *eTSP*
	p=0.0413	*p*=0.0167		group reported
				higher levels of
				occupational
				performance
				difficulty

* = Very good (Mokkink et al., 2019); Size CUMLOR = cumulative log of odds ratio. Interpretation: |CUMLOR|=0.43-0.63 logits is slight-moderate (orange); |CUMLOR|=>0.64 logits is moderate-large (red).

5.3 Preliminary Outcome Measurement Analysis

To determine if the *TSP* has the capability of detecting change across time (i.e., responsiveness [MOT, 1995]), a preliminary outcome measurement analysis was conducted using the standardised difference formula (Wolfe, & Chiu, 1999). To recap, the procedure (outlined in 3.3.4.2 in 'Chapter 3') involves assessing the invariance or stability of the tool and subsequently the sensitivity of the tool (Figure 5.2). The stability analysis is concerned with the stability of the item difficulty measures (i.e., do the items calibrate at the same point on the logit scale across time?) and with the stability of the Andrich thresholds (i.e., is the rating scale used the same across time?). If the item difficulty measures and Andrich Thresholds demonstrate stability, then the standardised difference formula can be applied to the person measures to assess if the *TSP* is sensitive to detecting significant changes over time in either direction. If either the item difficulty measures or Andrich Thresholds demonstrate instability over time, these parameters are anchored (i.e., put on a common scale) prior to investigating the sensitivity of the person measures.

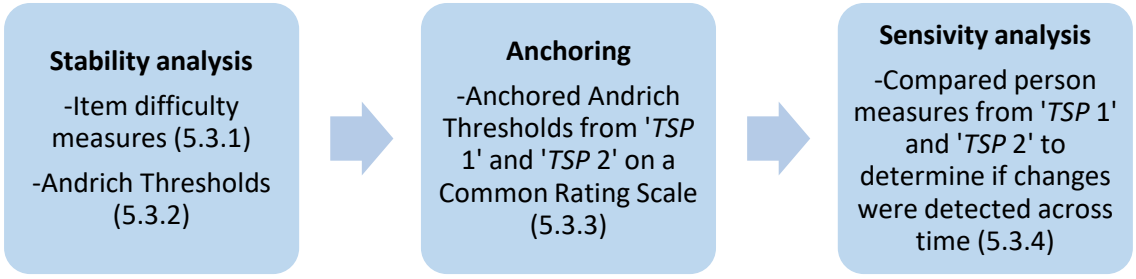


Figure 5.2: Preliminary outcome measurement analysis process (relevant sections given in brackets)

This section outlines the investigation into the stability and sensitivity of the 54-item 4-point *TSP* 'Difficulty' item-set. 91 students completed an initial assessment ('*TSP* 1') and a repeat assessment ('*TSP* 2'). This sample was adequate as Linacre (1994) and Azizan et al. (2020) advise that there should be as many items as there are persons for measures to be produced within ±1 logits with a 95% confidence interval. The '*TSP* 1' data was part

of the overall 667 sample which were subjected to refinement in 'Chapter 4'. As the '*TSP* 2' data was collected in the original 74-item 6-point format, the refinements made in 'Chapter 4' were similarly applied to this data, resulting in a 54-item 4-point '*TSP* 2' dataset for these 91 students. The sample demographics for the 91 students who completed '*TSP* 1' and '*TSP* 2' are outlined in Table 5.5. Certain variables remained the same across time (e.g., University, gender, disability, Faculty), whereas others have changed either due to missing data, a student moving from undergraduate to postgraduate study, or completing a paper-based *TSP* and then an Excel-based *eTSP* for their repeated measure. There was a mean of 11.18 months (SD 8.618 months) between '*TSP* 1' and '*TSP* 2', while the mode or most frequently reported interval between administrations was 12 months. The largest interval between '*TSP* 1' and '*TSP* 2' administrations was 40 months. It was not possible to gather any further data regarding the rationale behind various intervals between administrations (e.g., if it was a repeated *TSP*; if a student took a leave of absence or disengage from occupational therapy for a period and then returned; if a student changed course between intervals etc.). Hence, the results from the following outcome measurement analysis must be considered within the limited context of this data.

Table 5.5: Sample demographics of '*TSP* 1' and '*TSP* 2' administrations

Sample demographics	***TSP* 1 (N=91)**	***TSP* 2 (N=91)**
Gender		
Male	47 (51.6%)	47 (51.6%)
Female	43 (47.3%%)	43 (47.3%)
Missing	1 (1.1%)	1 (1.1%)
University		
TCD	78 (85.7%)	78 (85.7%)
UCD	13 (14.3%)	13 (14.3%)
Format		
Paper (*TSP*)	87 (95.6%)	73 (80.2%)
Excel (*eTSP*)	4 (4.4%)	18 (19.8%)
Level of degree		
Undergraduate	87 (95.6%)	77 (84.6%)
Postgraduate	3 (3.3%)	5 (5.5%)
Missing	1 (1.1%)	9 (9.9%)

Disability		
Depression	19 (20.9%)	19 (20.9%)
Autism	22 (24.2%)	22 (24.2%)
Attention Deficit Hyperactivity Disorder	8 (8.8%)	8 (8.8%)
Anxiety	8 (8.8%)	8 (8.8%)
Mental Health Other	19 (20.9%)	19 (20.9%)
Dyspraxia/Specific Learning Difficulty	7 (7.6%)	7 (7.6%)
Other (physical, sensory, significant ongoing illness, neurological, speech & language)	8 (8.8%)	8 (8.8%)
Repeating (e.g., modules, entire year)		
No	70 (76.9%)	56 (61.5%)
Yes	16 (17.6%)	22 (24.2%)
Missing	5 (5.5%)	13 (14.3%)
Faculty		
Arts, Humanities, Social Science, Law, Business	53 (58.2%)	53 (58.2%)
Science, Engineering, Mathematics, Architecture	22 (24.2%)	22 (24.2%)
Health, Agricultural Sciences	16 (17.6%)	16 (17.6%)
Time interval between *TSP* administrations		
Mean (standard deviation) in months	11.18 months (SD 8.618 months)	
Mode in months	12 months	
Median (Range) in months	10 months (40 months)	

5.3.1 Stability analysis Item difficulty measures across time

Separate RSM (Andrich, 1978) analyses were conducted on the '*TSP* 1' and '*TSP* 2' data. The item difficulty measures and standard errors for the 54 items from separate analyses were gathered and the standardised difference formula (Wolfe, & Chiu, 1999) was applied (Table 5.6). Any $|z| > 1.96$ indicated items whose difficulty measure significantly changed over time or did not remain stable. *z* values ranged from -1.41 to 1.57, indicating that no items demonstrated a significant change over time and hence item difficulty measures of the 54-item *TSP* 'Difficulty' scale remained stable/invariant across time.

Table 5.6: Item Difficulty Measure Stability Calculations

Item Codes*	*TSP* 1 Measure	*TSP* 1 SE	*TSP* 2 Measure	*TSP* 2 SE	*z*-test
ONTIMECO	0.32	0.13	0.28	0.13	0.22
CONCENLE	-0.32	0.13	-0.43	0.13	0.6
UNDERCON	0.24	0.13	0.26	0.13	-0.11
LIBSYSTE	0.67	0.14	0.88	0.15	-1.02
TOPIC	0.26	0.13	0.11	0.13	0.82
DEPARTEX	-0.3	0.13	-0.09	0.13	-1.14
COURSTRU	0.11	0.13	0.23	0.13	-0.65
CONCENST	-1.07	0.14	-1.3	0.14	1.16
PROCRAST	-1.28	0.15	-1.32	0.14	0.19
KNOWBEST	-0.76	0.13	-0.92	0.13	0.87
REMSTUDY	-0.48	0.13	-0.66	0.13	0.98
MANSTREE	-0.55	0.13	-0.49	0.13	-0.33
DECQUES	0.3	0.13	0.23	0.14	0.37
MANPANIC	-0.34	0.13	-0.15	0.13	-1.03
RECBADRE	-0.24	0.13	-0.29	0.13	0.27
MANANXIE	-0.77	0.13	-0.76	0.13	-0.05
MENSTAMI	-0.98	0.14	-0.78	0.13	-1.05
BECONFID	-0.74	0.13	-0.71	0.13	-0.16
MANANGER	0.48	0.13	0.26	0.13	1.2
PERFECTI	-0.71	0.13	-0.59	0.13	-0.65
SWITCHOF	-0.22	0.13	-0.18	0.13	-0.22
QUALSLEE	-0.73	0.13	-0.85	0.13	0.65
TOLERATE	-0.22	0.13	-0.29	0.13	0.38
MANLABPL	0.69	0.15	0.7	0.16	-0.05
GETEXAMH	1.26	0.16	1.22	0.16	0.18
USECOMPU	1.17	0.15	1.05	0.16	0.55
MANTUTOR	0.71	0.14	0.84	0.15	-0.63
INVOLVES	0	0.13	0.19	0.13	-1.03
COMMPEOP	0.24	0.13	0.25	0.13	-0.05
COMMSUPE	0.46	0.14	0.49	0.14	-0.15
MANHOUSE	0.99	0.15	1.03	0.17	-0.18
MANFAMIL	0.28	0.13	0.18	0.13	0.54
MANFINAN	0.53	0.13	0.23	0.14	1.57
NUTRITNE	0.27	0.13	0.02	0.13	1.36
MEDICATI	1.03	0.15	0.9	0.15	0.61
SHOPHOUS	0.8	0.14	0.65	0.14	0.76
MANALCOH	1.23	0.15	1.16	0.16	0.32
MANSUBST	2.28	0.22	1.94	0.22	1.09
PARTDISC	-0.18	0.13	0.05	0.13	-1.25
WORKGROU	0.03	0.13	0.03	0.13	0
PRESENTA	-0.38	0.13	-0.19	0.13	-1.03
ASKHELP	-0.16	0.13	0.01	0.13	-0.92
PRESSDEA	-1.01	0.14	-0.83	0.13	-0.94
ACHIEVEG	-0.81	0.14	-0.83	0.13	0.1

WORKOVER	-1.36	0.15	-1.07	0.14	-1.41
MANFREET	-0.59	0.13	-0.42	0.13	-0.92
PRACTICA	0.57	0.16	0.45	0.16	0.53
GETDOWNW	-0.85	0.14	-0.84	0.13	-0.05
STAYDOEX	0.8	0.15	0.94	0.16	-0.64
TAKENOTE	0.25	0.13	0.19	0.13	0.33
REFERENC	0.11	0.13	0.1	0.13	0.05
NOTESAFT	-0.18	0.13	-0.21	0.13	0.16
ORGANISE	-0.3	0.13	-0.27	0.13	-0.16
STRUCTPL	-0.53	0.13	-0.42	0.13	-0.6

Key: * = full item names in Appendix 1.2; Bold = indicates significant result (|*z*|>1.96); S. E. = standard error

5.3.2 Stability analysis: Andrich Thresholds across time

From the separate RSM (Andrich, 1978) analyses, the Andrich Thresholds and the standard errors of the 4-point scale were gathered from the '*TSP* 1' and '*TSP* 2' administrations and the standardised difference formula (Wolfe, & Chiu, 1999) was applied (Table 5.7). There was evidence that the Andrich Thresholds calibrated differently across time as the first threshold (between categories '*0=No difficulty*' and '*1=Some difficulty*') had a *z*=5.30 and the third threshold (between categories '*2=Moderate difficulty*' and '*3=Extreme difficulty*') had a *z*=-3.59.

Table 5.7: Andrich Threshold Stability Calculations

Threshold	***TSP* 1 Measure**	***TSP* 1 SE**	***TSP* 2 Measure**	***TSP* 2 SE**	***z*-test**
1 (between category 0 and 1)	-0.77	0.04	-1.07	0.04	**5.30**
2 (between category 1 and 2)	-0.29	0.04	-0.22	0.04	-1.24
3 (between category 2 and 3)	1.06	0.04	1.29	0.05	**-3.59**

Key: Bold = indicates significant result (|*z*|>1.96); S. E. = standard error

Figure 5.3 displays the Andrich Thresholds from '*TSP* 1' and '*TSP* 2' on a logit scale to visually demonstrate the difference. At '*TSP* 2', students were more likely to use categories '*1=Some difficulty*' or '*2=Moderate difficulty*' than at '*TSP* 1'. Whereas students were more likely to use categories '*0=No difficulty*' or '*3=Extreme difficulty*' at '*TSP* 1' than at '*TSP* 2'. This may be because students gain greater insight into their difficulties as they gain more experience of college. Similarly, students may not have had the opportunity to engage in some aspects of college at '*TSP* 1' (e.g., a first-year student

completing the *TSP* in September before sitting any exams or handing in assignments), hence influencing their rating across time.

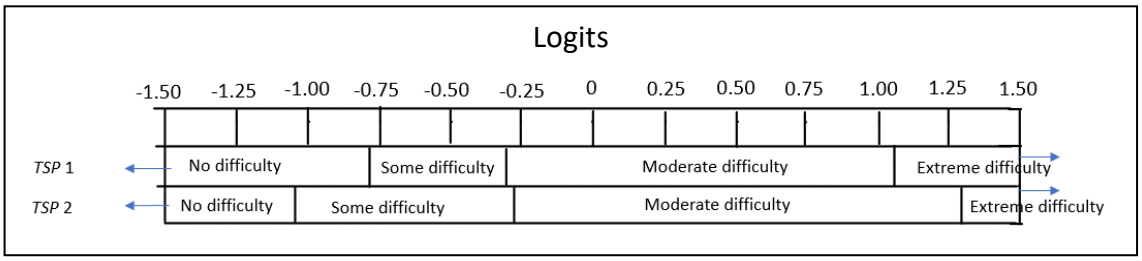


Figure 5.3: Visual representation of Andrich Thresholds from '*TSP* 1' and '*TSP* 2'

5.3.3 Creating a common rating scale

As the 4-point rating scale was found to function differently across '*TSP* 1' and '*TSP* 2' in 5.3.2, it was necessary to calibrate the data on a common rating scale in order for the person measures to be accurately assessed in the sensitivity analysis. To do this, '*TSP* 1' and '*TSP* 2' data were analysed together (otherwise known as stacking [Wolfe, & Chiu, 1999]), which means that each of the 91 students appeared twice in the analysis. This stacked data was analysed, and the average Andrich Thresholds were gathered and used as an anchor. A separate RSM (Andrich, 1978) analysis was conducted on the '*TSP* 1' and '*TSP* 2' data, but the Andrich Thresholds in both analyses were anchored using the average Andrich Thresholds from the stacked analysis. No items needed to be anchored as the item difficulty measures were demonstrating invariance across time as per 5.3.1. The person measures from these analyses were then generated.

5.3.4 Sensitivity analysis: Person measures across time

After gathering the person measures for '*TSP* 1' and '*TSP* 2' using the common rating scale, the standardised difference formula (Wolfe, & Chiu, 1999) was applied to determine if the 'Difficulty' scale was capable of detecting significant change across time in either direction (Appendix 5.2). Any $|z| > 1.96$ indicated person measures which had significantly changed over time (Table 5.8). Person measures that demonstrated a *z* value > 1.96 indicated that the student was experiencing **lower levels** of occupational performance difficulties at '*TSP* 2' than at '*TSP* 1', whereas person measures that demonstrated a *z* value < -1.96 indicated that the student was experiencing **higher levels**

of occupational performance difficulties at '*TSP* 2' than at '*TSP* 1'. Overall, there was a significant change detected in the person measures across time in both directions in 45 (49.5%) of the 91 *TSP*s. Although this provides evidence that the *TSP* can be used as an outcome measure in practice, Kielhofner, Dobria, Forsyth and Kramer (2009) highlight how the standardised difference procedure (Wolfe, & Chiu, 1999) is not suitable to be implemented in practice and that the use of a paper-and-pencil keyform may be easier to use for therapists in practice, which is developed in the following section.

Table 5.8: Sensitivity Analysis - Person Measures

***z*-test**	**Interpretation**	**Number of *TSP*s (N=91)**
z>1.96	Significantly **lower levels** of occupational performance difficulties at '*TSP* 2' than at '*TSP* 1'.	14 (15.4%)
z<-1.96	Significantly **higher levels** of occupational performance difficulties at 'TSP 2' than at 'TSP 1'.	31 (34.1%)
	Total	45 (49.5%)

5.4 Development of a Keyform

A keyform is a paper-and-pencil form that can generate instantaneous person measures without needing to use Rasch software (Kielhofner, Dobria, Forsyth, & Basu, 2005; Linacre, n.d.). Velozo (2021) also advocates that keyforms enable the identification of just-right challenges for intervention and help clients develop an awareness about their difficulties. The *TSP*'s keyform (Appendix 5.3) allows a therapist to quickly estimate a student's level of occupational performance difficulty within the student role regardless of missing data. These person measures can be used to determine if a change has occurred across time or to assess the impact of an intervention. Furthermore, person measures are usually presented in logits which can be difficult for therapists who are unfamiliar with the methodology to interpret. Hence, to improve the interpretability (MOT, 1995) of the measures, metric transformation was used to convert the logit scale into a 0-100 scale which is easier for therapists to interpret and explain to students (Wolfe, & Smith, 2007b).

An example of the *TSP* keyform is shown in figure 5.4. The items are presented in a hierarchical order in a vertical axis on the right-hand side, and the 0-3 'Difficulty' rating scale categories for each item are displayed along the continuum of 'occupational performance difficulty within the student role'. At the bottom of the page on the horizontal axis there are two scales: a logit scale (green) which reflects the person measure in logits; and converted 0-100 scale (yellow). The person measures ranged from -3.14 logits (0 on the 0-100 scale) to 1.66 logits (100 on the 0-100 scale). Ratings that are beyond this range would be considered extreme and are very unlikely to occur in practice. Students who would be receiving ratings below -3.14 logits are experiencing no difficulties with occupational performance within their student role and are likely not engaging with occupational therapy services. On the other hand, students who would be receiving ratings above 1.66 logits are experiencing extremely high levels of occupational performance difficulties with the items that are considered less difficult to manage such as '*Managing/avoiding other substances [MANSUBST]*', '*Getting to the exam hall [GETEXAMH]*', '*Use computers [USECOMP*]' and '*Managing alcohol intake[MANALCHO]*'. It is likely that people with such high levels of occupational performance difficulties may not be ready to manage a student role in higher education and hence are likely not engaged in a course at that time. Therefore, the ranges highlighted in green and yellow represent the typical range of occupational performance difficulties.

Figure 5.4 provides a worked example of how to use the keyform in practice:

1. Print out the keyform.
2. Circle the rating scale categories for each item depending on the student's answers on the 'Difficulty' scale in the 'Identifying Needs' section.
3. Draw a line of best fit down through the circles.
4. Read the logit and/or 0-100 scale person measure. Higher scores indicate higher levels of occupational performance difficulties whereas lower scores indicate lower levels of occupational performance difficulties. The example in Figure 5.4 demonstrates a logit measure of approximately 1.00 logit or approximately 81 on a 0-100 scale of occupational performance difficulties.

5. If the student has done a repeated measure, steps 2-4 can be followed again on the same sheet using either a different symbol (i.e., a triangle) or different colour pen for the second administration scores, after which the person measures can be compared.

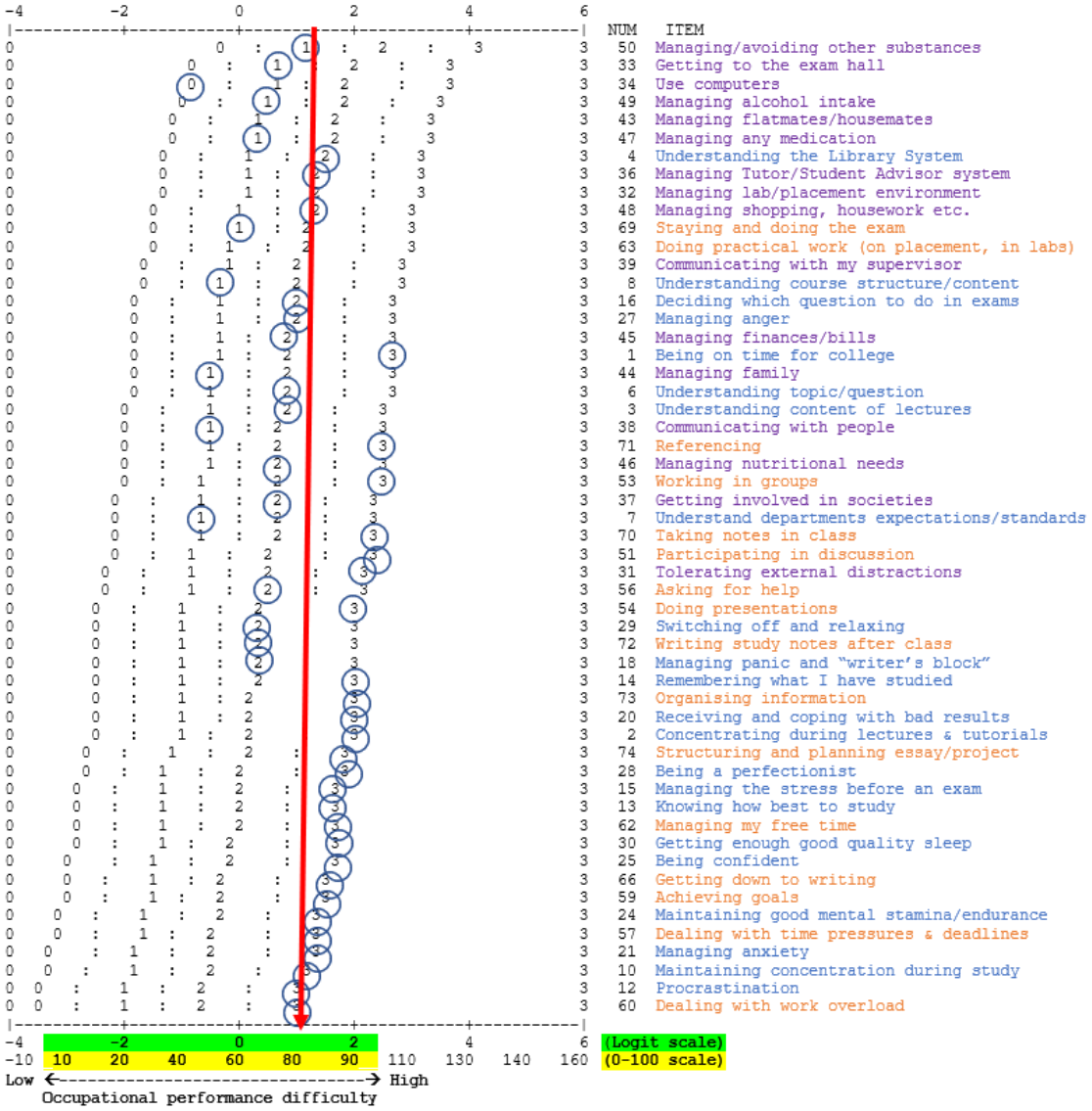


Figure 5.4: *TSP* 'Difficulty' scale keyform - worked example

5.5 Rating scale functioning of the 'Importance' scale

As explained in 'Chapter 1', an in-depth Rasch analysis was not conducted on the 'Importance' scale, other than an investigation into the rating scale functioning of the 6-point Likert scale. Nolan (2011) intended for the 'Importance' scale to be used as a mechanism to prioritise the difficulties identified in the 'Difficulty' scale. The 'Importance' scale does not seek to measure the importance or value that the student assigns to a particular item, but rather what difficulties are most relevant for them to prioritise for occupational therapy at that time, making it highly subjective and individualised to a particular student. Hence, it was decided that conducting an in-depth Rasch analysis of the 'Importance' scale would be redundant. However, as six rating scale categories was found to be difficult for students to differentiate between on the 'Difficulty' scale, hence the rating scale functioning of the 6-point 'Importance' scale was analysed using the 54 *TSP* items to make it easier for students to use in practice. As a reminder, the 'Importance' scale is a 6-point Likert-style scale (i.e., *'0=Not important' – '5=Great importance'*) and the adjectival descriptors of the middle categories are not displayed on the measure (i.e., *1=Some importance, 2=mild importance, 3=Medium importance, 4=Moderate importance*). The data completion rates for the 54-item 6-point 'Importance' scale can be found in Appendix 5.4.

Linacre's (2004) criteria for optimally functioning rating scales was employed (Table 5.9). In the 6-point scale, several categories were disordered as per the Andrich Thresholds which were not monotonically increasing. Similar to the 'Difficulty' scale, this indicates that six categories are too many for students to differentiate between, especially considering the similar nature of the qualitative category labels which were also not displayed on the tool. As several Andrich Thresholds were disordered, the first one collapsed was the one with the largest interval between thresholds, being categories '*1=Some importance'* and '*2=Small importance',* forming a 5-point scale. This 5-point scale demonstrated further category disordering, leading to a further collapsing of categories into a 4-point rating scale. Although this 4-point rating scale did not demonstrate disordering, it demonstrated evidence of category redundancy in that the thresholds of categories 1 and 2 were so close they were indistinguishable (-0.36 and -

0.35 respectively). This led to the creation of a 3-point 'Importance' scale which demonstrated optimal rating scale functioning as per Linacre's (2004) guidelines (Table 5.9). Similar to the 'Difficulty' scale, a '*NA=Not applicable'* option has been added to the refined 'Importance' scale to give students the ability to indicate items which are not applicable to their specific course (Table 5.10).

Table 5.9: Summary of Rating Scale Functioning of the 54-item 'Importance' Scale – 6-, 5-, 4- and 3-point scales

	6-point rating scale						5-point rating scale					4-point rating scale				3-point rating scale		
	0	1	2	3	4	5	0	1	2	3	4	0	1	2	3	0	1	2
Frequency	10144	3671	3419	4361	4357	6541	10144	7090	4361	4357	6541	10144	7090	8718	6541	10144	15808	6541
N (%)	(31%)	(11%)	(11%)	(13%)	(13%)	(20%)	(31%)	(22%)	(13%)	(13%)	(20%)	(31%)	(22%)	(27%)	(20%)	(31%)	(49%)	(20%)
Average Measure	-0.63	-0.31	-0.15	0.00	0.18	0.42	-0.83	-0.34	-0.06	0.17	0.49	-1.06	-0.37	0.13	0.71	-1.57	-0.15	0.98
Outfit *MnSq*	1.03	1.06	0.87	0.98	1.08	1.13	1.00	0.98	0.92	1.06	1.18	1.02	0.91	0.98	1.13	0.98	0.91	1.12
Andrich Threshold	None	**0.53**	**-0.21**	**-0.33**	**0.10**	**0.09**	None	-0.23	**0.24**	**0.05**	**-0.05**	None	*-0.36*	*-0.35*	0.71	None	-1.29	1.29

Key: Bold = decrease in Andrich Threshold indicating disordered categories; Italic = categories not disordered but so close considered indistinguishable; *MnSq* = mean square fit statistic

Table 5.10: Category labels of the 3-point 'Importance' scale

Category	0	1	2	N/A
Label	No importance	Some importance	Great importance	Not applicable

5.6 Conclusion

This chapter outlined the preliminary DIF analysis, outcome measurement analysis and development of a keyform of the 54-item 4-point 'Difficulty' scale, as well as refinement of the rating scale functioning of the 'Importance' scale. Although the results are preliminary, the DIF analysis demonstrated how male and female students may report differing levels of occupational performance difficulties in certain items, which is also the case for undergraduate and postgraduate students. There was also a slight-moderate DIF found on one item in the 'Difficulty' scale across both university context and administration format, indicating that, otherwise, the tool is generalisable across TCD and UCD and regardless of if it is administered via paper-based or electronic means. This chapter indicated that there is preliminary evidence to support the *TSP* being used as an outcome measure, and a paper-and-pencil keyform can support therapists to capture a change in a student's level of occupational performance difficulties in practice. Finally, similar to the 6-point 'Difficulty' rating scale, the 6-point 'Importance' rating scale was demonstrating category disordering and was collapsed to a 3-point scale.

6 Chapter 6: Qualitative Focus Group Findings (Stage Two)

6.1 Introduction

This chapter outlines the findings from Stage Two of the research:

(a) Gather the experiences of occupational therapists in using each section of the 2014 version of the *eTSP* in practice to identify if refinements of other sections of the tool are warranted.

(b) Train the occupational therapists in using the refined 'Identifying Needs' section and gather their experiences after a period of using this in practice.

(c) Make final refinements to each section of the tool and devise an administration manual on how to use the tool that is accessible for occupational therapists wishing to use the tool in their practice.

In order to give context to these findings, this section (6.1) outlines the purpose and timeline for the focus groups, a re-orientation to the 2014 version of the *eTSP*, and a description of the sample for this Stage of the research. The four themes that were generated from the thematic analysis (Braun, & Clarke, 2012) will then be discussed (6.2). The additional refinements made to the tool as a result of the focus groups will be presented (6.3), as well as justification for re-branding the tool as the *Trinity Student Occupational Performance Profile* (*TSOPP*) and developing an administration manual (6.4), ending the chapter with a conclusion (6.5).

6.1.1 Purpose & timeline of the focus groups

The focus groups with occupational therapists sought to gather information on the face validity and clinical utility of the refined *eTSP* in practice. Figure 6.1 outlines the timeline of both Stage One and Stage Two research activities over the project. This section provides a preview of the order of developments in the project, which will be further contextualised throughout the chapter.

The Initial Focus Group (FG1) and training were conducted in January 2021 after the major refinements had been made the 'Identifying Needs' section as a result of Rasch analysis, creating the 2021 version of the *eTSP*. The purpose of FG1 was to gain insight into the experiences of occupational therapists in using the 2014 version of the *eTSP* (Appendix 1.1) in practice. This helped to identify the issues that existed with the 2014 version of the tool. The occupational therapists were then trained in how to use the refined 2021 version of the *eTSP* (Appendix 6.1) and were asked to trial it in practice during trimester two of the Academic Year 2020/2021. The only sections that were changed from the 2014 version at this juncture was the refined 'Identifying Needs' section, and the re-introduction of a section called the 'Module Matrix' (formerly known as 'Course Demands') which was originally in the paper-based *TSP* but did not get translated over to the Excel-based *eTSP.*

The Follow-up Focus Group (FG2) was conducted in June 2021 at the end of the trial period. The purpose of the FG2 was to gain insight into the experiences of occupational therapists using the refined 2021 version of the *eTSP* in practice. This helped to determine if the Rasch analysis refinements had an impact on any of the issues identified with the tool in FG1. Furthermore, FG2 enabled the identification of the need for other refinements to improve the tool's face validity and clinical utility, but which could not be rectified using Rasch analysis. These refinements subsequently resulted in the 2022 version of the tool which was re-branded as the *Trinity Student Occupational Performance Profile* (*TSOPP*) which will be discussed further in section 6.4.

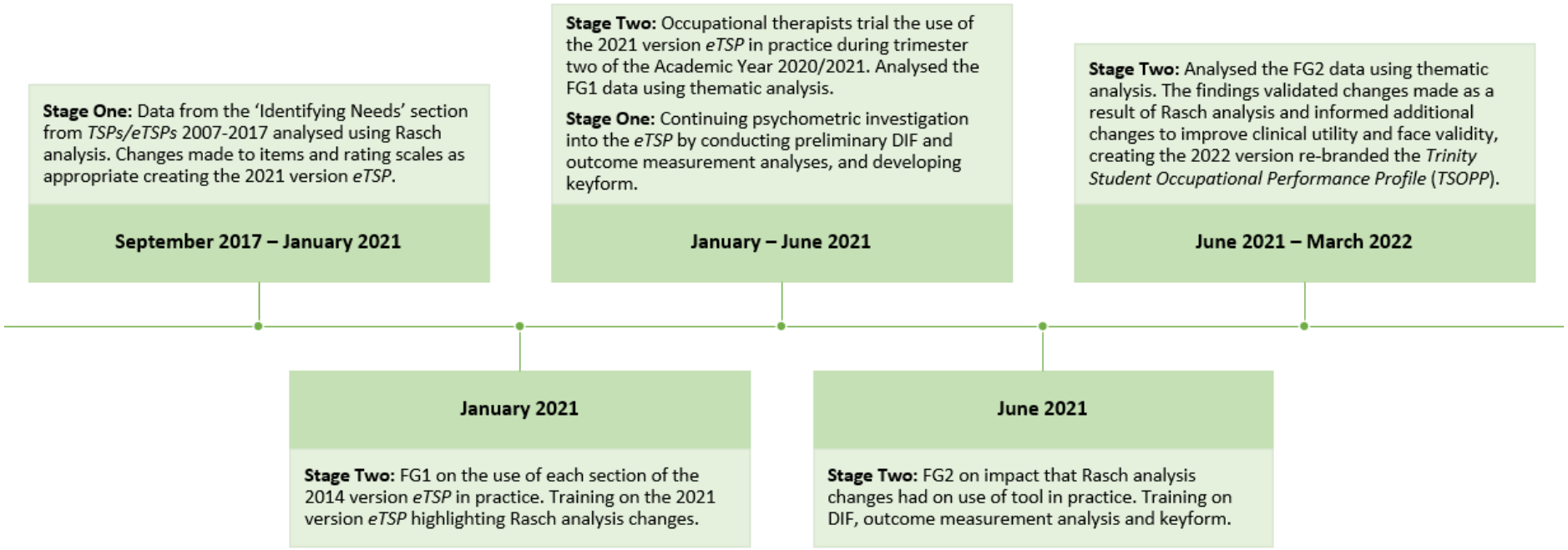


Figure 6.1: Timeline of Research Project

6.1.2 Re-orientation to the 2014 version of the *eTSP*

As FG1 was concerned with gaining the experiences of occupational therapists in using the 2014 version of the *eTSP* in practice, this section provides re-orientation to this version of the tool. Nolan (2011) developed and piloted the original paper-based version of the *TSP* within occupational therapy practice in higher education. This study provided preliminary evidence of validity and reliability for the tool (Nolan, 2011). This 2011 version was then utilised within the occupational therapy service in TCD and subsequently when the service was established in 2012/2013 in UCD and TUDublin.

In 2014, a clinical audit of the TCD service was conducted to determine if the service was following best practice guidelines and standards (Nolan, & Creaner, 2014). The Regulation and Quality Improvement Authority (RQIA; n.d.) describe how clinical audits and research share commonalities, including rigorous methods used to achieve their aims, but that there are distinctions between audits and research. Clinical audits are used to determine if a service is doing what it should be doing in accordance with guidelines of best practice. Whereas research is concerned with evaluating practice with the aim of broadening knowledge regarding a particular subject (RQIA, n.d.). During this audit, Nolan and Creaner (2014, p.5) aimed *"to assess the Unilink service in terms of its adherence to international and Unilink standards of OT practice; to examine fidelity to OT process within the Unilink service; to assess alignment to Models of OT practice including PEO Model and recovery model; to develop an audit tool that can be used to replicate audit in the future; to examine and discuss the application of Unilink standards within the Unilink manual"*. As the audit progressed, Nolan and Creaner (2014, p.5) described how other aims emerged, including to *"analyse record keeping techniques; analyse fidelity to TSP; analyse nature of contact of students across years and faculty; analyse goal setting within Unilink".*

The service scored high in terms of its adherence to international standards of best practice and recovery-oriented practice. Clinical audits can help identify opportunities for improvement within a service (RQIA, n.d.), which Nolan and Creaner's (2014) audit

did. This audit identified the need for improving practices regarding how outcomes were documented and setting goals in line with the PEO-Model. To implement these changes in practice, several recommendations were made as a result of this clinical audit. Most significantly, the paper-based 2011 version of the *TSP* was translated into the electronic-based 2014 version known as the *eTSP*, which intended to allow therapists to record student's needs and intervention plans and set goals within the PEO-Model (Creaner, & Nolan, 2016), enabling these to be integrated into the case notes. This 2014 version of the *eTSP* was then rolled out within the occupational therapy services in TCD, UCD, and TUDublin from 2014/2015 onwards after a period of retraining on how to use the tool in practice with all staff. The TCD service was re-audited using the same audit tools to determine how well the recommendations and changes were incorporated into practice from the original audit (Creaner, & Nolan, 2016). The service scored higher in all aspects of the audit following the recommendations, with the exception of the Evaluation section which was concerned with documenting outcomes. However, Creaner and Nolan (2016) reported that this was likely due to the timing of the re-audit in the middle of the trimester and hence intervention was still on-going in several cases.

It must be noted that during the translation process, some features from the 2011 version of the paper-based *TSP* were omitted in the electronic-based *eTSP*, whilst some new features were introduced. As for elements that were omitted, firstly, the instructions provided at the beginning of the *TSP* were not translated over to the *eTSP*. Furthermore, the 'Course Demands' section was omitted from the 2014 version, which had allowed students to outline the demands expected of them in each module during the semester. Finally, the wording of the 'Importance' scale changed from "*How important is it for you to work on this item in Unilink*" in the 2011 paper-based version of the *TSP* to "*Level of importance*" in the 2014 version of the *eTSP*. Some of these changes were made as some aspects of the tool did not translate over easily from a paper-based format to an Excel-based format (e.g., hosting the written instructions in Excel). However, creating the Excel format enabled the integration of the tool into a student's electronic case notes on the disability database allowing outcomes to be captured within the one place.

As for elements that were introduced, as the 2014 version of the tool was hosted on Excel, this enabled the generation of 'total scores' which summed up the ratings that students gave to each item in the respective 'Person', 'Environment', and 'Occupation' item-sets in the 'Identifying Needs' section. Furthermore, the 'Goal setting' section was formatted with the aim of improving goal setting practices of the service. This involved identifying person-focused, environment-focused, occupation-focused, and role-focused goals as demonstrated in Figure 6.2.

The changes made to create the 2014 version of the *eTSP* were based on audit recommendations with the aim of improving practice. However, no evidence had been gathered since its roll-out in 2014/2015 to investigate the experiences of occupational therapists using this updated tool to determine what the impact of these changes to the tool had in practice. Hence, the current study was the first opportunity for occupational therapists to share their experiences on using the 2014 version of the *eTSP* in practice.

A	B	C	D
	#REF!		
Areas Identified	Goals Set	OT intervention Goals	Goals Reviewed
Person	Person Focused Goals		Person Focused Goals
Managing anxiety			
Environment	Environment Focused goals		Environment Focused goals
Occupation	Occupation Focused goals		Occupation Focused goals
Participating in discussion			
Role Focused	Role Focused Goals		Role Focused Goals

Figure 6.2: PEO-Model goal setting format following Creaner and Nolan's (2016) clinical audit

6.1.3 Sample description

Altogether there were five occupational therapists who engaged in the focus groups. One therapist had experience of using the 2011 version of the *TSP* since its development in 2011, as well as having experiences of using the 2014 version of the *eTSP* since its roll out in 2014/2015. The remainder of the group had between 14 months to 3+ years' experience of using the 2014 *eTSP* version only. As explained above, this was the first

opportunity to capture the experiences of occupational therapists using the 2014 version of the tool in practice.

6.2 Findings

The findings and themes (Figure 6.3) from the thematic analysis (Braun, & Clarke, 2012) are expanded below. The findings are presented chronologically, with the themes from the Initial Focus Group presented first with quotes indicated by '***FG1***', whilst the themes from the Follow-up Focus Group are outlined with quotes indicated by '***FG2***' thereafter. The participant/occupational therapist who said the quote is also indicated by ***P1, P2, P3***… etc. The themes aid in telling the story about the development of the *eTSP* over time. The themes that emerged from FG1 (January 2021) pertain to the occupational therapists' experience of using the 2014 version of the *eTSP* in practice, including how the *eTSP* supports a student-centred assessment process (Theme 1) and how some changes made following the clinical audit in 2014 resulted in aspects of the original tool 'getting lost in translation' (Theme 2). FG2 (June, 2021) pertained to the occupational therapists' experiences of using the 2021 version of the *eTSP* in practice, in which it was found that the refinements from the Rasch Analysis implemented in Stage One of this study improved the clinical utility/face validity of the 'Identifying Needs' section of the tool in capturing the construct of occupational performance (Theme 3), and that there is a need to improve the clinical utility/face validity of the other sections of the tool in capturing the construct of occupational performance (Theme 4).

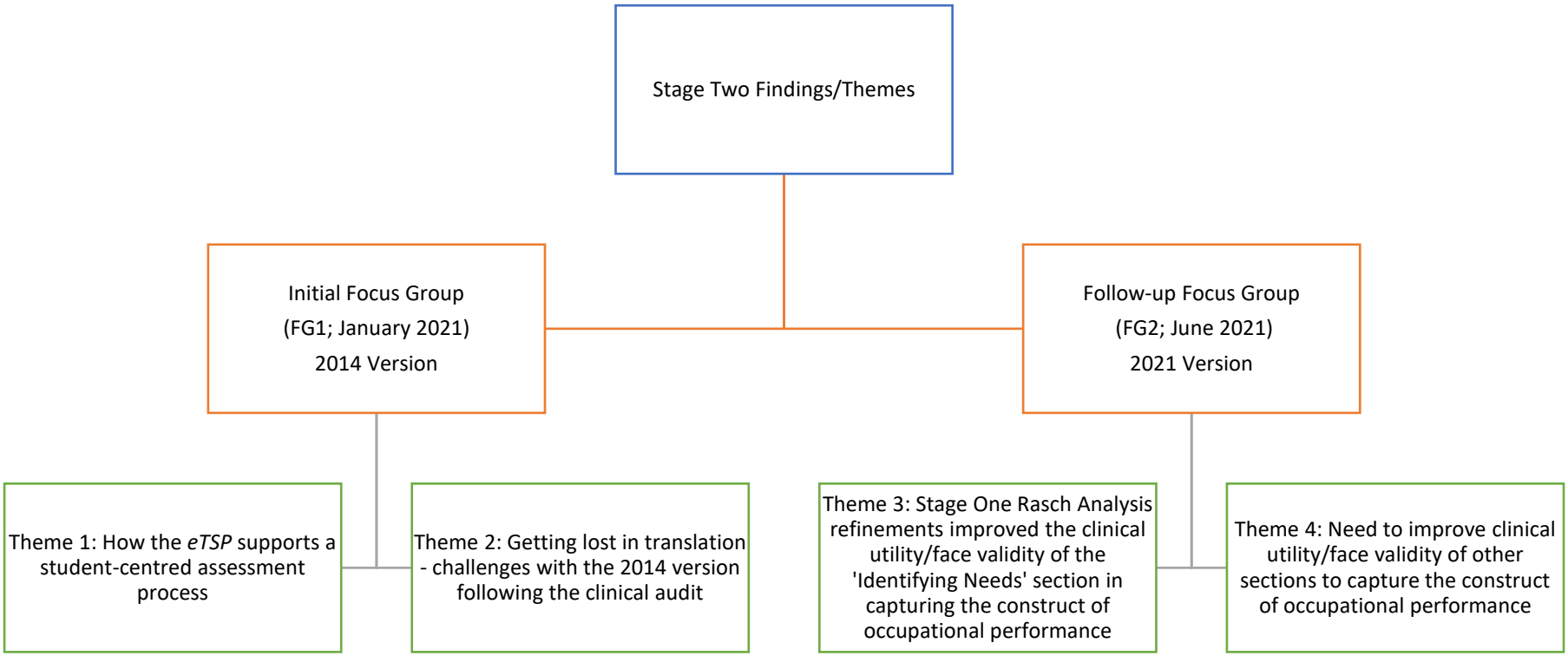


Figure 6.3: Thematic Map of Stage Two Findings/Themes

6.2.1 Theme 1 (Focus Group 1): How the *eTSP* supports a student-centred assessment process

As stated previously, this study was the first opportunity for occupational therapists to give feedback on using the 2014 *eTSP* in practice. The first theme to emerge related to how certain features of the *eTSP* support a student-centred assessment process. Firstly, the occupational therapists described how the tool's underpinning model, the PEO Model (Law et al., 1996), is beneficial for practice as it allows students to develop an understanding of occupational performance within their student role. Because of this underpinning model, the *eTSP* supports the development of students' self-awareness of their occupational performance difficulties as it is a *"useful reflective piece of work" [**P2, FG1**]* for them to engage with. Moreover, the occupational therapists described the benefit of having the PEO-Model diagram displayed in the 'Experiences & Expectations' section as it helps students *"build relationships or links" [**P4, FG1**]* between their occupational performance difficulties, especially if the therapist supports them to cluster, connect or draw a line between their difficulties.

> *I try to pick out the areas that they've identified as being challenges and try to map it into a PEO structure. But I think students do find it useful, because sometimes you know, depending on the reason a student has identified the need under any of the headings, they might not necessarily belong in the heading they fit under in the eTSP, so a student might have said attention is a challenge, but it might actually be an environmental challenge leading to poor attention…situating the eTSP items within the PEO Model gives a bit more clarity [**P5, FG1**]*

A student-centred approach to assessment is further enabled by the open-ended questions in the 'Experiences & Expectations' section. During the tool's original development, Nolan (2011) was influenced by a recovery approach and hence included open-ended questions relating to a student's strengths, hobbies/interests, college and work experiences, and academic, social, and personal expectations in this section. The occupational therapists described how these questions supported an individualised

strengths-based approach towards the assessment process, and that they have facilitated the development of positive therapeutic rapport with students while setting a positive tone for occupational therapy intervention.

> *I really liked the questions starting off with what's going well…it's a good way also to introduce what OT is like for students in terms of not always focusing on the problem and trying to fix a problem, sometimes it's about utilising somebody's strengths to enable them to engage…the piece about hobbies and interests, I think that's always a really nice way to start developing a rapport with students, to actually get a picture of what is meaningful to them…what do they do outside of college and kind of acknowledging that they are a person outside of college too [**P3, FG1**]*

The occupational therapists also noted the benefit of student's being given an additional 'Please Explain Your Answer' box next to each item in the 'Identifying Needs' section of the tool. The qualitative data captured in this feature can be used in conjunction with the numeric 'Difficulty' and 'Importance' scales to develop an understanding of the student's individual context and experience, assisting with developing a more student-centred approach towards intervention.

> *Then the 'explain' bit…I find this is really important part in terms of individualising the approach and kind of framing the approach as not being a general approach to how to manage college life, but a specific approach to how to help this person to manage their student role and I think that sort of tailoring to both the numeric scales and explaining bit is key to make it that individualised piece. [**P1, FG1**]*

Finally, the occupational therapists described how for a minority of students, the full *eTSP* may be too overwhelming for them to complete at the time of initially engaging with the service due to their needs and the comprehensive level of detail the tool seeks. Nevertheless, the tool provides therapists with a framework to guide the initial assessment with these students, ensuring that these students also have the opportunity to identify their occupational performance difficulties and priorities for intervention.

*There are some students that I wouldn't do the eTSP with, for certain students I would be influenced by the eTSP in how I would kind of do the initial assessment [**P5, FG1**]*

6.2.2 Theme 2 (Focus Group 1): Getting lost in translation – challenges with the 2014 version following the clinical audit

As described in the re-orientation section 6.1.2 above, the 2014 version of the *eTSP* was the product of a clinical audit which sought to determine if practice aligned with local and international standards of practice and occupational therapy models such as the PEO Model (Law et al., 1996) and recovery model. The audit recommended that the paper-based *TSP* be translated into the electronic-based *eTSP,* and several features of the tool were either omitted or introduced during this translation process. These changes were made to the tool based on the audit findings and recommendations which strived to improve the services' practices. Hence, until this research, no evidence had been gathered to determine the impact these changes had on the use of the tool in practice. By conducting this qualitative stage with the occupational therapists, the second theme that emerged was that the essence of the tool 'got lost in translation' and that the therapists experienced some challenges in using certain aspects of the 2014 version in practice.

The impact of some of the elements that were omitted from the tool during the translation process were highlighted by the occupational therapists, particularly relating to the **wording of the 'Importance' scale** and the **'Course Demands' section**. As for the **'Importance' scale wording**, the 2011 version of the paper-based *TSP* asked students to rate items on *"how important is it for you to work on this item in Unilink"* (Nolan, 2011, p.125). However, when the tool was translated into the 2014 version of the *eTSP*, this language got lost in translation, (as it was reduced to fit into an online version and space was at a premium) and simply asked students to rate items on *"Level of importance"*. The therapists maintained that some students misinterpreted the 'Importance' scale as

general importance of the items within the student role, especially if the therapist has not had the opportunity to explain this section to the student in advance, rather than its original intention of prioritising occupational performance difficulties to focus on within occupational therapy.

> *To be able to clarify the 'Level of Importance' box because I think sometimes students just see that as general importance and they'll rate everything as a five, I kind of say it's how important is it for you to address in occupational therapy, what's your priority rating, rather than just general importance…sometimes I get back everything is a five and I kind of say okay, 'so you want to work on all of these?', and they're like 'oh no but they're all important', and they just kind of misinterpreted the phrasing [**P4, FG1**]*

The paper-based *TSP* included a **'Course Demands' section** which asked students to outline what they had coming up in each module that semester. This section did not get translated over to the 2014 version of the *eTSP* as it was difficult to capture in an Excel format. This highlighted how certain sections of a tool such as this did not easily translate into an Excel format, indicating a limitation of using Excel to host the tool. When asked if therapists are still gathering this information, it was noted how this was a strength of the previous 2011 paper-based *TSP* as it supported the unique focus that the occupational therapy role has on occupational performance.

> *It's usually something students want to focus on in terms of managing course demands, so I suppose from an occupational perspective, we need to have a real good understanding…it also pulls on the strength of the role that we have a good understanding of different student's course demands and the workings of it…it's something that I always thought was a great strength of the of the other TSP because it really did set another good foundation of where the person was and in terms of what they had to do at the moment, and also gave an idea of their understanding of what they had coming up as well [**P1, FG1**]*

On the other hand, some features which were introduced during the translation process included the **total score** in the 'Identifying Needs' section and **re-formatting the 'Goal Setting' section to align with the PEO-Model** (Law et al., 1996). As for the **total score**,

this involves an automated Excel formula which sums up the scores that the students gave on both the 'Difficulty' scale and the 'Importance' scale. The critique raised by the therapists was that if the *eTSP* is to act as a person-centred prioritisation tool, then the total score isn't appropriate, or that its purpose is unclear. Furthermore, ***P5*** *[**FG1**]* noted that they *"get students asking me is that really bad?".*

> *Just the bit at the bottom…the total score, it's something that students can sometimes pick up on what that means. Because it doesn't quite fit…in terms of identifying a prioritisation or areas for us to initially discuss or focusing upon, and then it pulls an overall score, they don't quite - excuse the pun - they don't quite tally up…that it is pulling an overall score and what that actually means, so that's just one element of this sheet that I'm not sure really, really fits in. [**P1, FG1**]*

Furthermore, section 6.1.2 illustrated how the **'Goal Setting' was re-formatted using the PEO-Model** (Law et al., 1996) after the audit with the aim of improving the service's goal setting practices (Nolan, & Creaner, 2014). When discussing this section of the *eTSP*, the therapists emphasized the challenges associated with this format. At times, this led to therapists copying over individual items from the 'Identifying Needs' section and setting goals and intervention around individual person, environment, and occupation factors rather than overall occupational performance (Law et al., 1996). Subsequently, goals may become more problem-focused and less occupation-focused. Furthermore, this format may make it difficult to find a new direction with students who may use the service for a long time or to enable students to set goals using their own language in line with the client-centred approach.

> *I find it difficult splitting them up into person-focus goals and environment and occupation goals…its quite focused on issues and problems rather than shifting it to performance…I wonder whether keeping those more broad rather than splitting them into individual P, E and O and then talking about the interventions as being person-focused interventions or environment-focused intervention…if the student is using the service a lot or you're trying to get a new direction…I think splitting it by PEO isn't always helpful, having sort of three or four broad goals that you've been trying to work towards…it's much easier for students to*

*put it into their language…I think there's a bit of a change of format here could make this much more usable and would increase the use of it [**P1, FG1**]*

The occupational therapists further highlighted the challenges of using the 2014 version of the *eTSP* in practice, especially the 'Identifying Needs' section of the tool upon which the Rasch analysis was then conducted in Stage One of this study. The most apparent challenge that the occupational therapists described was trying to complete the lengthy *eTSP* assessment process within the temporal context of the semester when students are under pressure managing deadlines and hence the support therapists attempt to provide is time-sensitive in nature. Students may be *"expecting some kind of support…in the here and now" [**P3, FG1**],* which poses challenges for completing the *eTSP*, especially if they are entering the service for the first time later in the semester. Moreover, within the 'Identifying Needs' section, the occupational therapists described how there is repetition within some of the items which may cause students to become frustrated, while the horizontal layout of this section may lead a student to "*kind of get overwhelmed quickly just because it's…a busy page to look at" [**P3, FG1**].*

*I find the length and especially that the services that we provide are time sensitive…there's a window of kind of peace at the start of the semester and then everything gets intense…there can be an element of maybe frustration from students with the length of it at a later date in the semester…also there's an element of repetition in some of the questions which I think you know, not always for everyone because sometimes people interpret things differently…when they've come to me to and next week they've got a deadline or a test and they're feeling under pressure and they want it to be useful to them, this can be a challenge. [**P5, FG1**]*

As explained previously, the changes made to the tool were a result of Nolan and Creaner's (2014) audit which aimed to improve the services' adherence to international and local standards and models of practice. The current study has demonstrated that some of these changes did not work in practice as intended. Nevertheless, the evidence gathered from the occupational therapists in this stage highlights several opportunities

to improve the face validity and clinical utility of the electronic-based tool going forward in its development.

6.2.3 Theme 3 (Focus Group 2): Stage One Rasch Analysis refinements improved the clinical utility/face validity of the 'Identifying Needs' section in capturing the construct of occupational performance

After a period of trialling the use of the 2021 version of the *eTSP* in practice, the occupational therapists returned for FG2 in June 2021 to share their experiences. It was found that several of the challenges highlighted with using the 2014 version of the tool were positively impacted by the refinements made to the tool as a result of the Rasch analysis in Stage One of this research. Overall, the occupational therapists described how the 2021 version of the *eTSP* was *"easier to complete" [**P1, FG2**]* and *"quicker and more efficient" [**P3, FG2**].* In terms of the reduction of 20 items from the tool, the occupational therapists described how despite the reduction in the number of items they were still able to gather all necessary information and were afforded with more time to discuss the retained items in more depth with students. This is particularly important considering the temporal context of the semester and how time-sensitive the services that the occupational therapists provide are.

> *We were still able to capture everything we needed…I felt under less pressure to go through lots of items and to have the space to be able to really discuss things at length [**P3, FG2**]*

As for the reduced Likert-style rating scales, the occupational therapists described how students were able to make a decision on how to rate each item more easily because there were less rating scale categories to distinguish between. This allowed students to *"think a little bit more about what their priorities at this point in time are" [**P4, FG2**],* assisting the identification of priorities for occupational therapy intervention. As for the introduction of the 'Not applicable' option, the therapists *"welcome the 'NA' because no*

*difficulty isn't the same as not applicable…it's great to be able to distinguish between those two" [**P5, FG2**].*

> *Just a lot with students kind of getting caught up on the on the ratings and the numbers, that hasn't seemed to come up at all over the last couple of months. Whereas before it would have been that would have been a lot of hesitation…really time consuming if anything…the students who are really, really getting caught up on those numbers…I don't seem to have come across that at all over the last couple months with the shortened point scale [**P2, FG2**]*

Lastly, the Rasch analysis found that the *eTSP* functions better as one overall scale of occupational performance in comparison to three separate 'Person', 'Environment', and 'Occupation' item-sets which subsequently changed the format of the 'Identifying Needs' section. In the 2014 version of the *eTSP*, the three item-sets were displayed horizontally in different colours with a 'Difficulty', 'Importance' and 'Please Explain Your Answer' column given to all three respective scales (Appendix 1.1). Whereas in the 2021 version of the *eTSP*, all items were presented in one vertical scale with just one 'Difficulty', 'Importance' and 'Please Explain Your Answer' column provided (Appendix 6.1). Most of the occupational therapists agreed how this change was *"visually much easier…much simpler, it's a clearer structure, it's a nice logical layout" [**P5, FG2**]* and was better for student's stamina in completing the full tool.

> *It's less daunting, less overwhelming for students even though there's still significant level of questions…I know with the old eTSP you could even see the level of detail was just weaning off towards the end whereas when they're scrolling down I just didn't see that anymore… students seem to have a lot more stamina when they're completing that section [**P2, FG2**]*

On the other hand, one therapist commented on how they preferred the horizontal layout of the previous version as it was easier for them to support students to see connections between the person, environment, and occupation. Nevertheless, they acknowledged that the simplified sheet seemed less intimidating for students to complete.

*I don't know whether it's just the way I approach it but being able to connect you know how Person influences the Environment influences Occupation, the kind of the links between the different components, I think visually I felt better able to explain it rather than by scrolling through it. Even though, like scrolling through it it's a little bit shorter and it appears less intimidating as well…on one hand, having it in a different format can be useful because it does simplify it in a lot of ways, but there are elements of the old version that I did like. [**P3, FG2**].*

It is evident that the refinements that were made to the tool following the Rasch analysis in Stage One have improved the clinical utility of the 'Identifying Needs' section in practice. Furthermore, the occupational therapists' experiences also provide evidence for the face validity of the shortened 'Identifying Needs' section, as they were able to gather as much in-depth information about students' occupational performance difficulties despite a reduction in the number of items and rating scale categories. It was reported that the changes have improved the visual layout of this section of the tool from the old layout of the 'Identifying Needs' section in the 2014 version of the tool, although it is acknowledged that the tool needs to continue to support therapists in demonstrating the PEO-Model connections and relationships so that students are able to understand their occupational performance difficulties.

6.2.4 Theme 4 (Focus Group 2): Need to improve clinical utility/face validity of other sections to capture the construct of occupational performance

Theme 3 demonstrated how the face validity and clinical utility of using the 'Identifying Needs' section in practice was improved as a result of the Rasch analysis conducted in Stage One of this research. However, the fourth theme to emerge was that there were other qualitative aspects of the tool which required refinement that could not be remedied using the psychometric methodology of Rasch analysis. Through the discussions, it was evident that other sections and elements were not functioning as intended or that they were not fully supporting the underlying construct of occupational

performance within the student role. These included the re-introduction of the 'Course Demands'/'Module Matrix' section, the post-audit PEO-Model format of the 'Goal setting' section, and the qualitative wording of the 'Importance' scale within the 'Identifying Needs' section, all of which will be discussed below.

6.2.4.1 Re-introducing the 'Module Matrix' part

As explained previously in Theme 2 (6.2.2), the 'Course Demands' section did not get translated over to the *eTSP* following the clinical audit due to difficulties in hosting this section in an Excel format at that time. However, this section was highlighted as a strength of the original 2011 version of the *TSP* for both therapists and students in developing an understanding of the occupational performance demands of a student's course. It was for this reason that the section was re-introduced into the 2021 version of the *eTSP* renamed as the 'Module Matrix' section and was situated between 'Experiences & Expectations' and the 'Identifying Needs' sections, similar to the 2011 version of the *TSP*. The section was formatted as a table in Excel and provided space for students to outline the modules they were studying, the module pass mark, the breakdown of assessment (i.e., participation, labs, mid-term assignment, final essay, end-of-term exam, weekly quizzes/tutorials etc.), each assessment component's percentage weight, the expectations and demands of each assessment component (e.g., word count, group work, duration of exam, tutorial preparation etc.) and the assessment due date if the student had it. There was mixed feedback regarding the benefits and challenges of using this part of the tool in practice. On one hand, the occupational therapists described how this was a *"really useful reflective tool" [**P2, FG2**]* which enabled students to become aware of the importance of this information.

> *I really like having it as part of the eTSP…it's useful that someone's oriented to the fact that this is important and that this is something you need to be thinking about, I think that it itself is almost an intervention [**P5, FG2**]*

On the other hand, the occupational therapists described several challenges with this re-introduced section. Firstly, the positioning of the section was challenging as it was situated before the 'Identifying Needs' section where students could firstly identify their

needs. Furthermore, considering the workload involved in this section in addition to the rest of the tool, this counteracted the benefit resulting from the reduced length of the 'Identifying Needs' section due to the Rasch analysis which may be overwhelming for some students. Furthermore, it was noted that asking students who have difficulties with time management and managing their workload to complete this section initially prior to engaging with occupational therapy may be too overwhelming. Hence, it was suggested that it may be more appropriate to move this section after the 'Identifying Needs' section and to complete it during a one-to-one session with a student rather than getting them to complete it in advance.

> *Previously, one of the challenges was how much time the student had to take before that first appointment to fill in the first couple of tabs and sometimes that would put them off a little bit or they would come in with it not all fully complete. I think we're reducing the pressure on students by the fact that the 'Identifying Needs' section has been reduced so that makes it more manageable to do that work beforehand, I think the 'Module Matrix' maybe then when we actually can sit down together and talk it through. [**P3, FG2**]*

The occupational therapists also questioned if the 'Module Matrix' section was narrowing the focus in on academic demands too much and if it should be expanded to provide the opportunity for students to highlight other occupational demands they are trying to manage in their life on top of their studies, such as placement, work, or family commitments. By not explicitly asking students what other demands they are managing alongside their student role, this may increase the risk that a therapist would make wrongful assumptions about what a student is managing within their life. Providing an opportunity for students to identify other occupational demands would improve the tool's face validity. A suggestion was made to alternatively include an open-ended question in the 'Experiences & Expectations' section where they could highlight other demands that they are managing alongside their student role.

> ***P1 [FG2]:** Is there something about talking about what people actually have to do in their life being more explicit, it doesn't have to go into every detailed section of their life, but just to give the opportunity to say, 'are there other things in your life that you need to do at present?', or something along that line.*

P5 [FG2]: *An open question yeah.*

6.2.4.2 Post-audit PEO-Model format of Part '4 - Goal setting'

As captured in Theme 2 (6.2.2), during FG1 the occupational therapists described the challenges of using the 'Goal setting' section which was re-formatted using the PEO-Model following the audit with the aim of improving the goal setting practices within the service (Nolan, & Creaner, 2014). As the PEO-Model (Law et al., 1996) underpins the whole tool, it was used to try to develop a structure which aimed to improve how goals were set within the service. What resulted was a format in which students and therapists were provided with space to set person-focused goals, environment-focused goals, occupation-focused goals, and role-focused goals.

During FG2, the occupational therapists re-iterated their concerns with this part without any prompting. In terms of the construct of occupational performance, it was highlighted how this goal setting format makes it difficult to set top-down occupational performance goals and increases the risk that students and therapists will set bottom-up goals relating to personal, environmental, and occupational concerns identified in the 'Identifying Needs' section. There were concerns that because of this format, a student's understanding of occupational performance may be lost by the time this part is reached in the occupational therapy process.

> *I'll often explain the PEO in the beginning, when we're looking at that Experiences tab…then by the time we get to the goals, because the goal sheet is separated into person, environment, occupation, role goals, your kind of losing that connection. I think the student might initially understand the PEO and the concepts of it, but then there's no real carry over to how they apply it to themselves...they might end up just interpreting their goals as being a goal about them as a Person, a goal about their Environment, a goal about their Occupation, rather than really properly understanding the links between all of the components and how they influence each other. [**P3, FG2**]*

It was highlighted that a change in format of this part would better support the goal setting process, improving the tool's face validity and clinical utility. It was suggested there should be a *"blank canvas almost of a blank PEO…doodle board" [**P2, FG2**]* on the tool. This could assist with enabling students to map out their occupational performance difficulties found in the 'Identifying Needs' section, subsequently helping students make connections between how their difficulties influence occupational performance. Another therapist suggested that it would be better formatted where a broader occupational performance goal was identified and then the person, environment and occupation influences for this goal could be captured.

> *I would prefer a broad goal…what I mean like on the left column to have like the goals and then on the horizontal to have Person, Environment, Occupation, so that you can pop it across but that may be that's just the way my brain works [**P5, FG2**]*

6.2.4.3 'Importance' scale wording

Finally, the occupational therapists expressed the need for further refinement surrounding the qualitative wording used for the 'Importance' scale in the 'Identifying Needs' section of the tool in order to make the purpose of this scale clearer for students. As explained in previous chapters, Nolan's original intention for the 'Importance' scale was simply to prioritise the difficulties identified in the 'Difficulty' scale. Furthermore, the wording of the 'Importance' scale changed during the clinical audit translation process from *"how important is it for you to work on this item in Unilink"* (Nolan, 2011, p.125) in the 2011 version of the *TSP* to *"Level of importance"* in the 2014 version of the *eTSP*. On top of this, the occupational therapists described challenges with the purpose of this feature and how to appropriately explain this to students. For example, ***P2*** [***FG2***] described how they *"change the wording when explaining to 'priority'"* so that the purpose of it is clearer for students.

> *Around 'Importance'…that's still something I find myself explaining to the number of students who just kind of think how important is it…just the clarity of that because that's always the question that comes up, is it just 'generally important' or 'to work on with an OT'? [**P4, FG2**]*

To improve the scale's face validity, the therapists recommended that the word choice of 'importance' either be removed or changed to provide clarity that the purpose of this feature is to prioritise a student's occupational performance difficulties. Some of the suggestions that this could be changed to included *"'Important to do in OT' or 'important to work on now'"* [***P1, FG2***], *"'priority for goal setting' or something around those lines'* [***P5, FG2***] or *"'priority' or 'importance to address'"* [***P4, FG2***].

6.3 Additional Refinements and Re-branding as the *Trinity Student Occupational Performance Profile* (*TSOPP*)

This section outlines the additional refinements that are suggested for the tool to manage the persisting clinical utility/face validity issues that were arising in the qualitative parts of the tool that could not be resolved with Rasch analysis alone. The major refinements that resulted from Stage Two focus groups are presented below, with Appendix 6.2 providing an overview of the other minor refinements made to the tool. Some of these refinements involved enhancing existing sections, re-introducing elements that were lost from the tool during the clinical audit translation process, and the alignment of the tool's constructs with theory. Part of these refinements involved re-branding the tool as the '*Trinity Student Occupational Performance Profile* (*TSOPP*)' in order to better capture its underlying construct of occupational performance difficulties within the student role. The 2022 version of the *TSOPP* (Appendix 6.3) is currently being used in practice in TCD, UCD, and TUDublin.

6.3.1 Section '3 – Identifying Needs'

Section '3 - Identifying Needs' has undergone the greatest refinement in this project to-date as a result of the Rasch analysis in Stage One. However, there were further refinements that were made to this section of the tool, which arose from both the Rasch analysis and focus group results. These refinements revolve around re-defining the

underlying construct of the 'Difficulty' scale and subsequently re-naming the overall tool, as well as changing the 'Importance' scale to 'Priority' through the introduction of the Occupational Performance Process Model (OPPM; Fearing, Law, & Clark, 1997).

6.3.1.1 Re-define underlying construct of the 'Difficulty' scale as occupational performance & re-branding the tool

During the *TSP*'s development, Nolan (2011) described how the tool is underpinned by the PEO-Model (Law et al., 1996) and provided definitions for difficulties with the person, environment and occupation concepts underlying the separate 'Person', 'Environment', and 'Occupation' item-sets. However, 'Chapter 4' outlined the psychometric and conceptual rationale for continuing with the combined itemset rather than the separate item-sets firstly as it demonstrated strong evidence of unidimensionality; and secondly as this unidimensional construct represented difficulties with occupational performance, which is the ultimate construct of the PEO-Model (Law et al., 1996). Due to this, it is imperative to clearly re-define the underlying construct of the 'Difficulty' scale so that an accurate measure can be taken (Bond, & Fox, 2015; de Vet et al., 2011). Law et al. (1996) conceptualise occupational performance as an outcome of the dynamic and transactive relationship of the person engaging in purposeful tasks and activities within their environment, and that through this experience, one renegotiates one's occupational roles and view of self. Occupational performance is highly influenced by everyday routines and the environment (Kielhofner, 2008), and represents the means in which a person can connect with a particular occupational role and their sociocultural context (Law, Baum, & Dunn, 2017; Reed, & Sanderson, 1999). As the *TSOPP* is a self-report measure, this enables the subjective attributes of difficulties with occupational performance to be measured (Law et al., 1996). Within the context of the *TSOPP*, the 'Difficulty' scale measures difficulties with occupational performance associated with the occupational role of being a student in higher education. The role of being a student in higher education involves students developing a set of performance skills necessary to engage in the academic, social, and personal demands and occupations that are associated with this role. The physical, social, cultural, and institutional components of the university environment influence a

student's experience of occupational performance. Therefore, the 'Difficulty' scale aims to measure the self-reported difficulties that students are experiencing in relation to occupational performance within the student role in higher education.

During the tool's development, Nolan (2011) described how the *TSP* was a profile of student's occupational performance, rather than an assessment. An occupational profile consists of an individual's occupational experiences, interests, values, needs and concerns about occupational performance (AOTA, 2014). The tool adequately gathers this information in the context of an individual's student role, both through the qualitative sections (e.g., 'Experiences and Expectations' and 'Module Matrix') and quantitative sections (e.g., 'Identifying Needs') of the tool. However, as the ultimate construct underlying the tool is occupational performance within the student role, it was decided that the name of the tool to-date (i.e., *Trinity Student Profile*) did not fully capture this underlying construct. Hence the tool has been re-branded as the *Trinity Student Occupational Performance Profile* (*TSOPP*), which captures its underlying construct while retaining the fact that it is a profile. From herein, the tool will be referred to as the *TSOPP*, unless stated otherwise where appropriate.

6.3.1.2 Justify changing the 'Importance' scale to 'Priority' scale using the Occupational Performance Process Model & Suggested Rating Scale

It was evident from the focus groups that the 'Importance' scale was a contentious issue for the occupational therapists as there was confusion regarding the phrasing of the scale, its overall purpose and how students subsequently used the scale. Much of these issues arose due to the change in phrasing from the original paper-based tool to the Excel-based tool following the clinical audit (Creaner, & Nolan, 2016).

The 'Importance' scale was introduced into the tool originally to give students the ability to prioritise their occupational performance difficulties (Nolan, 2011), meaning that subsequent goals and intervention would be focused on what is important to the student to work on at that time. Furthermore, the 'Importance' scale is different to the

likes of the 'Value' scale in the *Occupational Self Assessment* (*OSA*; Baron et al., 2006) which measures the importance one places on each item within daily life. Discrepancies between the 'Competence' and 'Value' ratings within the *OSA* are then used to identify areas for occupational therapy intervention. Rather, within the *TSOPP*, the 'Importance' scale seeks to prioritise the previously identified occupational performance difficulties in the 'Difficulty' scale. As a distinction, students may rate certain items as very difficult, but rate them with little or no priority as they do not wish to focus on them at that time. For example, a student may report that they have extreme difficulty with '*Doing presentations [PRESENTA]*', but do not rate this as a priority as they do not have a presentation during the current college term; or a student reports that '*Managing family [MANFAMIL]*' is very difficult but not a priority because they are engaging with therapy support externally for this. Hence, the 'Importance' scale within the tool is a prioritisation mechanism.

This aligns with step one of the Occupational Performance Process Model (OPPM; Fearing, Law, & Clark, 1997) which involves naming, validating and prioritising the occupational performance difficulties identified by the student. Law (2000) argues that clients are the only ones who can identify what occupational performance difficulties are most important to focus on and would have the greatest impact in their daily lives. Hence, within the *TSOPP*, this scale should support students to appropriately prioritise their occupational performance difficulties so that they can focus on the most important aspects which will have the greatest impact in their student role. This prioritisation mechanism was acknowledged by the occupational therapists throughout the focus groups; however, they expressed concerns over the word 'Importance' in attempting to capture this as some students interpreted this as general importance for the student role. Hence, this scale has been re-named as the 'Priorities' scale. The operational definition of the *TSOPP*'s 'Priorities' scale is for students to prioritise the occupational performance difficulties which they want to work on in occupational therapy.

In 'Chapter 5', section 5.5 remedied the disordered 6-point Likert-style rating scale in the original 'Importance' scale by reducing this down to a 3-point scale. As this scale is re-named to the 'Priorities' scale in the *TSOPP*, it is imperative for the phrasing of the

qualitative category labels to be clear in this scale. Moving forward, it is suggested that this 'Priorities' scale includes a 3-point Likert-style rating scale with the category labels of '*0=Not a priority to work on in OT*', '*1=Low priority to work on in OT*', and '*2=High priority to work on in OT*', as well as an '*NA=Not applicable*' option (Table 6.1). It is further recommended that all the category labels are displayed on the tool to avoid students assigning their own meanings onto the scale. Finally, although the above recommendations have been made to make this scale more usable in practice, it is acknowledged that future research will be required to validate the refined 3-point 'Priorities' scale with new data.

Table 6.1: New *TSOPP* 'Priorities' Scale

Category	0	1	2	N/A
Label	Not a priority to work on in OT	Low priority to work on in OT	High priority to work on in OT	Not applicable

6.3.2 Section '4 – Item Difficulty Hierarchy'

One of the main benefits of Rasch analysis is that it has the capability to generate an item difficulty hierarchy (Bond, & Fox, 2015) which demonstrates the relative difficulty of the items within the *TSOPP* from less to more. Section 4.4 in 'Chapter 4' outlined the item difficulty hierarchy for the 'Difficulty' scale using a person-item map. However, to make the item difficulty hierarchy more usable in practice, it was embedded into the final version of the tool using an adaptation of Dr Scott Hutchison's keyform recovery map (Medical University of South Carolina, 2023; Velozo, 2021), which for the purposes of this research, will be called the 'Item Difficulty Hierarchy'. This enabled the difficulty hierarchy to be displayed, and student ratings in section '3 – Identifying Needs' automatically populated and colour-coded depending on the rating they provide through the use of conditional formatting on Microsoft Excel (e.g., green = *No difficulty*, yellow = *Some difficulty*, orange = *Moderate difficulty*, red = *Extreme difficulty*).

Although a paper-and-pencil keyform (Linacre, n. d.) had been developed for the *TSOPP* which enabled the estimation of overall levels of occupational performance difficulties and changes across time, the 'Item Difficulty Hierarchy' part of the tool aimed to

provided additional benefits. Firstly, embedding the hierarchy directly on the tool can facilitate a discussion between therapists and students regarding the relative difficulties within the student role and help students manage their expectations about how they are managing their student role. For example, students may feel that '*Procrastination [PROCRAST]*' is their biggest challenge, but highlighting to them that '*Procrastination [PROCRAST]*' is one of the hardest aspects to manage for all students may help them manage their expectations about this. Furthermore, it enables students to identify their strengths. For students who rate many items as '*3=Extreme difficulty'*, therapists can use the item difficulty hierarchy to identify realistic just-right challenges (Christie, 1999) when setting goals with these students to help build their confidence in how they are managing their student role. Hence, the item difficulty hierarchy is now displayed on the tool with a student's answers from section '3 - Identifying Needs' automatically populating the hierarchy through the functionality of Excel. This now forms section '4 – Item Difficulty Hierarchy' of the *TSOPP* which can be seen in Appendix 6.3.

6.3.3 Section '5 – Module Matrix'

As per the occupational therapists' feedback and suggestions, the 'Module Matrix' is a useful section to include in the tool. However, the positioning and use of it needs to be re-considered. Following this, it is advised that the 'Module Matrix' section not be sent to a student in advance but rather be initiated during a session with the therapist as part of intervention. This is so students who experience difficulties with organisation and time management can access some support on how to gather this information prior to being asked to do it. Once students are aware of how to gather this information, they may complete it by themselves after this point. There may be some students who have already gathered this information in their own format such as in a diary, notebook or on their phone. In this instance, the therapist is encouraged to focus on the resources a student has developed to-date and hence the 'Module Matrix' would not need to be completed in these cases.

Furthermore, the demands expected of students in taught modules are different to the expectations of longer-time projects such as dissertations, theses or capstone projects.

Hence, the 'Module Matrix' section has been split into two sub-sections: '5A - Module Matrix (Taught)' and '5B - Project_Thesis Management'. Section 5A gathers details pertaining to specific module names and codes, the module pass mark, the breakdown of assessment (i.e., participation, labs, mid-term assignment, final essay, end-of-term exam, weekly quizzes/tutorials etc), the assessment's percentage weight, the expectations and demands (e.g., word count, group work, duration of exam, tutorial preparation etc) and the due date if the student has them. Section 5A is likely to be most applicable to undergraduate students and Taught masters students, but some PhD students may find this useful in outlining the demands of their structured PhD modules.

Section 5B asks some general questions relating to a student's dissertation, thesis or capstone project. For example, if they have to complete one as part of their studies, what their supervisor's name and contact details are, who their School/Programme point of contact is, the focus of their project/research question, the deadline for the project, the overall word count, the Programme's expectations for the structure of the project and if each section had individual word counts, percentage weighting and deadlines. This part will likely be applicable to Research masters and PhD students, and final year undergraduate students and Taught masters students for whom a dissertation/thesis/capstone project forms part of their course requirements.

6.3.4 Section '6 – Goal Setting'

The original paper-based tool had an open-ended goal setting section with instructions on how to use techniques to set initial goals for occupational therapy (Nolan, 2011). Creaner and Nolan (2016) found that goals were not aligning with the PEO-Model (Law et al., 1996) and introduced a new goal setting format to achieve this (Figure 6.4). The occupational therapists expressed difficulties in using this format for setting goals with students as goals became too focused on separate 'Person', 'Environment', or 'Occupation' challenges, rather than overall occupational performance goals which are influenced by personal, environmental, or occupational factors. For example, in Figure 6.4, the student may have indicated '*Managing anxiety [MANANXIE]*' and '*Participating in discussion [PARTDISC]*' as some of their occupational performance difficulties. Upon

discussing the PEO-Model with this student, it may become apparent that they are having difficulty managing tutorial participation because of the anxiety they are experiencing towards contributing to discussion in class. However, the Goal setting format in the 2014 version of the *eTSP* captures these two difficulties separately.

	A	B	C	D
	#REF!			
	Areas Identified	Goals Set	OT intervention Goals	Goals Reviewed
	Person	Person Focused Goals		Person Focused Goals
	Managing anxiety			
	Environment	Environment Focused goals		Environment Focused goals
	Occupation	Occupation Focused goals		Occupation Focused goals
	Participating in discussion			
	Role Focused	Role Focused Goals		Role Focused Goals

Figure 6.4: PEO-Model goal setting format following Creaner and Nolan's (2016) clinical audit

Considering that the relationship between the *TSOPP* and the PEO-Model (Law et al., 1996) has been clarified to focus on occupational performance, it is advised that the 'Goal setting' section is updated in line with this. The occupational therapists also suggested that this section should support them in identifying broader occupational performance difficulties with students. Furthermore, there is a need to re-introduce the 'SMART goal setting technique within this section as per the original paper-based *TSP* (Nolan, 2011). As a result, the format of section '6 - Goal setting' has been updated with the aim of improving the goal setting practices when using the *TSOPP* (Appendix 6.3). This section automatically displays the academic, social, and personal expectations the student provided in section '2 – Experiences & Expectations' and acts as a reminder of the student's aspirations (Moran, & Danza, 2018) for the year ahead when setting goals. Figure 6.5 captures a worked example of this section, and the below sub-sections explain how it can be used in practice.

6.3.4.1 '1. Identified Occupational Performance Priorities'

This component aims to assist students in understanding the transactive relationship between the occupational performance difficulties they have identified as priorities in 'Section 4 – Item Difficulty Hierarchy' where applicable. In the example in Figure 6.5, the student and therapist discussed the relationship between specific person-related,

environment-related, and occupation-related difficulties to better understand the student's difficulty with occupational performance.

Goal Setting

Using the information gathered in previous sections of this form, you and your occupational therapist will **set collaborative goals** so that **intervention is focused on what is the highest priority** for you at this time.

	Academic	Social	Personal	
Reminder of Expectations	to pass all of my modules	to make a small group of friends, maybe join a society	to learn how to drive	

1. Identified Occupational Performance Priorities			2. Student-centred Goal(s) - Where do you want to be? "I want to be able to…."	3. OT Intervention - How are we making this happen?	4. Progress	5. Notes
Person-related difficulties	Environment-related difficulties	Occupation-related difficulties				
Knowing how best to study	Tolerating external distractions e.g. noise, light	Getting down to writing	I want to be able to study in the library	Explore VARK learning style questionnaire	Completed	
Maintaining concentration during study		Achieving goals		Using VARK results, trial visual and kineasthetic learning strategies	In progress	
Procrastination		Dealing with time pressures and deadlines		Visit the library to identify the most appropriate space with minimal distractions	No longer relevant	
				Learn how to use Google Calendar to track deadlines	Completed	
				Develop SMART goal-setting technique to identify weekly priorities		
Managing anxiety		Doing presentations	I want to do my group History presentation at the end of term with minimal anxiety	Use Google Calendar to keep track of group meeting dates		
				Identify my role/responsibilities for the presentation at the next group meeting		
				Explore anxiety management strategies (deep breathing & progressive muscular relaxation)		
				Learn how to use PowerPoint to create slides		
				Practice my presentation in my OTs office in 4 weeks		
				Practice my presentation in Room 123 with my OT in 6 weeks		

Figure 6.5: Worked example of the updated 'Goal Setting' section in the 2022 version of the *TSOPP*

6.3.4.2 '2. Student-centred Goal(s) – Where do you want to be?'

Thinking about the difficulties identified in the previous component, this component allows students to think about where they want to be in the future/what do they want to achieve. It is important that these goals are in a student's own language so that it is focused on their hopes and aspirations (Moran, & Dancza, 2018). However, to ensure that intervention is focused on occupational performance, students are encouraged to start the statement with "I want to be able to…". Figure 6.5 illustrates the student-centred goals set for the occupational performance priorities identified in the first component.

6.3.4.3 '3. OT Intervention – How are we making this happen?'

The third component allows students and therapists to capture the occupational therapy intervention being undertaken to assist in making the goal happen. Therapists and students may discuss and document the initial steps to take towards the student-centred goals and may expand this as the intervention progresses. Therapists are encouraged to be guided by the PEO-Model (Law et al., 1996) and document how intervention is addressing the person-related, environment-related, and occupation-related difficulties previously identified by the student in '*1. Identified Occupational Performance Priorities'*. Completing this component collaboratively with the student enables them to see how the intervention is relevant to their occupational performance difficulties and empowers them to make decisions regarding the intervention process. Where appropriate, therapists can assist students in identifying appropriate directions for intervention and should provide suggestions and recommendations on resources, strategies, and timelines based on their clinical reasoning. However, it is most important that the student is satisfied with the purpose of the intervention and understands the support available to them in achieving their goal.

In the original paper-based *TSP*, Nolan (2011) encouraged therapists to use the 'SMART' method for goal setting. For the 2022 version of the *TSOPP*, where appropriate, therapists may wish to use the 'SMART' method when documenting OT intervention, as

not only is this beneficial for intervention plans, but also helps students develop goal setting skills which they can employ in their student role. King and Ziviani (2015) highlight how variations of the 'SMART' technique has been used in goal setting by different professions. According to Moran and Dancza (2018), 'SMART' consists of:

- **S = Specific** – clearly outlining what the student and therapist agree to achieve, ensuring that this relates to the student-centred goals.
- **M = Measurable** – clearly identifying how to measure the progress made towards the goal.
- **A = Activity-based** – clearly outlining the activity that needs to be engaged in that relates to students' valued occupation.
- **R = Realistic and relevant** – intervention strategies should be tailored so that they are appropriately challenging for the student, but not overwhelming. Furthermore, they should be relevant to the student's goal.

6.3.4.4 '4. Progress'

This component allows students and therapists to track the progress made towards the student-centred goals, as seen in Figure 6.5. There is a drop-down menu with the options 'Completed', 'In progress' and 'No longer relevant' that can be used to identify the status of the goal. If timed targets are set, it is important for them to be flexible according to the student's demands throughout the semester, such as the student experiencing a particularly busy point in the semester, needing to apply for extenuating circumstances, or that their original goal has changed for them as time goes on. Therapists are encouraged to review goals regularly with students to ensure that they are flexible and still relevant to them, or to determine a more realistic timeframe if necessary. Reviewing goals is also useful to demonstrate to the student the progress that they are making towards their goals.

6.3.4.5 '5. Notes'

This component can capture any additional notes that may be of interest, such as a change in the timeline of a target or noting how a goal may have changed for a student over time.

6.3.5 Introduction of Keyforms and Repeated Measures

Although the tool was originally intended to be used as an outcome measure, Creaner and Nolan (2016) previously found that only 26% (N=38) of files had evidence of the tool being used as a repeated outcome measure during their clinical audit. Furthermore, prior to this study, no research had been conducted to determine the tool's validity and reliability in detecting change in occupational performance difficulties (i.e., ability to be used as an outcome measure). In 'Chapter 5', it was shown that the *TSOPP* 'Difficulty' scale demonstrates preliminary evidence to be used as an outcome measure using a small sample of 91 repeated measures. During the second training session, the occupational therapists were introduced to the keyform (Appendix 5.3) which is a paper-and-pencil method of quickly estimating a student's level of occupational performance difficulty without the need for complex Rasch analysis computer software (Kielhofner et al., 2005). The keyform is more meaningful than a total raw score as it is robust to missing data and appreciates the relative difficulty of the items within the tool (Wright, & Linacre, 1989). A demonstration of how to use the keyform to determine if a change has occurred in a student's level of occupational performance was conducted during this training session. This can also help achieve step seven in the Occupational Performance Process Model (OPPM; Fearing et al., 1997) which is concerned with evaluating occupational performance outcomes. Clear instructions on how and when to use a keyform are included in the *TSOPP* administration manual discussed below in 6.3.6.

Nonetheless, while a keyform is beneficial for gaining an accurate total measure of a student's level of occupational performance difficulties within the student role, it would also be beneficial to compare the individual raw ratings that student's give to each item over time. As shown in section '5.2.2 Stability Analysis: Andrich Thresholds across time', it was demonstrated that the Andrich Thresholds calibrated differently across time, with students more likely to use categories '*1=Some difficulty*' and '*2=Moderate difficulty*' at '*TSP* 2' completing the tool in comparison to '*TSP* 1', whereas students were more likely to use '*0=No difficulty*' and '*3=Extreme difficulty*' at '*TSP* 1' in comparison to '*TSP* 2'.

Potential reasons for this are a student's level of insight into their difficulties enhancing as they gain more college experience, a student's ability to manage certain aspects of the student role changing over time, or simply because some students may not have had the opportunity to engage in certain aspects of their student role when completing the tool initially at Time 1 (e.g., first year students not having completed exams yet) in comparison to Time 2, which influences their ratings across time. Therefore, by including a 'Repeated Measures' section in the tool, the individual ratings (and overall keyform measures) can be displayed side-by-side which enables therapists and students to qualitatively discuss how these ratings have changed over time. Such a discussion can be affirming for students to highlight the items that they have developed skills in managing, while also acknowledging that other aspects of the student role may be harder than they initially thought. Hence, this 'Repeated Measures' section has been included, and therapists using the tool are encouraged to discuss this section with students as a way of capturing both a quantitative and qualitative outcome measure.

6.3.6 Developing an Administration Manual

It became apparent that there was a stark need to develop an administration manual for the *TSOPP*. Other widely used tools within occupational therapy have an established administration manual, including the *Canadian Occupational Performance Measure* (Law et al., 2014), as well as many Model of Human Occupation based assessment tools including but not limited to the *Occupational Self Assessment* (*OSA*; Baron et al., 2006), the *Worker Role Interview* (WRI; Braveman et al., 2005) and the *Occupational Performance History Interview* (OPHI-II; Kielhofner et al., 2004). These administration manuals outline the development and research conducted on the tool, the theoretical underpinnings of the tool, the content within the tool, instructions on how to administer each section of the tool, and any additional resources such as keyforms for evaluating outcomes. To improve the clinical utility of the *TSOPP*, it was necessary to develop an administration manual (Appendix 6.4) to firstly provide clarity to the therapists currently using the tool, but to also ensure that new therapists who wish to use this tool can easily begin administering the tool within their practice.

6.4 Conclusion

This chapter outlined the thematic findings that were generated from the Initial and Follow-up Focus Groups with the occupational therapists in respectively using the 2014 version of the *eTSP* and the 2021 version of the *eTSP* in practice. These themes painted a picture of the impact that changes made to the tool have had over time, including changes made to the overall tool following the 2014 clinical audit with the aim of improving practice and the Rasch analysis refinements in the 'Identifying Needs' section in the current research. Moreover, the findings from Stage Two strengthen the argument from Stage One that the underlying construct of the *eTSP* is 'occupational performance difficulties within the student role' – relating to the ultimate construct of the PEO-Model (Law et al., 1996). Nevertheless, as the research progressed in this stage, it became apparent that there were persisting issues within other sections of the tool which could not be identified or resolved with Rasch analysis alone as they pertained to other qualitative parts or theoretical underpinnings of the tool. Additional refinements were made to each section of the tool, including the tool's re-branding as the *Trinity Student Occupational Performance Profile* (*TSOPP*) and the development of an administration manual. It is envisaged that these additional refinements will strengthen the face validity and clinical utility of the overall tool, and ensure that its ultimate construct of interest, occupational performance difficulty within the student role, will be evident in every section of the *TSOPP*, not just section '3 - Identifying Needs'.

7 Chapter 7: Discussion & Conclusion

7.1 Introduction

This research on the refinement of the *TSOPP* (formerly known as the *TSP*) is particularly timely considering the increasing need for person-centred measurement to highlight the distinct value of occupational therapy (Velozo, 2021) especially within the area of mental health practice to ensure continued growth and survival of the profession (COT, 2013; Donnelly, & Carswell, 2002; Doucet, & Gutman, 2013). Within the practice area of occupational therapy in higher education, there was a need for a self-report measure of occupational performance difficulties within the student role (Keptner, 2018) and a need for uniform measurement of outcomes in such services globally (Eichler, & Keptner, 2023). Although the tool has existed and been utilised in several services in Ireland (Nolan, 2011), prior to this research it had not been disseminated within peer-reviewed journals due to the need for further rigorous validation. The research presented in this thesis outlined the rigorous refinement process which the *TSOPP* underwent. To assist with the discussion presented in this chapter, the operational definitions of the 'Difficulty' scale and 'Priority' scale which resulted from this research are stated below:

- **'Difficulty' scale operational definition:** *The TSOPP's 'Difficulty' scale measures difficulties with occupational performance associated with the occupational role of being a student in higher education. The role of being a student in higher education involves students developing a set of performance skills necessary to engage in the academic, social, and personal demands and occupations that are associated with this role. The physical, social, cultural, and institutional components of the university environment influence a student's experience of occupational performance. Therefore, the 'Difficulty' scale aims to measure the self-reported difficulties that students are experiencing in relation to occupational performance within the student role in higher education.*
- **'Priority' scale operational definition:** *The purpose of the TSOPP's 'Priority' scale is to prioritise the occupational performance difficulties identified by the*

student in the 'Difficulty' scale. It does not seek to measure a specific construct of interest. It is highly individualised to the student's circumstances. The 'Priority' scale enables students to identify the difficulties with occupational performance which are most relevant to them which subsequently assists with setting goals for occupational therapy at the time in which they complete the TSOPP.

This final chapter discusses how the research aims and objectives were achieved and the implications of the findings within the context of current literature (7.2). The strengths and limitations of the research will then be discussed (7.3), followed by the implications and recommendations this research has for practice (7.4). The recommendations for future research will be outlined (7.5), and the chapter will end with the final conclusions of the research (7.6).

7.2 Findings within the context of current literature

The overall aim of this research was to refine the psychometric properties of the *TSOPP* (formerly known as the *TSP*). The aim of Stage One was to refine the psychometric properties of the 'Identifying Needs' section of the *TSP* using Rasch analysis, while the aim of Stage Two was to affirm the face validity and clinical utility of the refined tool in practice. This section discusses how the specific objectives of Stage One and Stage Two were achieved within the context of current literature. Through an embedded design approach, this research has better aligned the *TSOPP* with the underlying construct of occupational performance difficulties (Law et al., 1996) within the student role, both through psychometric and qualitative evidence.

7.2.1 Stage One (a) – Determine if the 'Difficulty' scale demonstrates stronger psychometric properties as three separate 'Person', 'Environment', and 'Occupation' item-sets or as a combined item-set of occupational performance difficulty within the context of the Person-Environment-Occupation Model.

When the tool was developed and piloted, Nolan (2011) determined that the PEO-Model (Law et al., 1996) was the most appropriate model to underpin the *TSP* as the tool aimed to measure a student's level of occupational performance difficulty within the student role in higher education. Using Classical Test Theory (CTT), Nolan (2011) developed three separate item-sets based on the 'Person', 'Environment', and 'Occupation' factors of the PEO-Model (Law et al., 1996), which demonstrated adequate reliability and validity. Although it was envisaged that the tool would measure occupational performance difficulties within the student role, these separate item-sets did not provide a singular measure of occupational performance difficulty – the ultimate construct of the PEO-Model (Law et al., 1996). Furthermore, due to the separation of these item-sets, it was not possible to determine the relative hierarchy of difficulty associated with the student role. Not having a measure of occupational performance difficulty nor an understanding of the item difficulty hierarchy within the student role poses challenges for practice, such as difficulties measuring if a change has occurred across time (Laver-Fawcett, 2014), measuring the effectiveness of an intervention (Casteleijn, & Graham, 2012; Rouleau et al., 2015; Velozo et al., 2012), or identifying just-right challenges during intervention planning (Christie, 1999; Velozo, 2021).

As for the current research, using Rasch analysis methodology highlighted issues residing with the separate item-sets which could not be identified in Nolan's (2011) research due to the limitations posed by CTT. For example, item fit and dimensionality were an issue for the separate item-sets which suggests potential multidimensionality (Bond, & Fox, 2015). One method of remedying item misfit is through item removal (Wright, & Masters, 1982). However, the items which misfit in the 'Person'

('*Understanding the Library System [LIBSYSTE]'; 'Handing up work on time [HANDWORK]'*), 'Environment' ('*Tolerating external distractions [TOLERATE]'*) and 'Occupation' ('*Staying and doing the exams [STAYDOEX]'; 'Doing practical work [PRACTICA]'*) item-sets were clinically relevant and if these items were to be removed with the sole purpose of remedying item misfit, valuable clinical information would be lost. Moreover, each of the separate item-sets demonstrated local independence violations and challenges associated with rating scale functioning, neither of which had been identified in Nolan's (2011) pilot research. As for reliability and separation, Nolan's (2011) original pilot study found that Cronbach's alpha ranged from 0.518 to 0.887 across the separate item-sets, with the 'Environment' item-set demonstrating the weakest reliability. This was reflected in this research, with the 'Environment' item-set demonstrating inadequate Person Reliability (0.76) and Separation (1.80). Evidently, using Rasch analysis highlighted the limitations associated with the separate item-sets, as well as uncovering further issues that had not been identified using CTT.

The purpose of combining the items together in this research was to determine if the items worked well together in measuring the ultimate construct of the PEO-Model (Law et al., 1996), which in this context was occupational performance difficulties within the student role. By making this refinement, it resolved several issues that were associated with the separate three item-sets. Firstly, combining the items enabled a singular measure of occupational performance difficulty to be gathered which allows therapists to measure if a change has occurred across time (Laver-Fawcett, 2014), measure the effectiveness of an intervention (Casteleijn, & Graham, 2012; Rouleau et al., 2015; Velozo et al., 2012), and identify just-right challenges during intervention planning (Christie, 1999; Velozo, 2021) with students. The combined item-set demonstrated evidence of item fit, unidimensionality, and strong person and item reliability and separation indices, meaning the items were working well together to measure the ultimate construct of the PEO-Model, namely, difficulties with occupational performance (Law et al., 1996).

Similar to the separate item-sets, the combined item-set demonstrated disordering of the rating scale functioning, highlighting a persisting issue with the original 6-point scale

which could not have been identified during the tool's pilot due to the use of CTT (Linacre, 2004; Nolan, 2011). Furthermore, there was evidence of local independence violations in the combined item-set, with some violations arising between items which originated from the 'Person', 'Environment', and 'Occupation' item-sets. This is logical as occupational performance is influenced by the overlapping transactive relationship between the person, environment, and occupation concepts within the PEO-Model (Law et al., 1996). However, these violations would not have been highlighted if the items were not combined. All of this provides evidence for the tool's structural aspect of validity (Messick, 1989; Wolfe, & Smith, 2007a) which focuses on the consistency of the scoring structure of a tool to the structure of the intended underlying construct.

Most importantly, this research has highlighted that the underlying construct of the *TSOPP* is focused on measuring difficulty with occupational performance within the occupational role of being a student in higher education. Through the use of Rasch analysis, this research generated an item difficulty hierarchy (Bond, & Fox, 2015) which is a novel finding as it captures the relative difficulty of occupational performance associated with the student role in higher education. Law et al. (1996) conceptualise occupational performance as an outcome of the dynamic and transactive relationship of the person engaging in purposeful tasks and activities within their environment, and that through this experience, one renegotiates their occupational roles and view of self. Occupational performance is highly influenced by everyday routines and the environment (Kielhofner, 2008), and represents the means in which a person can connect with a particular occupational role and their sociocultural context (Law, Baum, & Dunn, 2017; Reed, & Sanderson, 1999). Although it is acknowledged that occupational performance is influenced by the person, environment, and occupation factors as per the PEO-Model (Law et al., 1996), this research demonstrates that the previous 'Person', 'Environment', and 'Occupation' labels are obsolete and that the *TSOPP* in fact measures difficulties with occupational performance. As per the statement of the operational definitions at the start of this chapter, the *TSOPP*'s 'Difficulty' scale measures difficulties with occupational performance associated with the occupational role of being a student in higher education. The role of being a student in higher education involves students developing a set of performance skills necessary to engage in the academic, social, and

personal demands and occupations that are associated with this role. The physical, social, cultural, and institutional components of the university environment influence a student's experience of occupational performance. Therefore, the 'Difficulty' scale aims to measure the self-reported difficulties that students are experiencing in relation to occupational performance within the student role in higher education. Nevertheless, there were persisting issues with this combined item-set that needed to be remedied which will be discussed in section 7.2.2.

7.2.2 Stage One (b) – Refine the psychometric properties of the 'Difficulty' scale using an iterative process of Rasch analysis.

The use of Rasch analysis in this research enabled the resolution of the persisting measurement issues of the combined item-set. In relation to the rating scale functioning, the 6-point 'Difficulty' scale had evidence of disordered categories. Although Preston and Colman (2000) demonstrated that increasing the rating scale categories may increase reliability, Weng (2004) argues that having too many categories makes it more complex as it is difficult to discriminate between adjacent categories. For the *TSOPP*'s 'Difficulty' scale, six categories appeared to be too many for students to adequately discriminate between and the scale was collapsed to a 4-point scale. Category collapsing is a common approach to remedying disordered rating scales of self-report measures (Linacre, 2004; Smith et al., 2003). For example, in the scoping review in 'Chapter 2', of the 19 papers that investigated rating scale functioning of a measure between 2001-2022, eight measures demonstrated category disordering and subsequently required category collapsing, often to a 3- or 4-point rating scale (Chang et al., 2013; Chen et al., 2015; Cleanthous et al., 2019; Eakman, 2012; Hakansson et al., 2019, 2020; Hancock et al., 2011; Pan et al., 2018; Scanlan, & Bundy, 2011). Whereas 11 papers found that the original rating scale functioned optimally and did not require category collapsing (Atler, & Fisher, 2022; Chen et al., 2013; Eklund et al., 2009; George-Paschal et al., 2022; Hancock et al., 2015; Hansen et al., 2022; Janeslätt et al., 2018; Nilsson et al., 2011; Pan et al., 2020; Sigurðardóttir et al., 2022; Wæhrens et al., 2021).

Although it is acknowledged that these tools intend to measure different constructs with different target populations than the *TSOPP*, this highlights the importance of considering the specific purpose, construct of interest, and the target population as well as the statistical evidence when collapsing categories. For the *TSOPP*, this shorter scale was easier for students to accurately identify their occupational performance difficulties in practice as found in Stage Two (section 7.2.8), confirming that a shorter rating scale was more appropriate for the target population and construct of interest. Furthermore, unlike the original *TSP*, all four category labels were then displayed on the *TSOPP* which is desirable as it reduces the likelihood of students attaching their own meaning to unlabelled categories (Smith et al., 2003). **Nevertheless, future research should validate this refined rating scale (Smith et al., 2003) using a new sample of students with disabilities in higher education.**

In addition to the reduction in the rating scale categories, the number of items in the *TSOPP* was reduced from 74 to 54. Smith et al. (2016) advocate that Rasch analysis is the most appropriate methodology for reducing the number of items within an outcome measure in mental health. Local independence violations may occur due to potential multidimensionality, items which are measuring similar concepts or have similar wording (Yen, 1993). As local independence between items is an assumption of the Rasch model (Bond, & Fox, 2015), these violations needed to be remedied even though the *TSOPP* demonstrated strong Person and Item Reliability and Cronbach's alpha as a 74-item scale. Prior to removing the redundant items, Cronbach's alpha was 0.93 while after it was 0.91. However, Terwee et al. (2007) describe how Cronbach's alpha is impacted by the number of items in the scale and that extremely high indicators can be the result of high correlations and redundancy between items. Hence, Cronbach's alpha of 0.91 is still considered excellent (Terwee et al., 2007). As for Person and Item Reliability and Separation, although there were slight reductions in some of these indicators, all were within acceptable ranges (Bond, & Fox, 2015). For example, Person Reliability Index was 0.91 (acceptable = >0.80) with a Person Separation Index of 3.15 (acceptable = >2), while the Item Reliability Index was 0.99 (acceptable = >0.90) with an Item Separation Index of 13.90 (acceptable = >3) (Bond, & Fox, 2015).

Moreover, all 54 items demonstrated appropriate fit statistics, meaning they are working well together to measure the construct of occupational performance difficulties within the student role (Wright, & Masters, 1982). Interestingly, of the five items that were originally misfitting from the separate item-sets (7.2.1), the only item that then was removed due to a local independence violation was *'Handing up work on time [HANDWORK]'*. This item was from the original 'Person' item-set and was violating with *'Dealing with time pressures and deadlines [PRESSDEA]'* from the 'Occupation' item-set – an example of items violating local independence from across the original item-sets due to the transactive nature of the PEO-Model (Law et al., 1996). *HANDWORK* was removed due to the similar concept in which these two aimed to capture, which *PRESSDEA* was deemed to better capture. However, none of the other originally misfitting items were removed from the combined *TSOPP*, indicating their clinical relevance in measuring the construct of occupational performance difficulties within the student role and further highlighting the limitations with the original separate item-sets. This highlights the importance of considering the underlying conceptual model prior to item removal in order to remedy misfit. In practice, this shortening of the scale reduced the length of time for students to complete the *TSOPP* (7.2.8), which Prieto, Alonso and Lamarca (2003) claim minimises the burden of response for respondents.

As for person misfit, although it was demonstrated that misfitting persons did not substantially impact the item difficulty measures or hierarchy, a larger proportion (*N* = 104, 15.6%) of persons misfit than the 5% that was expected by chance (Smith, 2002) and may highlight issues with the substantive aspect of validity such as issues with the rating scale or between the underlying model and the measure's items (Messick, 1989; Wolfe, & Smith, 2007), potentially indicating the need for further development. **Hence, future research should further investigate person fit with another sample of students with disabilities in higher education, both investigating person fit statistics and clarifying response patterns with students qualitatively to better understand the cause of the misfit.**

In the scoping review in 'Chapter 2', it was found that no measures focused on occupational roles, such as the worker, student, or family role (AOTA, 2014). Rasch

analysis is ideally suited for developing measures of occupational roles, as item difficulty hierarchies (Wright, & Masters, 1979) allow both researchers and practitioners to gain insights into the relative difficulty of the tasks, activities, and occupations associated with these roles. The research conducted in this thesis illustrated the item difficulty hierarchy of occupational performance difficulties within the student role in higher education, a novel finding which is beneficial both theoretically and clinically. Although literature exists regarding the occupational performance difficulties experienced by students with disabilities in university and higher education (Campbell et al., 2022; Clouder et al., 2020; DuPaul et al., 2019; Goffer et al., 2019; Kwon et al., 2018; Jansen et al., 2017; Johnson, & Reid, 2011; McLeod et al., 2019; Nuske et al., 2019; Sheldon et al., 2021; Storrie et al., 2010; White et al., 2016), this research has been able to provide novel evidence regarding the relative difficulty of these challenges. This research found that originated from the 'Person' and 'Occupation' item-sets were found at the higher end of the scale. For example, some of the hardest items that came from the original 'Person' item-set included '*Procrastination [PROCRAST]*' (1.28 logits), '*Maintaining concentration during study [CONCENST]'* (-1.11 logits), and '*Managing anxiety [MANANXIE]*' (-1.09 logits). As for the items at the higher end of the scale that came from the original 'Occupation' item-set, this included '*Dealing with work overload [WORKOVER]*' (-1.31 logits), '*Dealing with time pressures and deadlines [PRESSDEA]*' (-1.02 logits), and '*Achieving goals [ACHIEVEG]*' (-0.88 logits). These items that are the most difficult to manage reflect the continuing brain development occurring between adolescence and adulthood as young people try to attain the necessary independence skills (Spear, 2000). On the other hand, the majority of items that came from the original 'Environment' item-set were some of the easiest to manage, such as '*Managing/avoiding other substances [MANSUBST]*' (1.85 logits), '*Getting to the exam hall [GETEXAMH]*' (1.39 logits), and '*Using computers [USECOMP]*' (1.33 logits). This indicates that if a student is struggling to manage the environmental aspects of their student role, they likely are experiencing other occupational performance difficulties associated with their student role. Hence, it is imperative that students are appropriately supported to adjust to the environment of the higher education institution in order to be able to manage the other more challenging aspects of their student role.

Most importantly, this hierarchy confirms the underlying construct of the *TSOPP*, as all of the items work in a transactive relationship to measure occupational performance difficulties within the student role in higher education. During its original development (Nolan, 2011), the tool was underpinned by the PEO-Model (Law et al., 1996) and intended to provide a measure occupational performance difficulty within the student role rather than of specific person, environment, and occupation concepts or subcomponents. However, due to the separation of these item-sets, one overall measure of occupational performance could not be generated. Through the use of Rasch analysis, the research conducted in this thesis has strengthened the *TSOPP*'s psychometric properties in measuring occupational performance difficulties within the student role by the combining the items into one scale and subsequently refining this scale. Nevertheless, how a student rates the items within the *TSOPP* can indicate where further and more specific assessment is necessary within the wider process of occupational therapy assessment. Moreover, this hierarchy not only adds to theory and understanding regarding the relative difficulty of occupational performance within the student role but also enables therapists to better grade intervention plans with students and allows students to develop better awareness about their difficulties (Velozo, 2021). For example, therapists and students may discuss this hierarchy and a student's level of reported occupational performance difficulties and start intervention with a just-right challenge (Christie, 1999; Velozo, 2021). A discussed in 7.2.9, the item difficulty hierarchy is now displayed on the *TSOPP.* **Future research should gather therapists and students experiences of this using part of the tool in practice.**

7.2.3 Stage One (c) – Establish preliminary evidence for the generalisability of the 'Difficulty' scale across measurement contexts (i.e., university, gender, level of degree, administration format).

This research conducted a preliminary differential item functioning (DIF) on the *TSOPP* across university context, gender, level of degree, and administration format. In terms

of university context, only one item ('*Being on time for college [ONTIMECO]*') demonstrated a slight-moderate DIF, with the TCD group reporting higher levels of occupational performance difficulty with this item. The exact reasoning for this is unknown, and it is possible that the imbalanced sample size between TCD (N=569) and UCD (N=98) contributed to this result. Another potential reason is the differing modes of transport taken by students in TCD and UCD which may impact their ability to get to college on time. To give context, the main TCD campus is based in College Green in Dublin City Centre, while the majority of health sciences courses are based in the Trinity Centre for Health Sciences in St James's Hospital, approximately 3km from the main campus. Trinity Hall, the main student accommodation primarily reserved for first year students, is located in South Dublin, approximately 4km from the TCD main campus, while there is limited on-campus accommodation. The TCD campus is well serviced by public transport and cycling routes. Students are unable to receive parking permits for on-campus parking unless they require parking due to the nature of their disability. In the 2018 TCD Travel Modes survey (n=3,912 – students and staff, breakdown not provided), it was found that the most common modes of transport were walking (28%), bus/mini-coach/coach (27%), train/Dublin Area Rapid Transport (DART; 17%), bicycle (14%) and Luas (11%), while car use declined from 3% in 2011 to 2% in 2018 (Healthy Trinity, 2018). On the other hand, the UCD Belfield campus is a large campus based within South Dublin, with the Smurfit Graduate Business School based approximately 3km away in Blackrock. UCD offers on-campus accommodation at both its Belfield and Smurfit campuses. The Belfield campus is well serviced by public transport options, but also offers over 3,500 parking spaces for students, staff and visitors. In 2018 (UCD Estates, 2018), the commuting survey to the Belfield campus (n=6789 – students and staff, breakdown not provided), found that students commuted to campus most frequently by bus (41%), followed driving a car (18%), cycling (17%), walking (15%), rail (6%) or being a car passenger (2%). The differing set up of the campuses and considerable difference between car use and parking between the universities may have contributed to the TCD group indicating higher occupational performance difficulties with *Being on time for college [ONTIMECO].* However, it must be noted that the data collected in this research pertains to student data between 2007-2017, whereas the increasing accommodation costs and housing crisis taking place (Ó Cionnaith, 2023;

White, Michael, & Murphy, 2022) at this current time may influence the commuting and accommodation options of students in TCD and UCD, and hence may produce different results if the DIF analysis was repeated with more up-to-date data. Otherwise, the remainder of the *TSOPP* items demonstrated generalisability (Messick, 1989; Wolfe, & Smith, 2007a) across the two universities, meaning students with disabilities from both universities conceptualised the relative difficulty of occupational performance within the student role in a similar manner. **In order to provide further evidence for the generalisability of the tool, future research should investigate how the tool functions in other universities both in Ireland and internationally.**

The DIF analysis according to gender revealed some interesting results. Students identifying as female reported higher levels of occupational performance difficulties in items relating to affective factors, with a moderate-large DIF found on items '*Managing stress before an exam [MANSTREE]*' and '*Managing anxiety [MANANXIE]*', and a slight-moderate DIF found on items '*Managing panic and 'writer's block [MANPANIC]*', '*Receiving and coping with bad results [RECBADRE]*' and '*Switching off and relaxing [SWITCHOF]*'. This supports existing literature that students identifying as female are at greater risk of severe anxiety and lower levels of resilience than male students (Dooley et al., 2019), mental health problems (Sheldon et al., 2021), and more recently greater stress related to COVID-19 (Bhargav, & Swords, 2022), whereas other literature demonstrates that being a female student is not associated with poor well-being or mental health (Campbell, 2022). Moreover, Mackenzie, Gekoski and Knox (2006) found that females were more likely to self-disclose and seek help for problems and more likely to utilise health services. This is supported by Dooley et al.'s (2019) 'My World Survey 2' of young adults in Ireland, with females being more likely than males to report talking about their issues as well as seeking professional help for issues.

On the other hand, for students identifying as male, there was a moderate-large DIF found on items '*Managing alcohol intake [MANALCOH]'*, '*Taking notes in class [TAKENOTE]*', and '*Organising information [ORGANISE]*', while there was a slight-moderate DIF found on items *'Managing finances/bills [MANFINAN]*' and '*Writing study notes after class [NOTESAFT]*'. As for managing alcohol, this supports Dooley et al.'s

(2019) findings that male student's alcohol behaviour was more likely to be within the hazardous drinking or possible alcohol dependence categories than females. However, Davoren, Demant, Shiely and Perry's (2016) systematic review of consumption of alcohol in university students in Ireland and the United Kingdom between 2002-2014 found that there was a trend of the gender gap narrowing between male and female students' alcohol consumption. As for the items relating to academic performance and study strategies (i.e., *TAKENOTE*, *ORGANISE*, and *NOTESAFT*), students identifying as male may have experienced less proficiency or engagement in study strategies. Existing literature highlights how female students demonstrate greater proficiency in applying study strategies (Marrs, & Sigler, 2011) and engaged with study strategies more frequently than male students (Ruffing et al., 2015). Furthermore, this is also the case for students with disabilities, for example female students with dyslexia outperforming male students with dyslexia in terms of study strategies in university (Tops et al., 2020).

Finally, male students reported higher levels of occupational performance difficulties in the item *'Managing finances/bills [MANFINAN]*'. In the United States, although it has been shown that female students demonstrated lower scores in financial knowledge than male students (Bordon, Lee, Serido, & Collins, 2008), Sages, Britt and Cumbie (2013) found that male students were more likely to reach the limit on credit cards. In Ireland, Dooley et al. (2019) found that male students were less likely to report feeling stressed about their finances than female students. Moreover, Keptner and Rogers (2019) found that students who commuted to college or students who had to work to support their education experienced occupational performance difficulties with managing finances. Keptner and Rogers (2019) study did not breakdown work status or commuter status by gender, while the current research did not collect data on how students commuted to college or if they worked alongside their studies. **Hence, further research exploring the impact of financial knowledge, commuting, and work status of students with disabilities in Ireland may provide clarity on this DIF finding.** Moreover, it is acknowledged that the retrospective data collected for the current research using the *TSP/eTSP* only included the binary categories of 'male' and 'female' for gender. As described in Appendix 6.2, to align the *TSOPP* with gender-inclusive policies within TCD, UCD, and TUDublin, the *TSOPP* now enables students to identify their gender as 'Male',

'Female', 'Gender non-binary', and 'Prefer not to say'. **Hence, future DIF research should appropriately reflect these more inclusive and student-identified categorisations.**

In terms of level of degree, it is acknowledged that the samples of undergraduate students (N=594) and postgraduate students (N=68) were imbalanced, and the postgraduate sample is considered inadequate (Mokkink et al., 2019). As per this preliminary analysis, the items in which undergraduates reported higher levels of occupational performance difficulty pertained to adjusting to the university environment and processes, with a moderate-large DIF found on items '*Understanding the content of lectures [UNDERCON]*', '*Understanding the course structure and content [COURSTRU]*', '*Using computers [USECOMP]*', and '*Managing the Tutor/Student Advisor System [MANTUTOR]'*, and a slight-moderate DIF found on item '*Knowing best how to study [KNOWBEST]*'. This is unsurprising, considering the existing literature on the importance of transition and adjustment to university for undergraduate student's well-being and retention (Baker, & Siryk, 1986; Campbell et al., 2022; Keptner, 2019; Nerdrum, Rustøen, & Rønnestad, 2009; Sheldon et al., 2021). However, it cannot be assumed that postgraduate students do not experience high levels of occupational performance difficulties during the transition to postgraduate study. Coneyworth, Jessop, Maden and White (2020), as well as Tobbell and O'Donnell (2012), argue that postgraduate students are often overlooked in terms of the transition to their postgraduate study, and that there is a lack of literature pertaining to the transition supports that postgraduate students require. Tobbell and O'Donnell (2012) found that there is an assumption and emphasis placed on postgraduate students to be independent and able to manage the transition alone. This may be one reason why postgraduate students reported higher occupational performance difficulties related to affective factors and executive functioning, with a moderate-large DIF found on items '*Switching off and relaxing [SWITCHOF]'*, '*Dealing with time pressures and deadlines [PRESSDEA]*', and '*Achieving goals [ACHIEVEG]*'. This supports existing literature, as Evans, Nguyen, Richardson and Scott (2018) found that many postgraduate students were not well prepared to cope with the academic demands of postgraduate study, while Brooke, Brown, Orr and Gough (2020) identified that curriculum coursework was

a frequently reported stressor of postgraduate students. Due to the nature of data collection in the current research, it must be noted that it was not possible to ascertain if the postgraduate students within the sample were studying taught masters or diplomas or engaging in research-based masters or PhD programmes which may impact how students rate the *TSOPP* items. **This warrants further research with appropriately sized samples of undergraduates and postgraduates, and between taught or research postgraduate students.**

As for administration format, only one item ('*Managing flatmates/housemates [MANHOUSE]'*) demonstrated a slight-moderate DIF, with higher occupational performance difficulties reported in the Excel-based *eTSP* group. It is unclear why this is the case and unlike the DIF analysis across university context, the sample sizes for the Paper-based *TSP* (N=444) and Excel-based *eTSP* (N=223) were considered very good (Mokkink et al., 2019), albeit they were not balanced. One potential reason for this DIF could be the nature in which students were introduced to the tool. For the paper-based *TSP*, students usually met with their occupational therapist and began the tool in the initial appointment, and completed it in their own time if it was not completed within the session. This afforded students the opportunity to clarify how to complete the tool if necessary. The Excel-based *eTSP* was rolled out in 2014/2015, and since its roll out has usually been sent to a student to be completed in advance of their initial appointment where possible. It must be noted that neither version of the tool had a '*Not applicable'* option within the rating scales, and the instructions that there originally included in the paper-based *TSP* did not translate over to the Excel-based *eTSP* after the clinical audit. It is possible that these circumstances may have influenced how students completed the Excel-based *eTSP,* potentially leading to some students rating '*MANHOUSE*' with greater difficulty due to a lack of clarity of how to complete the tool. Otherwise, the remaining items on the tool demonstrated generalisability across administration format. Nevertheless, ensuring that there is a standardised approach to how the tool is administered and clarity for students on how to complete it is imperative for the reliability, validity and clinical utility (Magasi et al., 2017) of the measures, hence why the administration manual was developed (Appendix 6.4).

A limitation of this research was that DIF analysis across other variables, such as disability category, was not completed due to the sizes of some subsamples being particularly small. Future research could investigate how the *TSOPP* is used by students with different disabilities, especially in providing evidence for its validity and applicability for neurodivergent students.

7.2.4 Stage One (d) – Establish preliminary evidence that the 'Difficulty' scale can be used as an outcome measure (i.e., is sensitive to detecting change over time).

Using a Wolfe and Chiu's (1999) Rasch-based standardised difference formula, this research demonstrated that the 'Difficulty' scale has the ability to be used as an outcome measure, providing evidence for the tool's responsiveness (MOT, 1995; Wolfe, & Smith, 2007a). The results of this preliminary outcome measurement analysis indicate that item difficulty hierarchy of the 54-item 4-point 'Difficulty' scale remain stable or invariant (Engelhard, 2012) across time. This means that the relative difficulty of occupational performance associated with the student role is interpreted similarly across administrations of the tool over time. On the other hand, the 4-point rating scale appears to be used slightly different across administrations (i.e., student's interpretation of the rating scale changed over time). Students were more likely to use categories '*0=No difficulty'* or '*3=Extreme difficulty'* at their first administration than at follow-up administration. Whereas students used categories '*1=Some difficulty'* and '*2=Moderate difficulty'* more frequently at follow-up administration than initial administration. Due to limited information in the dataset relating to the sample and the inability to gather qualitative data as to why the interpretation changed over time, the reasoning for this change in interpretation across time is not fully known.

To-date, the only other occupational therapy mental health self-report measure to have used a similar approach is the *OSA* (Kielhofner et al., 2010). As found in the 'Difficulty' rating scale, Kielhofner et al. (2010) found a similar shift in the *OSA*'s 'Value' rating scale, and cited Schwartz, Andresen, Nosek, Krahan and the RRTC Expert Panel on Health

Status Measurement (2007) in that this shift may be a result of respondent's re-defining their understanding of the underpinning construct. If this is the case for the *TSOPP*, it is plausible that as students gain further experience managing their student role over time, they also gain further self-awareness and insight into their occupational performance difficulties. It is possible that at initial administration early in the semester, some first-year students may not have had the opportunity to experience certain items (e.g., items relating to exams or managing deadlines), while the course demands change over time. Furthermore, for those students with mental health difficulties, the journey of recovery is complicated, non-linear, and cyclical (Sommer et al., 2021) in nature, and may involve cycles of coping with setbacks which, over time, result in greater coping responses (Strauss, 1989). Hence, it is possible that students may not be managing an aspect of their course at follow-up administration as well as they were at first administration, which may impact how they interpreted the rating scale across time. Similar to Kielhofner et al.'s (2010) interpretation, this shift in how student's use the 'Difficulty' rating scale also provides evidence that the *TSOPP* has the ability to capture changes in student's conceptualisation of occupational performance difficulties within the student role.

Furthermore, there is evidence that the 'Difficulty' scale has the potential to detect change in a student's self-reported occupational performance difficulties in either direction. This is a similar finding to that of the *OSA* (Kielhofner et al., 2010). This research demonstrated that a significant change was detectable in nearly half of the sample (N=45, 49.5%). Once again, due to limited information regarding the sample, conclusions relating to why these changes in person measures occurred (e.g., as a result of intervention, changes in course demands, changes in self-awareness etc.) cannot be drawn. **However, future research may focus using the *TSOPP* as an outcome measure to explore this.** Nevertheless, the result from this analysis supports the use of the *TSOPP* as a self-reported outcome measure in detecting changes in occupational performance difficulties within the student role. This is an important finding, considering the emphasis placed on the use of outcome measures that have the ability to detect change in occupational performance and are underpinned by occupational therapy conceptual models (AOTA, 2008; Brown et al., 2019); supporting the unique role of occupational

therapy in mental health settings for stakeholders (Casteleijn, & Graham, 2012; Rouleau, Dion, & Korner-Bitensky, 2015; Velozo et al., 2012); and justifying the contribution, growth, and survival of occupational therapy within mental health practice (COT, 2013; Donnelly, & Carswell, 2002; Doucet, & Gutman, 2013). Although the evidence from the standardised difference formula (Wolfe, & Chiu, 1999) supports the use of the *TSOPP* as an outcome measure, the researcher agrees with Kielhofner et al.'s (2010) stance how this procedure is not suitable to be implemented by occupational therapists in practice and that the use of a paper-and-pencil keyform (Linacre, n.d.) would be easier to use in practice, the development of which will be discussed in 7.2.5 below.

7.2.5 Stage One (e) – Develop a keyform for the 'Difficulty' scale that can be used to estimate a student's measure of occupational performance difficulties in practice.

The benefits that Rasch analysis methodology (Bond, & Fox, 2015; Velozo et al., 2012; Velozo, 2021; Wright, & Masters, 1982) possesses for the *TSOPP*'s measures have been clearly outlined and applied throughout this thesis. However, the measures generated by the refined *TSOPP* are only relevant if they are useful in practice (Velozo, 2021). This is known as interpretability (MOT, 1995; Wolfe, & Smith, 2007a), which is concerned with assigning qualitative meaning to quantitative measures. Magasi et al. (2017) argue that interpretability is not necessarily a measurement property but rather the ability of the measures of a tool to be used in clinical practice. Furthermore, when considering the clinical utility of the *TSOPP*, the level of burden (i.e., time taken to administer and interpret scores) for therapists in completing measures as well as the clinical reasoning required for interpretation of the measures generated from the *TSOPP* are important practical considerations (Riddle, & Stratford, 2013). Although 7.2.4 demonstrated how the *TSOPP* has the potential to detect change in person measures across time, applying the standardised difference procedure (Wolfe, & Chiu, 1999) is neither practical nor feasible in practice for therapists unfamiliar with Rasch methodology or software (Kielhofner et al., 2005; Kielhofner et al., 2010). The solution to this was the development of a keyform (Linacre, n.d.) which is a paper-and-pencil form that, similar

to a ruler (Velozo, 2021), visually displays a latent construct of occupational performance difficulty within the student role and allows therapists to circle the raw rating scale categories chosen by students to then draw a line of best fit to estimate a student's level of occupational performance difficulty (i.e., person measure), without the need for complex software. Furthermore, the logit scale has been transformed into a 0-100 scale to make the measures more easily interpreted (Wolfe, & Smith, 2007b) by therapists and students.

Therapists can use the form using repeated measures to identify if there has been a change in a student's level of occupational performance difficulties within the student role across time. As the 4-point rating scale demonstrated a change in interpretation across time, the results from the keyform should be approached with caution (Kielhofner et al., 2010), and in the interest of person-centred measurement (Velozo, 2021), therapists are encouraged to discuss any changes in measures with students individually to best understand and interpret the change in the context of the student's life.

In practice, the keyforms can assist with identifying just-right challenges for intervention (Christie, 1999; Velozo, 2021). Most importantly, they can support students in developing an understanding and awareness of their difficulties within the student role (Velozo, 2021). This can help support recovery-oriented practice (Davidson, & Roe, 2007), as it enables students to identify their strengths in managing the student role, but also gaining an appreciation for the complexities of the student role while maintaining hope that they will be able to manage this role as they engage with supports and gain more college experience over time.

7.2.6 Stage One (f) – Improve the rating scale functioning of the 'Priority' scale (formerly known as the 'Importance' scale).

As outlined throughout this thesis, the 'Priority' scale (formerly named the 'Importance' scale prior to Stage Two of this research) was not investigated to the same depth as the 'Difficulty' scale as the scale does not seek to measure a construct, but rather to prioritise the occupational performance difficulties identified in the 'Difficulty' scale. Clarification of this theoretical distinction is discussed further in 7.2.9. Nevertheless, to make the actual rating scale easier to use in practice, the rating scale functioning of this scale was investigated. Similar to the 6-point 'Difficulty' rating scale discussed in 7.2.2, the 6-point rating scale used for the 'Priority' scale demonstrated disordered category thresholds. This indicated that students found it difficult to differentiate between six categories (Weng, 2004), and furthermore, as the adjectival labels for the middle categories were not displayed on the original tool this may have led to students creating their own subjective interpretations of the unlabelled categories. Interestingly, collapsing the rating scale categories resulted in a 3-point scale for the 'Priority' scale in comparison to the 4-point scale for the 'Difficulty' scale, indicating that students did use these scales differently. As outlined in 6.3.1.2 in 'Chapter 6', the 'Importance' scale was re-branded as the 'Priority' scale with the categories '*0=Not a priority to work on in OT*', '*1=Low priority to work on in OT*', '*2=High priority to work on in OT'*, and the inclusion of category '*NA=Not applicable'*. The resulting adjectival labels of the 3-point scale can assist with the appropriately prioritising the occupational performance difficulties in practice, improving the clinical utility (Magasi et al., 2017) of this part of the tool. **Nevertheless, similar to the refined 'Difficulty' scale, future research should validate this refined rating scale (Smith et al., 2003) using a new sample of students with disabilities in higher education.**

7.2.7 Stage Two (a) – Gather the experiences of occupational therapists in using each section of the 2014 version of the *eTSP* in practice to identify if refinements of other sections of the tool are warranted.

The 2014 version of the *eTSP* was the version being used in practice in TCD, UCD, and TUDublin at the time when this research was being conducted. This version of the tool was the result of a clinical audit conducted in TCD (Nolan, & Creaner, 2014; Creaner, & Nolan, 2016) in which several recommendations were made to the align the *TSP* with best practice guidelines. Although the changes were made to the tool with the aim of improving practice (RQIA, n.d.), no research had been conducted to determine the impact these changes had on using the tool in practice. Considering there is ample evidence demonstrating the difficulties of implementing consistent and sound measurement within practice (Garland et al., 2003; O'Connell, & McKay, 2010; Rouleau et al., 2015), gathering the experiences of occupational therapists in using the 2014 version of the *eTSP* was imperative prior to training the occupational therapists on the refined 'Identifying Needs' section as a result of the Rasch analysis in Stage One.

This research highlighted how the occupational therapists experienced strengths (as evidenced by '*Theme 1: How the eTSP supports a student-centred assessment process'*) and challenges (as evidenced by '*Theme 2: Getting lost in translation – challenges with the 2014 version following the clinical audit*') in implementing the 2014 version of the *eTSP* in practice. For example, Creaner and Nolan (2016) attempted to better align the tool with the PEO-Model (Law et al., 1996) which the occupational therapists found beneficial for practice as it assisted with students developing an understanding and self-awareness of their occupational performance difficulties. The occupational therapists affirmed Creaner and Nolan's (2016) recommendation to display the PEO-Model (Law et al., 1996) in the 'Experiences & Expectations' section. On the other hand, the occupational therapists described inherent challenges in using the re-formatted 'Goal Setting' section as it narrowly focused on individual person-focused, environment-focused, occupation-focused, and role-focused concerns rather than a broader focus on

occupational performance difficulties within the student role. Creaner and Nolan (2016) implemented this change with the aim of aligning goal setting practices to the PEO-Model (Law et al., 1996). Unfortunately, this re-format did not translate well into practice. This finding reflects the results of the Rasch analysis at the start of Stage One, which confirmed that the tool demonstrated stronger psychometric properties as one measure of occupational performance, rather than separate 'Person', 'Environment', and 'Occupation' item-sets. It is imperative that outcome measures are based on appropriate conceptual models (AOTA, 2008; Brown et al., 2019; de Vet et al., 2011), however, this research highlights the importance of gathering qualitative data alongside quantitative data to determine how this manifests in practice.

Creaner and Nolan (2016) demonstrated that the tool had the ability to capture data that aligned with the recovery model. This was further confirmed by the occupational therapists in this research who described how the tool enabled a strengths-based and individualised approach to assessment (Stoffel, 2011), as well as the facilitation of therapeutic rapport. The individualised approach to assessment is the ultimate aim of person-centred measurement which is enabled through the use of Rasch analysis (Velozo, 2021). This fidelity to the recovery model is essential within current mental health practice (Department of Health and Children, 2006; Department of Health, 2022; Government of Ireland, 2001; MHC, 2007). Kearns et al. (2021) conducted a systematic review to identify occupational outcome measures supportive of recovery-orientated mental health services in Ireland and identified that the *COPM* (Law et al., 2005) was the most aligned with recovery-orientated practice. Unfortunately, at the time of this systematic review, the *TSOPP* had not been published within a peer-reviewed journal, and if it had been, it is unclear if the tool would have been considered part of Kearns et al.'s (2021) inclusion criteria in that the study location had to be from an inpatient, outpatient, or community setting and that the types of services was mental health settings specifically, rather than higher education. Nevertheless, using qualitative evidence, this research re-affirms that the *TSOPP* continues to align with the recovery model as per Nolan's (2011) development and Creaner and Nolan's (2016) clinical audit.

On the other hand, this research highlighted challenges with the aspects of the tool that were either omitted or introduced during the translation process that affected how it was used or interpreted in practice. Most of these omissions and introductions were the result of using Excel to host the electronic version of the tool. For example, the wording of the 'Importance' scale (now known as the 'Priority' scale) was altered in the translation from the paper-based *TSP* (i.e., "*how important is it for you to work on this item in Unilink"*) to Excel-based *eTSP* (i.e., "*Level of importance*") due to space limitations. However, as described by the occupational therapists in this research, this change in wording changed students' understanding and interpretation of this feature of the tool from its original intention. Nolan (2011) originally intended for this section to simply prioritise the occupational performance difficulties identified in the 'Difficulty' scale, but the change in the 2014 version of the *eTSP* opened up the possibility of students interpreting this as the general level of importance of each item. Moreover, the 'Course Demands' section from the original *TSP* did not get translated over to the Excel-based *eTSP*, leading to the occupational therapists having to collect this information in alternative formats although it was considered a valuable part of the original *TSP*. Although the tool was translated to an Excel format with the aim of improving the integration with student case notes in practice (Creaner, & Nolan, 2016), Gwaltney, Shields and Shiffman (2008) advocate that an assessment tool that is transformed to an electronic format needs to be investigated to determine if it is still psychometrically sound. Prior to the current research, this had not been investigated for the *eTSP*. For Stage One, the DIF analysis across administration formats (7.2.3) highlighted that apart from one item that demonstrated a slight-moderate DIF size, the remainder of the 'Difficulty' scale demonstrated generalisability across administration formats. In contrast, the findings of Stage Two demonstrated that the face validity and clinical utility (Magasi et al., 2017) of other sections/features were the aspects of the tool's psychometric properties that were impacted as a result of the translation process to Excel.

Furthermore, due to the ability of Excel to generate automated total scores, this feature was introduced for the 'Person', 'Environment', and 'Occupation' item-sets with no clear explanation on how to use them for practice purposes. The occupational therapists

reported that this led to several students questioning if their scores were inadequate, which does not support recovery-orientated practice (Stoffel, 2011). As described throughout this thesis, the issue with generating total scores using raw ordinal level from a self-report measure such as the *TSP* is that it is not robust to missing data, nor is it appropriately reflective of the relative difficulty of the items within the scale (Bond, & Fox, 2015). Nevertheless, as described previously, the item difficulty hierarchy and keyform developed for the *TSOPP* in Stage One provide occupational therapists with mechanism which appropriately identifies a student's measure of occupational performance difficulty within their student role and enables students to develop an understanding of their difficulties through person-centred measurement (Velozo, 2021). Hence, this 'total score' feature was removed.

Lastly, Creaner and Nolan (2011, p.277) recommended that *"the eTSP should be used with all students as a case note template and as a means of identifying occupational needs*". The occupational therapists in this research described how in a minority of cases, if a student was too overwhelmed, they were not asked to complete the tool but rather the tool guided the therapist's initial assessment with the student. Furthermore, the occupational therapists described how the *eTSP* was a lengthy assessment process with repetitive items which was challenging to complete within the time-sensitive nature of a college semester, especially when students are expecting outcomes from sessions quickly. During Creaner and Nolan's (2016) re-audit, the aspect of the audit that was concerned with documenting outcomes (i.e., Evaluation section) was the only section not to score higher at re-audit, although this may have been explained due to the time in which the re-audit was conducted. Nevertheless, Creaner and Nolan's (2016) audit coupled with the findings from this research reflect the well-documented challenges that many occupational therapists experience when attempting to implement consistent outcome measurement within their practice such as a perceived lack of time (Garland et al., 2003; King, Wright, & Russell, 2011; O'Connell, & McKay, 2010; Rouleau et al., 2015), despite the consistent calls for routine outcome measurement as a way to demonstrate the value of occupational therapy in mental health practice (COT, 2013; Donnelly, & Carswell, 2002; Doucet, & Gutman, 2013; Laver-

Fawcett, 2014; Law, Baum, & Dunn, 2017). The changes made to the 'Identifying Needs' section in Stage One aimed to improve this experience, as discussed in 8.2.8 below.

7.2.8 Stage Two (b) – Train the occupational therapists in using the refined 'Identifying Needs' section and gather their experiences after a period of using this in practice.

Sudsawad (2006) suggests that one of the most important aspects of outcomes research is ensuring that it is usable for practice, while Velozo (2021) highlights how the difficulty with implementing outcome measurement is because the measures generated from assessment tools pose little value to clinicians. Furthermore, Cruz Rivera et al. (2017) emphasise the importance of gathering evidence to demonstrate the impact of research such as the impact on policy, quality of service delivery, and evidence-based practice. The refinements made to the *TSOPP* in Stage One aimed to create a tool that was easier to use in practice while still gathering reliable and valid measures of occupational performance difficulties within the student role. However, in order to determine if this was achieved, the occupational therapists needed to be trained on the refined 'Identifying Needs' section so that they could translate this knowledge into practice (Burke, & Gitlin, 2012; Forsyth, Summerfield Mann, & Kielhofner, 2005; Lencucha, Kothari, & Rouse, 2007; Ohtake, Strasser, & Needham, 2013; Schaaf, 2015). They were then invited to participate in a follow-up focus group to gather their experiences of using this refined tool in practice (as evidenced by '*Theme 3: Stage One Rasch analysis refinements improved the clinical utility/face validity of Part '3 – Identifying Needs' in capturing the construct of occupational performance'*).

Philibert, Snyder, Judd and Windsor (2003) state that one barrier for implementing evidence-based practice is a lack of understanding or ability on how to interpret research findings, which impacts the transferability of these findings into practice. To assist with this, the researcher held the training sessions to harness the benefits of social learning (Lencucha et al., 2007) so that the refinements made as a result of the Rasch analysis could be explained in a user-friendly manner, and that the occupational

therapists had an opportunity to clarify and ask questions prior to implementing the refined tool in practice. After the initial training, the occupational therapists had the opportunity to use the refined tool within their practice for a semester.

The refinements made to the 'Identifying Needs' section were based on Rasch analysis, but required the occupational therapists' input by conducting the follow-up focus group to ensure that these refinements were responding to real life situations (Boyce, & Lysack, 2000) and were reflective of the sociocultural environment (Lencucha et al., 2007) of higher education. For example, the occupational therapists reported that due to the merging of the tool into one scale with reduced items and refined rating scale, it was easier, quicker, and more efficient to use in practice, affording the therapists more time to have in-depth student-centred discussions about occupational performance difficulties and priorities in the time-sensitive nature of a semester. These refinements directly and positively impacted the barriers identified by the occupational therapists in 8.2.7, and in wider literature (Garland et al., 2003; King et al., 2011; O'Connell, & McKay, 2010; Rouleau et al., 2015).

Furthermore, although one occupational therapist preferred the older horizontal layout of the 'Person', 'Environment', and 'Occupation' item-sets on the 2014 version of the *eTSP,* the new singular vertical layout of the refined 'Identifying Needs' section was welcomed by the majority of the occupational therapists. Gwaltney et al. (2008) states that the electronic interface used when translating a tool from paper-based to an electronic-based format may result in items being presented differently to respondents which may impact how they answer the items. Hence, this finding highlights how the vertical layout introduced in this research was favourable over the horizontal layout implemented following the clinical audit (Creaner, & Nolan, 2016). Although the follow-up focus group confirmed the benefit of the Rasch analysis refinements to the 'Identifying Needs' section, it also highlighted persisting issues with the other parts of the tool that needed to be further rectified as discussed in 8.2.9 below.

7.2.9 Stage Two (c) – Make final refinements to each section of the tool and devise an administration manual on how to use the tool that is accessible by occupational therapists wishing to use the tool in their practice.

As a result of the follow-up focus group, it was evident that there were persisting issues with the face validity and clinical utility of the other sections of the tool which could not be remedied using Rasch analysis (as evidenced by *'Theme 4: Needs to improve clinical utility/face validity of other parts to capture the construct of occupational performance'*). The additional refinements made to the tool and subsequent re-branding to the *Trinity Student Occupational Performance Profile* (*TSOPP*) were documented in 'Chapter 6'.

Most importantly, these refinements were concerned with aligning other parts of the *TSOPP* with the ultimate construct of the PEO-Model (Law et al., 1996), namely difficulties with occupational performance within the student role. The importance of practitioners being guided by a conceptual model of practice is widely emphasised within occupational therapy literature (AOTA, 2020; Law et al., 2017; Reagon, 2012). Unlike other conceptual models, the PEO Model (Law et al., 1996) does not have a specific set of assessment tools, but Strong et al. (1999b) advocate for its use as a practical analytical framework for assessing occupational performance difficulties, intervention planning and for assisting occupational therapists to communicate the value of their services. The PEO-Model (Law et al., 1996) has undoubtedly underpinned the development of the tool prior to this research. Nolan (2011) was guided by the PEO-Model when developing the original tool leading to the 'Identifying Needs' section to be structured as separate 'Person', 'Environment', and 'Occupation' item-sets. Moreover, Creaner and Nolan's (2016) clinical audit aimed to improve the goal setting practices within the tool by formatting the goal setting section according to person-focused, environment-focused, occupation-focused, and role-focused goals. However, the theoretical limitations of these structures meant that the ultimate construct – occupational performance – was not easily captured or documented.

Stage One of this research highlighted the refinements made to the 'Identifying Needs' section based on psychometric evidence to better align this section of the tool with identifying difficulties with occupational performance in the student role. Where relevant in Stage Two, other sections of the tool were refined to similarly align with the construct of occupational performance difficulties within the student role. Together these refinements seek to improve the tool's face validity (Magasi et al., 2017) in being a measure of occupational performance difficulties within the student role. There refinements include:

- Re-branding as the *TSOPP* to better capture the focus of occupational performance.
- Clearly re-defining the underlying construct of the 'Difficulty' scale as occupational performance.
- Including further questions in the 'Experiences and Expectations' section to capture the wider picture of the student as an occupational being and to determine if any aspect of their course is held within the virtual environment.
- Re-introducing the 'Module Matrix' section to clearly capture the occupational demands of the student role.
- Re-formatting the 'Goal Setting' section so that a broader occupational performance goal was identified which is influenced by person, environment, and occupation-related difficulties.

Further to the above, the purpose of the 'Priority' scale (formerly known as the 'Importance' scale) was clarified using the Occupational Performance Process Model (OPPM; Fearing et al., 1997). This clarification was essential for improving the clinical utility (Magasi et al., 2017; Riddle, & Stratford, 2013) of this feature specifically regarding how it is used in practice, as the occupational therapists described challenges in student's interpretation of this scale despite its intention to be used as a mechanism to prioritise the difficulties identified in the 'Difficulty' scale (Nolan, 2011). Re-naming and defining it as a 'Priority' scale aims to fulfil Nolan's (2011) original intention in practice.

Considering the many barriers facing practitioners in implementing consistent outcome measurement practices (Garland et al., 2003; King et al., 2011; O'Connell, & McKay, 2010; Rouleau et al., 2015), several refinements were made to the *TSOPP* to provide more user-friendly mechanisms for documenting outcomes that are useful at individual-, service-, and professional-levels. These sections include the 'Item Difficulty Hierarchy', 'Repeated Measures', and the paper-and-pencil keyforms. From an individual-level, these features of the *TSOPP* enable students to gain insight into their occupational performance difficulties as they transition into and navigate their student role, and facilitate the development of individualised intervention plans which can focus on just-right challenges (Christie, 1999; Velozo, 2021). From a service-level perspective, these features can be used to document the effectiveness of different interventions and help identify service developments for various cohorts of students using group data (Velozo, 2021). Lastly, from a professional-level, these features can be used to provide evidence for the benefit and value of occupational therapy in higher education, which has been identified as a global need for this practice area (Eichler, & Keptner, 2023).

Finally, an administration manual was developed for the *TSOPP* to improve the clinical utility of the tool (Magasi et al., 2017; Riddle, & Stratford, 2013). This manual provides a user-friendly comprehensive overview of the development and psychometric properties of the tool as well as instructions on how to use each section of the tool in practice with the aim of supporting future occupational therapists to interpret the research (Philibert et al., 2003) and translate this knowledge into practice (Burke, & Gitlin, 2012). Exemplars of models which have consistently published administration manuals for their associated assessment tools or free resources include MOHO (Kielhofner, 2008) and the Intentional Relationship Model (Taylor, 2008), all of which are hosted on The Model of Human Occupation and Intentional Relationship Model Clearinghouse (MOHO-IRM Web, 2023). Similar to these tools, it is hoped that the administration manual for the *TSOPP* will be published and accessible online via the Discipline of Occupational Therapy's website within the School of Medicine, Trinity College Dublin.

7.3 Methodological Strengths and Limitations

To the researcher's knowledge, this was the first research study which used Rasch analysis to refine the psychometric properties of a self-report measure of occupational performance difficulties within the student role in higher education, and subsequently roll out this tool in the appropriate occupational therapy services. There were several strengths and limitations experienced during each Stage of the research.

For Stage One, retrospectively collecting anonymised *TSP/eTSP* data from 2007-2017 onsite from TCD and UCD allowed for the researcher to access existing data of the full population of students with disabilities who engaged with the occupational therapy services in these universities, and hence as large a sample as possible to be gathered. However, due to this, it was not possible to clarify response patterns with students to better understand erratic response patterns and hence identify potential sources of person misfit in the Rasch analysis. The use of Rasch analysis provided novel insights and refinements of the *TSOPP* which could not be achieved otherwise, especially the development of the item difficulty hierarchy and keyform. As the data was gathered from only TCD and UCD, and due to small subsample sizes in some DIF analyses, this limits the generalisability of the results to other universities in Ireland or internationally. As for the preliminary outcome measure analysis, the original 91 '*TSP 1*' files were included in the overall sample which was used for Rasch analysis refinement process as existing secondary data was used for this research. Moreover, the sample consisted of *TSP/eTSPs* completed by students who were formally registered with the disability services in higher education and hence may not fully reflect the occupational performance difficulties experienced by students with disabilities who were not registered with these services, or those who were registered but did not engage with occupational therapy specifically.

As for Stage Two, holding focus groups with occupational therapists provided beneficial insights into the use of the tool in practice. It is acknowledged that there were several limitations associated with this Stage. Firstly, the sample size gathered for Stage Two was small, consisting of five therapists. However, this was because the *TSP/eTSP* was

only utilised in the developing occupational therapy services that follow the Unilink model, specifically TCD, UCD, and TUDublin, which limited the number of occupational therapists that could be recruited for the focus groups. Nevertheless, the maximum number of occupational therapists with experience of using the tool were recruited, and came from these different higher education institutions. It is acknowledged that the findings from Stage Two informed the development of the administration manual which may be confounded by these specific practice sites. Due to the limited timescale of the project and the nature in which students access the service, it was beyond the scope of this research to include students in Stage Two.

Focus groups were chosen as the most time-efficient method to collect the qualitative data. This method generated discussion between the therapists which provided the researcher with the opportunity to share her own clinical experience by agreeing/disagreeing with points raised in the focus groups while also managing researcher bias. However, it is acknowledged that there are limitations with focus group methods. For example, the presence of other participants can influence the discussion, as some participants may give socially desirable answers or feel intimidated to provide honest answers in the group context (Bergen, & Labonté, 2019; Kreuger, & Casey, 2009). Furthermore, some participants may dominate the discussion, while others may be quieter and less engaged in the discussion. The researcher acted as a moderator in order to manage the discussion, ensuring each participant had the opportunity to provide feedback on each section of the tool during both the initial and follow-up focus groups. Nevertheless, it is acknowledged that alternative data collection methods, such as individual semi-structured interviews, may have provided alternative insights as participants would have had the opportunity to focus on topics that were most important to them (Tod, 2006).

Due to the COVID-19 pandemic, the focus groups needed to be held virtually online rather than in-person as originally intended. To manage this, the researcher invested time into developing their skills of hosting virtual focus groups. The researcher was fulfilling a dual role of clinician-researcher during this research. Engaging clinical practice was essential for gaining the knowledge and expertise in the occupational performance

difficulties experienced by students with disabilities in higher education, and practicing onsite in UCD while being a TCD PhD student afforded the researcher insights into the nuances of these two higher education institution environments. Nevertheless, a reflexive journal was used throughout Stage Two as a way of managing potential researcher biases that could have resulted from the dual role of clinician-researcher, having pre-existing professional relationships with the occupational therapists, and during the data analysis of the qualitative data.

7.4 Implications and Recommendations for Occupational Therapy Practice

This research has outlined how the *TSOPP* is a valid and reliable measure of occupational performance difficulties within the student role. The refinements made to the tool due to Rasch analysis have made it easier to use in practice, and led to the development of the item difficulty hierarchy and keyform which enable the clear documentation and measurement of outcomes. Considering there has been a call for uniform outcome measurement in occupational therapy services in higher education globally (Eichler, & Keptner, 2023), it is recommended that existing services consider the use of the *TSOPP* to measure and document student and service outcomes. Using the PEO-Model (Law et al., 1996), the *TSOPP* can also assist with identifying the scope of practice and the remit of the role of occupational therapy in newly established services in higher education institutions. The tool has been successfully rolled out to three occupational therapy services in higher education in Ireland, and the administration manual has been developed to assist with the tool's standardised use across future services. For occupational therapists practising in other settings (e.g., community, in-patient hospitals etc.) supporting clients who are students in higher education, it is encouraged that the *TSOPP* is utilised with any client who is a university student and expresses difficulties with occupational performance within the student role. However, it is acknowledged that its administration outside of an on-site university occupational therapy service requires further validation. The administration manual provides practitioners with an overview of the *TSOPP*'s theoretical underpinnings, development,

and research to-date, as well as a step-by-step guide on how to administer the tool in practice. It outlines how therapists should become familiar with the PEO-Model (Law et al., 1996) when using the *TSOPP* to enhance their clinical reasoning, as well appropriate institutional and data protection policies in their practice site. It also outlines how therapists can deal with challenges that may arise, such as difficulties administering the tool due to the temporal context of the semester or supporting a student to complete the tool if they are overwhelmed.

In terms of the *TSOPP*'s ability to measure outcomes, this is beneficial at individual student, service and professional levels. From a student-level, the *TSOPP* enables person-centred measurement (Velozo, 2021) and allows students to develop their awareness of the complexities of the student role, meaning they can document their progress over time or identify periods in which it was harder to manage. From a service-level, the item difficulty hierarchy can help identify specific interventions for students at different points in time during the academic year, as well as measure intervention effectiveness and service efficacy (Casteleijn, & Graham, 2012; Rouleau et al., 2015; Velozo et al., 2012). Lastly, measurement of *TSOPP* outcomes provides justification for the growth and survival of the occupational therapy profession, especially in mental health practice (COT, 2013; Donnelly, & Carswell, 2002; Doucet, & Gutman, 2013) and within higher education (Eichler, & Keptner, 2023; Keptner, 2018). This research has initiated the important step in publishing and disseminating the benefits of the *TSOPP* for practice through publications (Lombard et al., 2023) and conferences, including a poster presentation at the Association of Occupational Therapists of Ireland (AOTI) virtual conference in October 2021 and 18th World Federation of Occupational Therapists (WFOT) Congress in August 2022.

7.5 Recommendations for future research

7.5.1 Using Rasch analysis to validate self-report mental health occupational therapy measures

The scoping review outlined in 'Chapter 2' (Appendix 2.1; Lombard et al., 2021) presents several recommendations for future researchers of self-report mental health occupational therapy measures. Psychometric researchers developing self-report measures within mental health occupational therapy should consider the benefits that Rasch analysis possesses when making methodological decisions, while occupational therapy practitioners should be cognisant about fundamental Rasch analysis terminology and approaches to appropriate appraise evidence underlying the self-report measures they seek to use in practice. Increasing the use of Rasch analysis can create more robust self-report measures that can be used to capture the effectiveness of occupational therapy within the field of mental health.

To improve psychometric research within the field, future instrument developers and researchers could clearly define the conceptual or theoretical model which underpins a measure as this upholds how the construct under investigation is manifested through the measure's items (de Vet et al., 2011) and not having a clear model can lead to unwarranted multidimensionality (Wright, & Masters, 1982). Concurrently, if a measure intends to be multidimensional, it is imperative that it is underpinned by a multidimensional model. In terms of the Rasch analysis techniques employed, future research in the field can be strengthened by more frequently reporting person fit, principal component analysis of residuals, local independence analysis, the Item Reliability Index, and the Item Separation Index. Finally, if a self-report tool is to be used as an outcome measure, it is imperative that its sensitivity across time is validated to reliably demonstrate the effectiveness of occupational therapy intervention, both in practice and research (Laver-Fawcett, 2012). Hence, future self-report outcome measure research within mental health occupational therapy may consider the use of the standardised difference formula (Wolfe, & Chiu, 1999) to facilitate this.

7.5.2 Evidence-base and development of the *TSOPP*

In addition to the suggestions for future research on the *TSOPP* made throughout this chapter, further research should look to validate Stage One results using an independent sample of students with disabilities in higher education. Moreover, future research may determine the validity of using the *TSOPP* with the general student population including postgraduate students, especially in determining if any differences with occupational performance difficulties exist between the general student population and those who have identified with a disability. Furthermore, to provide further evidence for the generalisability (Messick, 1989; Wolfe, & Smith, 2007a) of the *TSOPP*, future research should investigate larger and more stable DIF analyses between different groups (e.g., other universities both nationally and internationally, disability, culture, year and faculty of study). This can also provide evidence for the use of the tool with neurodivergent students. It is also recommended that a larger study using an independent sample of *TSOPP*s is conducted to confirm the tool's utility as an outcome measure. Moreover, future research should investigate the cross-cultural validity of the *TSOPP* especially if it is translated to another languages. Although it is envisaged that the *TSOPP* can be utilised with any client who is a student in higher education and expresses difficulties with occupational performance within the student role, future research should validate its administration in occupational therapy services not based within a higher education institution (e.g., community, in-patient hospitals etc.).

For the purposes of this research, it was only feasible to gather occupational therapists' experiences of using the *eTSP* and refined *TSOPP* in practice. Students were involved in the item development of the original *TSP* (Nolan, 2011); hence, future qualitative research utilising cognitive interviewing and think-aloud protocols may wish to seek students' experiences of completing the tool to re-affirm that the item content still captures the full range of occupational performance difficulties associated with the student role to provide further evidence for the tool's face validity. Cognitive interviews use questions to assess a person's understanding while completing a task, whereas think-aloud protocols asks a person to 'think-aloud' or describe their thought processes as they complete the task (Wolcott, & Lobczowski, 2021), such as completing the *TSOPP*.

These methods can also be used to evaluate the relevance of the content of a tool with a population of interest, such as various student cohorts (Mokkink et al., 2019).

Finally, there were evident difficulties using Excel to host the tool. Therefore, future tool development may focus on hosting the *TSOPP* on an alternative electronic platform to Excel which is easily accessible to students (Gwaltney et al., 2008).

7.6 Conclusion

Services in Ireland, and specifically the Unilink approach, have been a leading example of occupational therapy service provision in higher education (MHC, 2008). Although the piloted *TSP* tool had been used in practice in the TCD Occupational Therapy service since its original inception in 2006 (Nolan, 2011) and in UCD and TUDublin since 2012, the tool required further rigorous refinement and had not yet been disseminated widely in the field. Using a combination of Rasch analysis and qualitative methodology, this research has rigorously validated the *TSOPP*, and has initiated the important process of disseminating the tool's benefits and psychometric evidence in national and international journals and conferences. The refined *TSOPP* presented here is a valid and reliable self-report measure which adequately captures the occupational performance difficulties of students with disabilities within their student role in higher education. The item difficulty hierarchy is beneficial both theoretically and clinically as it furthers knowledge regarding the relative difficulty of the tasks, activities, and occupations associated with managing the student role in higher education. The refined *TSOPP* and its accompanying administration manual provides occupational therapists seeking to support students with disabilities in higher education with a credible measure to guide their practice. It is hoped that this research will contribute to the continued development of the services in which the *TSOPP* is used, as well as the evidence base for occupational therapy in higher education.

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