

IDENTIFYING AND EVALUATING TROUBLESOME KNOWLEDGE AND THRESHOLD CONCEPTS IN SPORTS THERAPY EDUCATION

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Abstract

This research uses threshold concepts as a lens to identify “troublesome” knowledge and thresholds of learning within the discipline of sports therapy education in the UK. A phased stakeholder inquiry was conducted, interrogating the perspectives of educators, educator-practitioners, nearly and newly graduated therapists, industry professionals and professional body representatives. The objectives were to explore stakeholder perceptions of troublesome knowledge, identify troublesome knowledge and threshold concepts, explore the nature and categorisation of troublesome knowledge and threshold concepts, and provide recommendations for sports therapy educators. By identifying “troublesome” knowledge in sports therapy, educators can design and deliver curricula that can best prepare practitioners for the unique and variable nature of this discipline, supporting students through uncertainty to develop their adaptive expertise.

A phased stakeholder inquiry, including an online questionnaire and semi-structured interviews, was conducted. A total of fifty-six stakeholders across five distinct groups took part in phase one of the research (sixteen educators, fifteen nearly and newly graduated therapists [< 1 year], fourteen educator-practitioners, six industry professionals, and five professional body representatives). Thirty-two participants took part in one-to-one semi-structured interviews (ten educators, three nearly and newly graduated therapists [< 1 year], ten educator-practitioners, five industry professionals, and four professional body representatives).

Data revealed that acceptance of uncertainty, “connecting the dots”, and professionalism were “troublesome” concepts. Stakeholders encountered transformations where there was exposure to authentic learning environments and other practitioners, typically after they had graduated. The proposal of “threshold mindsets” and “threshold skills”, which underpin the acquisition of the threshold concepts: clinical reasoning; and professional identity and philosophy, is a novel contribution to the field. These findings have implications for sports therapy education and suggest that there are developments required in sports therapy education and practice-placement settings to best support student learning in this discipline.

Declaration

I declare that the work in this thesis was carried out in accordance with the regulations of the University of Gloucestershire and is original except where indicated by specific reference in the text. No part of the thesis has been submitted as part of any other academic award. The thesis has not been presented to any other education institution in the United Kingdom or overseas. Any views expressed in the thesis are those of the author and in no way represent those of the University.

Signed

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List of Abbreviations

UK	United Kingdom
PSRB	Professional Statutory Regulatory Body
SST	The Society of Sports Therapists
BASRaT	The British Association of Sports Rehabilitators
HEI's	Higher Education Institutions
FHEQ	Framework for Higher Education Qualifications
MSc	Master of Science
PAYE	Pay As You Earn
NHS	National Health Service
USA	United States of America
JISC	Joint Information Systems Committee
PDF	Portable Document Format
Ed	Educator
Gr	Nearly and Newly Graduated
EP	Educator-Practitioner
IP	Industry Professional
Rp	Professional Body Representative
SATs	Standard Assessment Tests
GCSEs	General Certificate of Secondary Education
A-Level	General Certificate of Education Advanced Level
DEI	Diversity, Equity, and Inclusion
ITaP	Intensive Training and Practice

Chapter 1.0 Introduction

1.1 Chapter Overview

This thesis sets out the approach to a phased stakeholder inquiry into “troublesome” knowledge in sports therapy education, using a threshold concept lens. Addressing a significant gap in the existing literature within the discipline, this study proposes five new threshold concepts that students must attain to develop as competent practitioners. Furthermore, it introduces the concept of “threshold mindsets” and skills which underpin the acquisition of the threshold concepts: clinical reasoning, and professional identity and philosophy. This is a novel contribution to the field.

Evidence to inform this work has been drawn from neighbouring disciplines such as medicine, nursing, occupational therapy, and physiotherapy. In this chapter, I introduce the key tenets of this research, namely, the unique context of sports therapy, and threshold concepts. I outline the objectives of this research and the approaches taken to investigate this important area.

1.2 Context

Sports therapy is an allied health profession. Sports therapy education aims to produce confident and competent clinical practitioners, with the skills to assess, treat and rehabilitate musculoskeletal injuries (Maguire, Chesterton and Ryan, 2019, p. 2). A sports therapist requires the knowledge and skills to prevent injury; evaluate and assess injury; manage and treat injury, rehabilitate injury; educate patients and understand issues relating to professional practice (Ward, 2016, p. xiii).

There are two leading professional bodies for the provision of Sports Therapy and Sports Therapy and Rehabilitation education in the UK: The Society of Sports Therapists (SST) and the British Association of Sport Rehabilitators (BASRaT). Two other organisations exist but are affiliated with a limited number of higher education institutions (HEIs). Rather, they tend to align themselves with shorter vocational training programmes outside of undergraduate level, degree, training of sports therapists. For this reason, they have not been included in this research.

In most cases, degree programmes are governed by a professional body that dictates standards of proficiency, professional competencies (SST, 2012) or, in the case of BASRaT, a

professional framework that must be met as part of the award, with a heavy focus on practical skills (BASRaT, 2024). Toohey (1999, p. 51) describes the provision of competencies as a performance or systems-based approach, whereby the learning goal is to become a skilled performer, familiar to professional preparatory programmes. This approach allows little choice for students in terms of what they will learn, but it provides the necessary framework for standards to be met. In such programmes, knowledge is used to plan a structured series of learning experiences, involving practice and feedback, which should lead to a competent performance (Toohey, 1999, p. 52).

The SST accredit undergraduate and postgraduate educational programmes at institutions across the UK and provides a list of competencies a learner must pass to be eligible for membership. This list provides the basis for the education of therapists and for validation of the degrees (Leddington Wright, Duncan, Savin-Baden, 2015, p. 41). Students must also demonstrate having undertaken a minimum of 200 hours of clinical experience upon graduation, and the SST require all members to meet minimum standards of proficiency to maintain membership (Munro-Wilson, 2012, p. 682). The standards of proficiency are a publicly available document, while the list of professional competencies is not. The British Association of Sport Rehabilitators (BASRaT) also accredit undergraduate and postgraduate educational programmes at institutions across the UK. To be accepted onto the BASRaT register, sport rehabilitators must complete a minimum of 400 hours of clinical work, ensuring BASRaT students graduate with professional experience (BASRaT, 2024). Programme requirements of SST and BASRaT programmes include the knowledge, skills, and attributes to be learned and demonstrated by graduate practitioners and are publicly available (SST, 2012; BASRaT, 2024).

Despite the existence of these two accrediting bodies, not all programmes with sports therapy in the title are accredited by the SST or BASRaT, and some remain ungoverned. As such, some institutions work towards a specific set of competencies or framework and must give assurances of these being met, while other institutions do not. Whilst this creates further questions beyond the scope of this research, it would be interesting to investigate if this variation influences the pedagogical practice of staff delivering these programmes.

Sports therapy practice is predominantly practical in nature, with a combination of hands-on and exercise-based interventions, underpinned by sport and exercise science theory. Other than the practical competencies required to assess and treat a patient (Waterworth *et al.*, 2022, p. 1), practitioners should demonstrate exceptional communication, clinical reasoning, and critical reflection (Johnson and Hammond, 2018, pp. 291-293). Communication and critical reflection are core skills for therapists to be able to respond to unfamiliar clinical problems in a dynamic context, while navigating patient feedback (Wilson-Thain and Hammond, 2023, p. 191). These skills are shared with disciplines such as nursing, occupational therapy, and medical education (Wald, 2015, p. 696; Nicola-Richmond, Pepin and Larkin, 2016, p. 101; Collett, Neve and Stephen, 2017, p. 106). Clinical reasoning is “bounded” to the medical and allied health professions and, in the context of sports therapy, practitioners are additionally challenged by the need to take sports performance and athletic development into consideration, making this kind of clinical reasoning unique to the sports therapy and rehabilitation discipline. The process of clinical reasoning relies on the acquisition and integration of knowledge. Students must therefore understand the underpinning concepts, some of which may be considered thresholds.

1.3 Conceptual framework

Professional learning is shaped by theories and theoretical frameworks, including but not limited to learning in communities of practice (Wenger, 1998), ‘reflection in action’ (Schön, 1992), and vocational thresholds (Vaughan, 2016, pp. 99-105). These perspectives help to explain how individuals engage in meaningful learning and develop expertise within their fields. While these frameworks provide valuable insights, my research utilises threshold concepts (Meyer and Land, 2003, p. 412) as the core conceptual lens, examining stakeholder perspectives in order to identify transformative ideas that may alter an individual’s understanding and professional development. My research focuses on sports therapy education. While this includes elements of practice placement, it does not extend to examining all areas of professional practice. By investigating threshold concepts in sports therapy education, this research aims to explore what thresholds exist and their role in shaping learners’ transitions. Threshold concepts represent transformations in learning experiences that shift an individual’s understanding, which may be useful for analysing deep learning moments within professional practice.

1.3.1 Threshold concept theory

Threshold concept theory argues that within a discipline, there are concepts that transform students' understanding and lead to previously inaccessible ways of thinking (Amin, 2019, p. 176). Threshold concepts have been described as 'portals, opening a new and previously inaccessible way of thinking about something; a transformed way of understanding, interpreting or viewing something, without which the learner cannot progress' (Meyer and Land, 2003, p. 1). As such, using a threshold concept approach for evaluating the sports therapy profession could provide insight into what students find "troublesome" and why.

A threshold concept is said to be "transformative", changing the way in which we view the subject matter, landscape, or even worldview (Meyer and Land, 2003, p. 412). Threshold concepts have also been described as 'conceptual gateways' (Liljedhal, Palmgren and McGrath, 2022, p. 1), key transformations which enable the learner to understand other, more complex aspects of a discipline. Clinical reasoning, for example, is a complex skill that practitioners need to develop, but the identification of other "troublesome" knowledge that might influence the acquisition of this "troublesome" skill has not been conducted in the discipline of sports therapy. In the context of sports therapy, a threshold concept such as clinical reasoning (Pinnock, Anakin and Jouart, 2019, p. 687) can transform the way practitioners are able to think about injury scenarios and come to reasoned conclusions to form a diagnosis, management, plan for treatment and return to play. Clinical reasoning is difficult because it requires a student to integrate all aspects of other learning, it is subject to variability from one patient to the next, and varies in complexity (Wilson-Thain and Hammond, 2023, p. 192). To clinically reason, students must draw together scientific knowledge and skills which may have been learnt in isolation. During the process of clinical reasoning, the integration of learning will occur to varying degrees, contingent upon contextual factors and shaped by the challenges presented by variability. Once the threshold is crossed, the student will autonomously make connections and integrate or 'pull it all together,' as part of the clinical reasoning process (Pinnock and Welch, 2014, p. 256).

Identifying threshold concepts enables the mapping of "troublesome" aspects within a curriculum, acknowledging the need to connect theoretical or conceptual knowledge with procedural or practically-applied knowledge, while adopting a student-focused approach

(Correira *et al.*, 2024, p. 28). In addition, threshold concepts and the associated idea of ‘troublesome knowledge’ can offer new perspectives for educators (Meyer and Land, 2003, p. 1; Perkins 2006, p. 37), specifically in relation to the barriers and enablers of effective learning (Neve, Wearn and Collett, 2016, p. 851).

Using a threshold concept lens offers an opportunity to rethink student learning and curriculum design in sports therapy. Identifying threshold concepts could help educators consider what they are teaching, how, and if it best prepares practitioners for industry. The dynamic nature of contemporary knowledge acquisition calls for a shift from traditional teaching approaches, demanding innovations that engage students throughout their educational journey. Embedding threshold concepts successfully in a curriculum carries the potential to positively shape what and how the student learns (Barradell and Peseta, 2016, p. 263). To achieve this, it is essential to first identify “troublesome” knowledge and thresholds within sports therapy. Literature highlights that collaboration with academics and students is essential, and what is lacking in the literature is the wider consultation of stakeholders in identifying thresholds (Barradell, 2013, p. 273). As such, this research analyses the perspectives of five stakeholder groups in sports therapy education, including educators, educator-practitioners, nearly and newly graduated therapists, industry professionals and professional body representatives.

1.4 Research contribution, questions and objectives

This work presents a novel contribution to the field of sports therapy education, as it is my understanding that the use of this combination of key stakeholder groups has not previously been used to explore “troublesome” knowledge and threshold concepts within any discipline. In this unique, phased approach, stakeholder perceptions are evaluated to support the identification of “troublesome” knowledge and thresholds for learning in sports therapy; a first for this discipline. Through a qualitative approach to research across two phases of activity, the perceptions of sports therapy education from key stakeholders are gathered with a view to better understanding the challenges faced by sports therapy students and indeed, educators. Such perspectives are typically made up of a set of beliefs, values, and assumptions that have been acquired through experiences (Dirkx, 1998, p. 4). This work culminates in the proposal of five thresholds for learning in sports therapy and introduces the idea of “threshold mindsets”

and “threshold skills”, offering categorisation of thresholds for the first time. This research addresses the following research questions:

RQ1 - What is troublesome in sports therapy education and why?

RQ2 - What are considered transformational moments in sports therapy education?

RQ3 - What are the thresholds for learning in sports therapy?

RQ4 - Does categorisation of thresholds for learning exist in sports therapy?

RQ5 - What are the implications for educators of sports therapy?

In addressing the above research questions, this thesis achieves the following objectives:

- To explore stakeholders’ perceptions of troublesome knowledge in sports therapy education.
- To identify troublesome knowledge and thresholds in sports therapy education.
- To explore the nature and categorisation of troublesome knowledge and thresholds.
- To provide recommendations for sports therapy educators.

Chapter 2.0 Literature Review

2.1 Chapter overview

This chapter aims to provide the theoretical background of this thesis, using a thematic approach that presents topics relating to the research objectives. The chapter starts by introducing sports therapy as a discipline before discussing threshold concepts and transformational learning. I define and discuss threshold concepts utilising research conducted in the allied health professions, highlighting some of the challenges faced by students in the context of sports therapy. The chapter presents the struggles faced by students in sports therapy education and appraises approaches to research. It concludes by presenting the justification for this investigation and the associated research objectives.

2.2 Sports therapy

Sports therapy has been described as an allied health profession focused on assessing, treating, and rehabilitating musculoskeletal sports injuries, using a combination of patient education methods and other injury management strategies (Munro-Wilson, 2012, p. 682;

Waterworth *et al.*, 2022, p. 1). In this research, the term sports therapy incorporates sports therapy, sport and exercise therapy, sports therapy and rehabilitation, and variations thereof as part of named awards. These variations cover the spectrum of degree names representing similar skill sets and reflecting programmes accredited by the two leading professional bodies in the United Kingdom (UK). The focus of this investigation is on degree-level education that dominates the training sector for this discipline.

Sports therapy in the UK is typically studied at degree level (FHEQ levels 4-6) at a higher education institution (HEI), though diplomas, foundation degrees, and master of science (MSc) conversion courses do exist. The aim of sports therapy programmes is to produce industry-ready practitioners who, once graduated, can work in several settings. Practitioners may choose to work in a clinical setting as a self-employed therapist by setting up their own business. Practitioners may work for another business or practitioner as a pay-as-you-earn (PAYE) employee. Alternatively, and sometimes in addition, practitioners may work in sport, associated with a team or club (Waterworth *et al.*, 2022, p. 1). This distinction highlights one of the differences between sports therapy and other professions, such as nursing or medicine. In these professions, it is rare for newly graduated practitioners to set up self-employed businesses; instead, many work for a National Health Service (NHS) trust.

Over the course of a typical undergraduate three or four-year (with placement) degree course, student therapists will undertake training in musculoskeletal examination and assessment, manual therapies, exercise-based rehabilitation, and clinical practice (Waterworth *et al.*, 2022, p. 1). Other content covers underpinning sport and exercise science content such as anatomy, physiology, biomechanics, psychology, and research methods (Leddington Wright, Duncan and Savin-Baden, 2015, p. 41). Therapists must balance biomedical understanding with the knowledge of cognitive responses to injury, and related social and contextual factors, to inform their approach to the rehabilitation process (Truong, Bekker and Whittaker, 2021, p. 5). For example, understanding that the mechanism of injury for an anterior cruciate ligament rupture may involve a multitude of anatomical structures beyond that of the isolated ligament. In addition, the therapist needs to consider the patient's response to injury, such as feelings of doubt, fear of re-injury and apprehension by athletes (Mahood *et al.*, 2020, pp. 145-146; Lukas

et al., 2022, p. 2). Social and contextual factors might include timing in the season, external pressure from coach or family and financial conflicts of interest (Shrier, 2015, p. 1312).

It is typical for sports therapy content to be taught in laboratory settings such as clinical classrooms and sport science laboratories. As identified by Reilly *et al.* (2020, p. 235), laboratory settings are meant to bridge the gap between theory and practice, but their inauthenticity may limit the transferability of skills. Learning in the context of a patient case or encounter provides the foundation needed for mastering clinical skills early in the curriculum. The development of clinical skills relies on the integration of knowledge, yet skills are typically taught as individual tasks without considering context and therefore do not promote translation of theory to clinical practice (DeBourgh, 2011, p. 146).

Clinical reasoning is a skill that requires the ability to ‘sort through a number of features presented by a patient and accurately assign a hypothesis or diagnosis, culminating in the development of an appropriate treatment strategy’ (Eva, 2004, p. 98). As an allied health profession that routinely evaluates injury and pathology, and makes treatment, management, return to play, and rehabilitative recommendations, clinical reasoning is at the core of a practitioner's skill set (Geisler, 2009, p. 64). The development of clinical reasoning is complex, and the skill itself requires students to respond to unfamiliar and ill-structured problems in a dynamic context, including feedback loops between clinician and patient, knowledge, and a growing body of evidence (Higgs and Jones, 2008, p. 90). Reasoning becomes the activity of integrating knowledge with the contextual factors of the individual situation, to arrive at an adaptive solution (Koufidis *et al.*, 2020, p. 445). Both professional bodies represented in this research reflect the importance of clinical reasoning in their standards of proficiency and educational frameworks (The Society of Sports Therapists [SST], 2012; British Association of Sport Rehabilitators [BASRaT], 2024).

Clinical reasoning has been identified in the literature as a threshold concept (Pinnock, Anakin and Jouart, 2019, p. 687; Wilson-Thain and Hammond, 2023, p. 195), but there is no empirical evidence for this in the context of sports therapy. There is also a paucity of research for identifying and understanding other “troublesome” areas of sports therapy education. Understanding what concepts students find “troublesome” during the journey to become a

sports therapist is paramount to effectively preparing them to work as professional practitioners, hence the necessity for this work.

2.3 Threshold concepts

2.3.1 What are they?

Threshold concepts are the aspects of learning where students often get ‘stuck’ (Fredholm *et al.*, 2020, p. 313). Students might grapple with an idea or concept for some time before reaching an ‘ah-ha!’ moment that leads to a transformation. It is this transformation that enables learners to move onto more complex learning and practice, and because of passing said threshold, learners may have a different perspective or approach to their practice (Meyer and Land, 2003, p. 1). Meyer and Land (2003, p. 1) describe a threshold concept as a ‘portal, opening a new and previously inaccessible way of thinking about something; a transformed way of understanding, interpreting, or viewing something, without which the learner cannot progress’. The understanding of a threshold concept is said to be transformative, changing the way in which we view the subject matter, subject landscape, or even worldview (Meyer and Land, 2003, p. 412). These threshold moments are key to the individual being able to understand other, more complex aspects of a discipline, resulting from both conceptual and ontological shifts (Land, Rattray and Vivian, 2014, p. 201). An example of a threshold concept in physics might be *gravity*: a concept that is critical for understanding other aspects of science, such as motion, weight, and mass, and yet is notoriously difficult for learners to grasp (Bar, Brosch and Sneider, 2015, p. 24). In medical education a further example of a threshold concept might be ‘person-centred care’: a concept that has led to a transformation in how students view health (Neve, Lloyd and Collett, 2017, p. 98), assisted by the realisation that there is more to medical practice than clinical application of biomedical science (Jones and Hammond, 2022, p. 987).

Archer *et al.* (2024, p. 3) suggest that when learners experience learning challenges, it indicates a threshold concept being present. This appears to be a narrow view of learning, given that there are multiple reasons why students might experience challenges. These challenges are often individual, so assuming that all students will find the same ideas “troublesome” is misleading and should be avoided (Mac Suibhne, 2012, p. 134; Holley, 2020, p. 19). Threshold concepts are distinct from core concepts within a subject; whilst a core

concept must be understood, it does not necessarily lead to a different view of subject matter (Meyer and Land, 2003, p. 4). For example, in sports therapy, the practitioner will be assessed on knowing the names of anatomical structures, but this is knowledge being used in isolation, rather than assessing its use in applied and integrated ways. Therefore, it is unlikely to lead to a transformation, an ontological shift or a change in practice.

It has been proposed that disciplinary threshold concepts should not be seen as a checklist or hierarchy but as a web, because there is no fixed requirement for one threshold to precede another (Davies and Mangan, 2007, p. 724). Instead, thresholds may subsequently be transformed by the acquisition of new thresholds as indicated by Davies and Mangan (2007, p. 722). It is useful to think of threshold concepts in this way because it draws attention away from a list of competencies and forces learners and educators to consider the integrated nature of the learning. In contrast, and perhaps as a development of earlier work, Mitchell and Pereira-Edwards (2022, p. 42) found that evidence-based practice threshold concepts identified in nursing could be levelled as foundational, application, or epistemic, with some concepts acting as prerequisites to others. Recalling what Barradell (2013, p. 266) highlighted about core concepts rather than threshold concepts, the author wrote that they 'do not take the learner into a new realm but rather build layers upon the learning foundations already possessed.' This suggests that Mitchell and Pereira-Edwards (2022, p. 42) may have misinterpreted threshold concepts when they presented those relating to evidence-based practice as foundational and building across academic levels. In later work by Mitchell and Kramer (2023, p. 1), it was highlighted that core concepts become levelled and advance through curriculum rather than transforming the learner's practice and their professional identity, as threshold concepts would. This shows a progression in thought that aligns with others' work on threshold concepts where levelling is not present (Davies and Mangan, 2007, p. 724; Barradell, 2013, p. 266).

Meyer and Land (2005, p. 37) liken threshold concepts to ideas capable of defining critical, irreversible moments of conceptual transformation. This transforms how a student uses the ideas and integrates the concept elsewhere. This transformed view '... may represent how people "think" in a particular discipline, or how they perceive, apprehend, or experience particular phenomena within that discipline' (Meyer and Land, 2003, p. 1). This is particularly

true of critical events that may be experienced in sports therapy, resulting in critical self-reflection (Prout *et al.*, 2014, p. 151). Specifically, critical events relating to making mistakes can be “transformational” in allowing the practitioner to learn from the experience and not make the same mistakes in the future.

2.3.2 Characteristics of threshold concepts

In order to identify something as a threshold concept within a discipline, it should reflect threshold characteristics (Meyer and Land, 2003, pp. 5-6). In this section, I outline what the characteristics are and provide examples in the context of medicine and allied health professions. Meyer and Land (2003, pp. 5-6) propose five key characteristics of threshold concepts, they are: “transformative”; “irreversible”; “troublesome”; “integrative”; and “bounded”.

Transformation is a process that can be sudden or may be protracted (Meyer and Land, 2003, p. 1). In the health sciences, Barradell and Peseta (2017, p. 349) argue that threshold concepts are transformative in how learners encounter and reconstruct the knowledge of a discipline or profession. Meyer and Land (2003, p. 1) explain that such transformed understanding leads to a privileged or dominant view and therefore a contestable way of understanding something. In sports therapy, a student passing a threshold of person-centred care could have a permanently transformed perspective of health, as identified in medicine (Neve, Lloyd and Collett, 2017, p. 98). For example, in sports therapy, a person-centred approach would need to take multiple factors into consideration, including the context, the needs of the individual, the tissue types, and the requirements of the sport or activity the athlete will return to (Brukner and Khan, 2017, p. 286). This ontological shift is likely to result in a transformed way of practising.

Threshold concepts are irreversible due to their transformative nature, and the change in perspective they induce is unlikely to be forgotten (Meyer and Land, 2003, p. 5). The irreversibility of a threshold concept has anecdotally been likened to an experienced practitioner’s inability to recall what it was like before crossing their own thresholds. Respondents within a study by Meyer and Land (2003, p. 3) reported difficulty experienced by expert practitioners looking back across thresholds they have long since crossed and attempting to understand, from a transformed perspective, the difficulties faced from a student perspective. For example, once a therapist can clinically reason by drawing lots of different

pieces of knowledge together, they are highly unlikely to lose that skill; it is 'irreversible' (Wilson-Thain and Hammond, 2023, p. 195).

A threshold concept is "troublesome", meaning learners may encounter conceptual difficulty and/or emotional uncertainty as what they know is redefined (Barradell and Peseta, 2017, p. 349). According to Perkins (2006, p. 37), there are five types of troublesome knowledge: ritual knowledge, inert knowledge, conceptually difficult knowledge, foreign knowledge, and tacit knowledge. These categories of troublesome knowledge depict distinct challenges that learners may encounter, each influencing the acquisition and application of knowledge in different ways:

- Ritual knowledge has been described as 'information that lacks meaning and tends to form part of a routine' (Hill, 2010, p. 81). This might include knowledge such as particular names and dates in history. A specific example in the context of sports therapy is a student presenting the definition of arthrokinematics, rather than fully understanding the concept or being able to apply it in joint movement assessment. Ritual knowledge is characterised by following a conceptual rule, but not understanding it. For example, conducting a passive joint range assessment but not understanding the various end feels at the joint.
- Inert knowledge is rarely used and only employed when prompted. Ritual knowledge can become inert knowledge when used in disconnected and isolated examples during teaching (Hill, 2010, p. 81). In sports therapy, anatomical information that assists the learner to identify structures but has little relevance otherwise is an instance of this. For example, the teaching of the innominate bone, a bone with 'no name' that has little clinical relevance.
- Conceptually difficult knowledge includes concepts that require different pieces of information or knowledge to be drawn together (Hill, 2010, p. 81). An example in sports therapy is the convex-concave rule in arthrokinematics and the necessity to draw together anatomical, mechanical, and theoretical understanding (Neumann, 2012, pp. 53-54).
- Foreign or alien knowledge comes from a perspective that conflicts with our own, making it "troublesome". Sometimes the learner does not even recognise the knowledge

as foreign (Meyer and Land, 2003, p. 9). In order that students can embrace and learn foreign or alien knowledge, educators need to help them identify and critically appraise alternative perspectives (Hill, 2010, p. 81). An example of this might be getting students to appreciate the approaches to therapeutic treatment from non-Western origin.

- Tacit knowledge is knowledge we might act upon but are only peripherally aware of (Perkins, 2006, p. 40). Learning from clinical practice and the development of contextual knowledge is a good representative of this. For example, picking up the tacit knowledge relating to a local context or specific population influencing how a therapist communicates (Sanford, Schwartz and Khan, 2020, p. 2).

Finally, threshold concepts are “integrative” and “bounded”. They are integrative because they require learners to pull knowledge together, making connections between theory and practice (Meyer and Land, 2003, p. 5). For sports therapists, this could reflect the art of integrating a patient’s subjective and objective clinical presentation, while considering the mechanics of injury and individual sporting context. The “troublesome” nature of threshold concepts comes not from concepts themselves but from the way concepts fit together to transform a student’s understanding (Perkins, 2006, p. 41). The drawing together of fundamental knowledge to develop a more sophisticated and essential understanding is what makes a threshold concept integrative, but also contributes to the difficulty and uncertainty faced by learners navigating these gateways (Liljedahl, Palmgren and McGrath, 2022, p. 1458).

Mitchell and Kramer (2023, p. 3) offer an alternative perspective for this characteristic, which presents it as something that occurs after the threshold has been crossed, rather than a feature of the learning that identifies it as a threshold concept. So, the threshold concept becomes integrative rather than the experience of learning the concept requiring integration. This was described by Cousin (2009, p.203) as moving from a fragmented view to a position where the learner can identify previously hidden connections. While there is limited evidence for the irreversibility of the skill of clinical reasoning, evidence suggests that a practitioner builds on their knowledge base with each clinical encounter, building on their experiences and pattern recognition bank (Pinnock and Welch, 2014, p. 254). Through experience, the reasoning becomes stronger due to the growth of non-analytical and analytical reasoning

processes (Wilson-Thain and Hammond, 2023, p. 195). The idea of both having a ‘bank’ of knowledge and the ability to reason becoming ‘stronger’ suggests this skill is “irreversible.”

A threshold concept is “bounded,” meaning that any conceptual space will have boundaries between disciplinary areas, defining academic territories (Meyer and Land, 2003, p. 6). An example from the health professions might be the concept of person-centred care, arguably something that is not relevant to disciplines outside of the health care profession. For the sports therapy discipline, concepts will be “bounded” in the distinct context of the musculoskeletal environment and the clinical encounter with the ‘athlete as patient’ (Wilson-Thain and Hammond, 2023, p. 195).

It is the combination of the five characteristics (transformative, irreversible, troublesome, integrative, and bounded) (Meyer and Land, 2003, p. 5) that leads to personal and professional transformations (Mitchell and Kramer, 2023, p. 3). Additions to the threshold concept characteristics since their inception have included liminality, re-constitutive and discursive (Baillie, Bowden and Meyer, 2013, p. 229; Wearn *et al.*, 2020, p. 733; Jones and Hammond, 2022, p. 984), but authors have since returned to using the characteristics as originally proposed (Crookes *et al.*, 2020, p. 1; Meyer and Land, 2003, pp. 5-6). In this research, I use the original five characteristics in the identification of thresholds for sports therapy. In combination with the term “conceptual gateways” used by Liljedhal, Palmgren and McGrath (2022, p. 1), I use the terms threshold concepts, learning thresholds and thresholds for learning interchangeably to represent the gateways traversed by practitioners. Simplified, I am defining threshold concepts as “troublesome” aspects of learning that have “transformational” capacity.

2.3.3 Problems with threshold concepts

Threshold concepts are widely acknowledged across medical (Jones and Hammond, 2022, p. 984) and allied health professions such as nursing (Crookes *et al.*, 2020, p. 2), occupational therapy (Nicola-Richmond *et al.*, 2019) and physiotherapy (Barradell and Peseta, 2017, p. 350). However, the value of threshold concepts has been questioned (Rowbottom, 2007, p. 263; O’Donnell, 2009, p. 190; Brown, Whybrew and Finn, 2022, p. 305). Criticism of threshold concepts has included concerns regarding definitions and empirical limitations. Authors have highlighted that threshold concepts are portrayed in different and sometimes incompatible

ways (Liljedahl, Palmgren and McGrath, 2022, p. 1459), not helped by the inconsistency in definitions used. This is predominantly because, like many other concepts and theories, there is room for subjectivity of the definitions and, in this case, with the associated characteristics. In addition, Meyer and Land's (2003, p. 4) use of indefinite terminology such as 'likely to be.... probably irreversible...possibly often (though not necessarily) bounded... potentially (and possibly inherently)' leaves room for interpretation of what constitutes a threshold concept and may contribute to the inconsistency of application (Brown, Whybrow and Finn, 2021, p. 305). This has been referred to by O'Donnell (2009, p. 190) as 'grave shortcomings in the definition of threshold concepts which prevent or problematise their identification in any discipline'. This is an important consideration for this research because the identification of threshold concepts in sports therapy is a core component of this work. It is useful to draw on adjacent professions, such as physiotherapy (musculoskeletal), to make comparisons of the concepts being identified and perhaps, more broadly, clinical concepts from the wider health professions.

Further, threshold concept literature has been criticised for the inconsistent use of the threshold characteristics as outlined by Meyer and Land (2003, pp. 5-6). It is seemingly difficult to find consensus in disciplinary areas, as researchers are either applying the characteristics of threshold concepts differently or are not transparent about the application of the characteristics. Though there is inconsistency in the application of threshold concept characteristics among authors, for example some authors using all five characteristics and others using less, it is pertinent to note that there was seemingly no intention that threshold concepts should meet every criterion, evidenced by the uncertainty of Meyer and Land's (2003, pp. 5-6) original terminology. There has been some suggestion that the first three characteristics may be seen as interwoven, for a concept that integrates prior understanding is necessarily transformative and is more likely to be 'irreversible' (Davies and Mangan, 2007, p. 712). This could be one of the reasons authors are not using all the characteristics in their identification of threshold concepts. Confirmation that this may be the case is presented by Barradell and Peseta (2017, p. 368) in their review of the threshold framework use in health sciences. They explain that it is uncommon for authors to be explicit about all the characteristics but suggest that mindfulness of all the characteristics might promote a more rounded and richer conception of student learning (Barradell and Peseta, 2017, p. 368).

Some authors suggest that threshold concepts are portrayed in different and sometimes incompatible ways and that there is insufficient consensus on what constitutes a threshold concept (Rowbottom, 2007, p. 265; Nicola-Richmond *et al.*, 2018, p. 110; Correia, Soida, Souza and Lima, 2024, p. 33), which is in keeping with previous appraisal of their use. In addition, there have been concerns relating to the ‘body of knowledge’ problem and issues associated with identifying a singular body of knowledge captured by a threshold concept (Liljedahl, Palmgren and McGrath 2022, p. 1459), assuming that there is one way of knowing (Brown, Whybrow and Finn, 2021, p. 306).

Another critique has exposed problems with researchers' explanations lacking a grounding in the literature (Brown, Whybrow and Finn, 2021, p. 308). It is argued that reducing student difficulties to a list of thresholds removed from context and widely applied within the curriculum removes the possibility for these concepts to influence learning in any meaningful way (Brown, Whybrow and Finn, 2021, p. 306). Thresholds within disciplines should not be removed from context, evidenced by the characteristic of “boundedness” as proposed by Meyer and Land (2003, pp. 5-6). Moving away from thinking about threshold concepts as isolated learning components, Jones and Hammond (2023, p. 988) surmise that crossing a threshold is not the endpoint of the learning journey and that liminality may be better thought of as a state continually occupied by professionals. This shifts the perspective of threshold concepts to one that would appear more fluid, recurring at various points in a professional's career, requiring a more sophisticated understanding or embodiment (Jones and Hammond, 2023, p. 988).

Timmermans and Meyer (2019, p. 357) encourage educators to move through the discussion of what ‘concept’ means and focus their attention on the transformative impact on the learner and learning, as significant to identifying threshold concepts. Barradell (2013, p. 269) summarises the importance of threshold concept identification:

Fundamentally, the intent behind threshold concepts is to improve the learning experience of students. Inextricably linked to this is the teaching of students. This should be remembered during any conversation on threshold concepts, and the starting point should be the identification of these concepts, for if we cannot appropriately identify them, their subsequent use is limited in value.

Despite the critique of threshold concepts, their use has stimulated robust discussion and reflection on teaching and learning design (Timmermans and Meyer, 2019, pp. 354-368), particularly in the higher education sector, and to date remains a useful lens for looking at education.

2.3.4 Liminality

Meyer and Land (2003, p. 13) suggest that difficulty in understanding threshold concepts may leave the learner in a state of liminality, a suspended state in which understanding approximates to a kind of mimicry or lack of authenticity. This poses a challenge for sports therapy education due to the critical role authenticity plays in the learning process, as emphasised by Wilson-Thain and Hammond (2023, p. 194). It underscores the necessity of exploring the obstacles students face in learning sports therapy and how educators can aid their transition through the liminal space. Hence, the justification for this research.

The concept of liminality was originally proposed by van Gennep in 1960 and developed by Turner in 1969 (p. 94). Liminality describes the subjective state of being 'on a threshold or betwixt and between two different existential positions' (Ybema, Beech and Ellis, 2011, p. 21). Being in the liminal space causes a student to pause because learning is "troublesome" and requires integration; learners are able to move on once a threshold concept is grasped (Wearn *et al.*, 2020, p. 733). The notion of liminality has been used in the work of Meyer and Land (2003, p. 13) in relation to threshold concepts and, in particular, draws on the idea of 'transformation' as outlined by Turner (1969, p. 116). For transformation to occur a critical or 'activating event' results in critical self-reflection, sometimes feelings of guilt, fear, anger, or shame, and where one's prior assumptions are questioned (Prout *et al.*, 2014, p. 151). Threshold concepts are provocative; they challenge the learner and may lead to feelings of uncertainty, discomfort, anxiety, confusion, or the feeling of being 'stuck,' thus inhibiting progression (Meyer, 2016, p. 464). These feelings align with the notion of being in the liminal space, facing uncertainty. It has been proposed that these feelings of being 'stuck' and experiences of doubt can drive and energise learners to generate possibilities, and trial their implementation until new concepts or patterns are generated (Locke, Golden-Biddle and Feldman, 2008, p. 908). In contrast, learners being 'stuck' may create feelings of frustration and, in some cases, may hinder their ability to progress (Walker, 2012, p. 250).

There are said to be three distinct stages of threshold concept acquisition: pre-liminal, liminal, and post-liminal (Meyer, Land and Baillie, 2010, p. xii) (see Figure 2.1). These stages help to frame the full process of transformation and identify where students might be in their learning of a particular threshold.

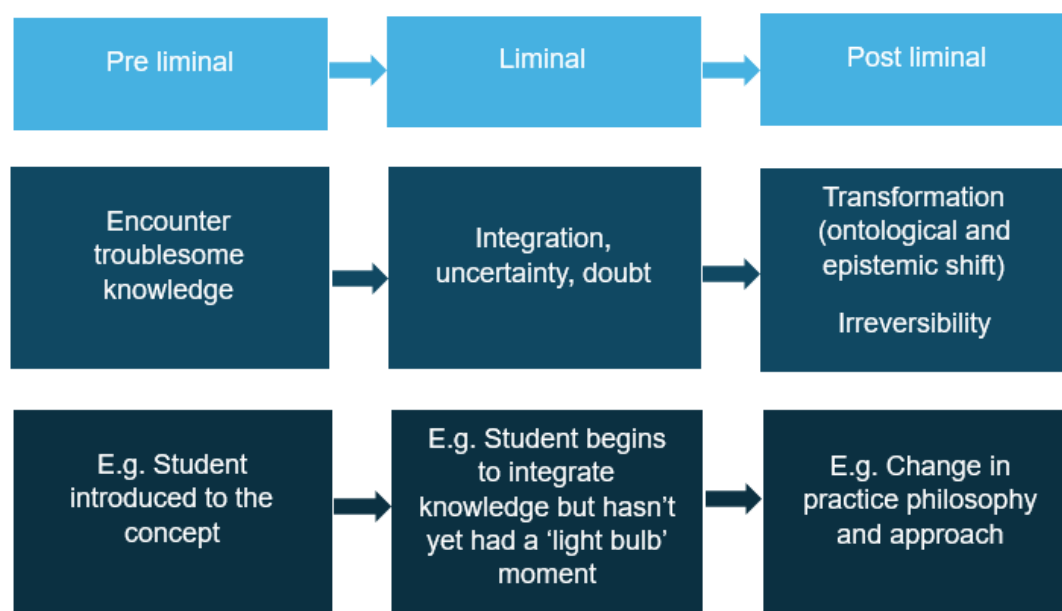


Figure 2.1 The stages of threshold concept acquisition in sports therapy, adapted from Meyer, Land and Baillie (2001, p. xii).

Time spent in each stage may be different from student to student. Much of the uncertainty associated with mastering a threshold concept occurs whilst the learner is crossing the liminal space, and it is usual for a learner in this phase to experience feelings of doubt (Fredholm *et al.*, 2020, p. 312). Making students aware of these stages may help to validate their feelings during the learning process and normalise them as part of experiencing troublesome knowledge.

2.3.5 Framework, theory, or lens?

The multitude of ways in which authors have referred to threshold concepts demonstrates ongoing confusion relating to their use, and there appears to be no way of positioning threshold concepts that is unproblematic (Brown, Whybrow and Finn, 2021, p. 303). Previous work has referred to threshold concepts as a concept, framework, theory, and an approach

(Land, Rattray and Vivian, 2014, p. 200; Rattray, 2016, p. 67). Meyer (2016, p. 464) referred to threshold concepts as a framework that emphasises “transformational” learning experiences, associated with a particular class of concepts. The authors responsible for the idea of threshold concepts have used different and perhaps conflicting terminology to describe them.

Archer *et al.* (2024, p. 3) have used the term ‘lens’ to describe their use of threshold concepts but more commonly the terms ‘theory’ or ‘framework’ are used (Crookes *et al.*, 2020, p. 1; Meyer and Land, 2005, p. 380; Barradell and Peseta, 2016, p. 263; Amin, 2019, p. 176; Jones and Hammond, 2022, p. 983). I have chosen to apply threshold concepts as a theoretical lens through which to explore stakeholder perceptions of sports therapy education (Betinol, Murphy, Regehr, 2023, p. 142; Wilson-Thain and Hammond, 2023, p. 191) because it may afford the flexibility to identify pivotal ideas that, once understood, can transform learner’s understanding of the subject. Adopting threshold concepts as a lens places more emphasis on the use and application of threshold concepts rather than on the characteristics themselves.

2.3.6 Identifying threshold concepts

To identify what is “troublesome” for students learning sports therapy and how educators can support them to transition through liminality, first “troublesome” knowledge and potential thresholds need to be identified. While there are a considerable number of investigations exploring thresholds within disciplines such as medicine, nursing, occupational therapy and physiotherapy (Barradell and Peseta, 2017, p. 350; Nicola-Richmond *et al.*, 2019, p. 578; Crookes *et al.*, 2020, p. 2; Jones and Hammond, 2022, pp. 986-988) no studies exist that explore thresholds in the field of sports therapy; hence, the rationale for this research. In addition, significant variation in the methods for engaging with the issue of threshold identification exists (Barradell, 2013, pp. 265-276; Nicola-Richmond, Pépin and Larkin, 2016, pp. 95-104; Collett, Neve and Steven, 2017, pp. 97-115). Without a shared understanding of what threshold concepts are and the best methods for identifying them, there is a danger that too many threshold concepts become identified, which is potentially counterproductive and leads educators to the prospect of an overcrowded curriculum (Barradell and Peseta, 2016, p. 264).

The challenges in identifying threshold concepts include balancing the understanding of what a threshold concept is and what distinguishes a threshold concept from any other content

(Barradell, 2013, p. 267). Although threshold concepts have been acknowledged in numerous educational fields, little attention has been paid to a consistent application of the characteristics identified by Meyer and Land (Brown, Whybrow and Finn, 2021, p. 302). The way threshold concepts have been identified within the nursing profession has been openly criticised by Crookes *et al.* (2020, p. 3), noting that methods for identification have not been satisfactory as they have not fully articulated the process for identification. This results in a lack of repeatability and replication (Crookes *et al.*, 2020, p. 2).

Jones and Hammond (2023, p. 983) conducted a scoping review of threshold concepts in medical education and established that a threshold concept framework is most often used for the identification of threshold concepts relating to basic scientific knowledge and ways of thinking and practising. However, only two of thirty-six papers used empirical methods to examine threshold concepts, and there was significant variation in the characteristics used for this identification (Jones and Hammond, 2023, p. 990). While this was a valid point of critique from Jones and Hammond, there was no formal assessment of quality presented as part of this work. However, they do acknowledge that future research needs to apply a higher degree of rigour and transparency when applying the threshold concept framework. This will be addressed in my research with clear justification of threshold concepts, full transparency of included or excluded characteristics and a replicable methodology.

Few studies have used empirical data for the identification of threshold concepts and even fewer have engaged more than two or three stakeholder groups. Allan *et al.* (2015, p. 79) conducted a two-year ethnographic case study to identify threshold concepts in nursing. Participant observations and in-depth interviews with thirty-three newly qualified nurses, ten healthcare assistants and twelve ward managers were conducted. This appears to be one of the most rigorous examples in the literature of stakeholder engagement for the identification of “troublesome” knowledge and threshold concepts. However, while healthcare assistants and ward managers may have been educator-practitioners, this was not made explicit in the methods, and therefore this study may still lack the engagement of educators. Educator perspectives may have been a useful addition to this work, allowing for an assessment of whether what is currently being taught best prepares nurses for entering the profession. Tanner (2011, p. 433) promotes threshold concepts as a way to connect the thinking of

academics and clinicians. Whilst this is in reference to occupational therapy, it is reasonable to assume that the same impact could be seen in the sports therapy profession, given that the two professions share some elements of musculoskeletal learning.

The variation in views about what constitutes a threshold concept and the attributes surrounding them, in addition to the lack of research into the threshold concepts in sports therapy education, provides the opportunity to investigate how stakeholders understand and perceive “troublesome” knowledge and thresholds in this discipline. This research aims to explore stakeholders' perceptions of threshold concepts and troublesome knowledge in sports therapy, examining how and why these concepts are understood and identified as ‘thresholds’ by stakeholders.

In a recent scoping review, Liljedahl, Palmgren and McGrath (2022, p. 1462) examined the approaches of fifty-nine studies investigating threshold concepts in health professions education. Of the fifty-nine articles included in the review, thirty (51%) were empirical, twenty-six (44%) conceptual and three (5%) were reviews. Of the empirical studies, twenty-three (76%) were qualitative, two (7%) were quantitative, three (10%) used a mixed-method approach, and two (7%) described educational development initiatives. Literature concerning seven different health care professions was found: medicine (n=18), occupational therapy (n=10), nursing (n=8), dentistry (n=4), physiotherapy (n=2), pharmacy (n=1) and midwifery (n=1). This highlights the paucity of research in closely allied professions such as physiotherapy and the absence of research in the field of sports therapy, hence the need for my research. The dominance of qualitative approaches to research for identifying threshold concepts has also been demonstrated in medical education (Jones and Hammond, 2022, p. 986). This is undoubtedly because qualitative research allows for the collection of rich, subjective, value-laden data. The review by Liljedahl, Palmgren and McGrath (2022, p. 14) included only peer-reviewed articles in their search to ensure a high level of quality. However, they failed to register their review protocol before conducting it, which is a notable limitation because it means the authors may not have held themselves accountable to a set protocol. My research follows a qualitative approach, mirroring most of the empirical work conducted in this area between 2003 and 2020. It, for the first time, explores “troublesome” knowledge and seeks to identify learning thresholds in the sports therapy discipline.

Barradell and Peseta (2016, p. 266) used a nominal group technique to facilitate discussions amongst a group of clinical educators and to identify a list of threshold concepts. Participants were presented with a thirty-minute presentation on threshold concepts prior to the nominal group technique starting, and participants were asked to identify threshold concepts both individually and assess them as a group. It could be argued that thirty minutes is not sufficient time to truly understand threshold concepts and to be able to successfully identify them. Though demanding on time, this thirty-minute familiarisation would have been a useful opportunity to bring the group up to speed and to ensure that all participants were getting the same information. It is also far more achievable to spend thirty minutes familiarising participants in a focus group or nominal groups design setting, because data is being captured from multiple participants at once. In contrast, some studies have not mentioned threshold concepts as part of the instructions to participants, despite trying to identify them. Instead, they have asked participants to describe difficult concepts, “troublesome” knowledge, or crucial learning experiences (Bhat *et al.*, 2018, p. 622; Leidl, 2018, p. 75).

When asking the participants to think about threshold concepts, Barradell and Peseta (2016, p. 266) focused on a modular level. The question asked was ‘What are the desired threshold concepts upon completion of PTY4NEP’ [module code]. The phrasing of this question may have led participants to think only about “troublesome” knowledge and transformations occurring within the module, rather than more widely across the programme of study, or in a more integrated way. In one sense, this may have been useful for framing the question and providing the participants with some boundaries for their thoughts. Conversely, this may have been quite constraining because the question was focused and might not have encouraged participants to think about integrated knowledge, which is a known characteristic of threshold concepts (Meyer and Land, 2003, pp. 5-6).

Other qualitative methods of investigating threshold concepts have included the use of focus groups (Tanner, 2011, p. 429), the Delphi technique (Nicola-Richmond, Pepin and Larkin, 2016, p. 97), and narrative inquiry (Fredholm *et al.*, 2020, p. 309). A recent critique of the nursing literature highlighted a lack of robust identification methods for threshold concepts (Crookes *et al.*, 2020, p. 1) and concluded that there are limited examples of robust methodological approaches for identifying threshold concepts (Martindale, 2015, pp. 137-139).

Having more robust approaches to threshold concept identification is essential if threshold concepts are to become a curriculum development tool (Crookes *et al.*, 2020, p. 3).

Hill (2020, p. 673) used empirical data to determine what constitutes a threshold concept in the prosthetics discipline, applying a criteria and concept model to critically appraise threshold concepts identified by students and staff (Hill, 2020, p. 673). In their study, interviews, and questionnaires with eighteen students and eight lecturers from two UK institutions using a phenomenological analysis resulted in the identification of five themes, two of which were deemed threshold concepts. The distinction between difficult concepts and threshold concepts made by Hill (2020, p. 675) was that threshold concepts involved both conceptual and ontological transformation, which is in keeping with what has previously been presented in the literature (Land, Rattray and Vivien, 2014, p. 201). Hill (2020, p. 674) proposes three criteria for distinguishing a threshold concept from other difficult concepts; they should be “troublesome”, “integrated”, and produce ontological transformation. This aligns with three of the five characteristics proposed by Meyer and Land (2003, pp. 5-6).

This research is the first of its kind in the sports therapy discipline. A qualitative approach combining the use of a questionnaire and semi-structured interviews was used as the data collection method. Correia *et al.* (2024, p. 40) categorise this research as one of the most robust approaches, where the researcher explains the idea of threshold concepts to enable participants to recognise one. Data is then gathered, analysed, and the threshold characteristics applied to arrive at a shortlist of threshold concepts.

In the study by Hill (2020), the students were from different stages in their degree programmes, some with only one year of experience and others in their final placement year. There may have been some interesting distinctions to be made between the perceptions of these participants and the varying experiences they had. This was mentioned in the methodology, but did not appear to be addressed in the analysis of the data. This may have been because, given the small number of participants in the respective groups, aligning the experiences with the year of study may have affected the anonymity of participants. Capturing the experience of students and lecturers seemed to be the most useful tool in identifying possible transformations in thinking and it was through the exploration of these accounts that Hill (2020) was able to identify key moments of integration and associated evidence on

ontological shift, which are critical to the identification of a threshold concept in this allied health profession (Hill, 2020, p. 675).

In contrast to Hill (2020), who conducted interviews and questionnaires with students and lecturers, Archer *et al.* (2024, p. 3) only used lecturer perspectives to understand how student knowledge is shaped on an MSc in health professions programme. Whilst this offers a valuable perspective, it could be criticised for not exploring a broader set of stakeholder perspectives. Early critique of threshold concepts literature from Barradell (2013, p. 273) raised this very issue and challenged the methodological approach of involving only students and educationalists in identifying and developing threshold concepts. Barradell (2013, p. 273) argues that other stakeholders, such as professionals, should be included for the identified threshold concepts to be valid and authentic. One explanation for the decision to exclude other stakeholders in previous research may be that expert practitioners have previously expressed difficulty looking back across thresholds they have long since crossed (Meyer and Land, 2003, p. 3). My research seeks to add value through a novel contribution to the threshold concept literature and to the field of sports therapy by exploring the perspectives of five different stakeholder groups.

Barradell (2013, p. 272) argues that the identification of threshold concepts is not without challenge, noting that the process of identification takes time, reflection, discussion, and debate, stressing that collaboration with academics and students is essential. What appears to be lacking in the literature is the wider consultation of stakeholders external to the educational programme itself. Authors have used several ways to try and identify threshold concepts within their fields, and many methods have attracted critique. Cousin (2009, p. 201) describes threshold concept research as a form of research requiring partnership between subject specialists, educational researchers, and learners. Researchers predominantly focus on identifying threshold concepts within their respective disciplines (Khatri, Knight and Wilkinson, 2020, p. 178; Liljedahl, Palmgren and McGrath, 2022, p. 1458; Jones and Hammond, 2022, p. 984) and one of the biggest limitations seen in the process of identification is the failure to involve the wider professional community (Barradell, 2013, p. 273). In addition, several researchers have not considered the student voice in the identification of threshold concepts but have instead relied on who they perceive to have 'expert' opinion (Allan *et al.*, 2015, p. 79;

Barradell and Peseta, 2016, p. 267; Archer *et al.*, 2024, p. 3), usually qualified practitioners or educators. This raises an issue of power as outlined by Brown, Whybrow and Finn (2021, p. 306) who argue that when threshold concepts are identified and implemented by researchers and educators, students are subjected to the power of the 'dominant educational class'.

Barradell and Peseta (2016, p. 267) engaged stakeholders by inviting physiotherapy clinical educators to participate in a discussion about threshold concepts. This approach enabled them to gather the views of those with awareness of the professional registration requirements, bringing with it experiences of practising professionals who were able to share the demands and realities of real-world practice. Although clinical educators were included in the investigation, there was no professional body representation. The inclusion of PSRB representative views in this research offers a novel perspective and combination of perspectives (educator, educator practitioner, student-industry professional and professional body representation) not seen in the literature to date for sports therapy, medical, or allied health profession disciplines.

Others have used student voice alone to identify threshold concepts (Collet, Neve and Stephen, 2017, p. 105). Derias, Loftus and Kamel-ElSayed (2021, p. 919) highlight that the majority of threshold concept literature has used educator perspectives. Instead, they used student perspectives to investigate "troublesome" areas of preclinical medical education and found that students were able to use the characteristics of threshold concepts to articulate the areas that they were finding 'troublesome' (Derias, Loftus and Kamel-ElSayed, 2021, p. 920). It has been highlighted that while students may not always know what they need to learn, they are able to report what the learning experience was like and can therefore provide an alternative perspective to that of the educators (Barradell, 2013, p. 269). While the medical students provided useful insights into threshold concepts in this field and may complement the work of content experts (Derias, Loftus and Kamel-ElSayed, 2021, p. 920), these views in isolation may not offer the fullest picture of threshold identification in this area. A core function of this work is to ensure that perceptions of multiple stakeholders in sports therapy education are evaluated. This addresses one of the common downfalls in threshold concept literature as highlighted by Barradell (2013, p. 267): 'threshold concepts are defined by how disciplinary

knowledge is learnt and experienced by students, but often, they are identified by academics who have long traversed the threshold.'

Few studies have engaged students, educators and professionals (Nicola-Richmond, Pepin and Larkin, 2016, p. 98; Hill, 2017, p. 667; Khatri, Knight and Wilkinson, 2020, p. 179), but consultation with stakeholders is an important form of inquiry because the discussions provoke valuable challenge and reflection, signalling a more holistic representation of the complexity of knowledge, skills and practice within a curriculum (Barradell and Peseta, 2016, p. 264). The use of five stakeholder groups is to be included in this research, offering insights from all corners of the educational experience.

It is challenging to navigate and make inferences from the threshold concept literature when everyone is approaching it differently. Despite this, threshold concepts continue to provide a useful lens for thinking about difficult knowledge, encouraging educators to explore better ways to present concepts and to design and test valid measures of understanding.

Despite numerous criticisms of threshold concepts (Rowbottom, 2007, p. 263; O'Donnell, 2009, p. 190; Brown, Whybrew and Finn, 2021, p. 305), their use has continued to be present in the literature and has recently gained broader acceptance and traction in the health professions education research, with a considerable number of publications exploring threshold concepts both conceptually and empirically (Neve, Wearn and Collett, 2016, p. 851; Gaunt and Loffman, 2018, p. 790; Jones and Hammond, 2023, p. 986). It is critical to understand the role the educator might play in shifting focus towards "troublesome" knowledge and directing learners to more adaptive approaches to learning and practice.

Threshold concepts have been identified for several disciplines (Barradell and Peseta, 2017, p. 350; Crookes *et al.*, 2020, p. 2; Jones and Hammond, 2022, p. 984), but this is yet to occur in sports therapy education. This research aims to identify "troublesome" knowledge and threshold concepts in the sports therapy discipline and explore the perceptions of key stakeholders for undergraduate sports therapy education in the UK. This will provide an opportunity to reflect on what is considered "troublesome" knowledge from multiple perspectives and to enhance the education of practitioners. Though there is common ground among other allied health professions, sports therapy is a domain whose education has been predominantly competency-based. The contribution of this work will aim to impact the

education of sports therapy in the UK and has the potential to inform professional, statutory and regulatory body (PSRB) guidance.

It is difficult to anticipate what the stakeholders might present as “troublesome,” given that there has not previously been work undertaken to identify threshold concepts in sports therapy. However, looking at adjacent professions such as physiotherapy provides some insight. Barradell and Peseta (2016, p. 269) identified thirteen threshold concepts in physiotherapy, generated as part of the nominal group technique. It was later concluded that only one represented a true threshold concept, namely a ‘client-centred approach and attitude’ (Barradell and Peseta, 2016, p. 269). The authors made this judgement due to ambiguous connections of the other concepts to the characteristics proposed by Meyer and Land (2003, pp. 5-6).

Caution should be applied when considering thresholds from adjacent professions. It is suggested that threshold concepts are not readily identifiable by a single absolute technique extendable to all areas, due to the specificities in each area that cause threshold concepts to have significant variations in each context (Correia *et al.*, 2024, p. 42). In this research, “troublesome” knowledge and threshold concepts will be identified where there is agreement among stakeholder groups and threshold characteristics can be evidenced.

2.4 Transformational learning

In this section, the nature of learning in the unique context of learning to be a sports therapist is set out to help frame later sections, which foreground what students struggle to learn and why. The theoretical frameworks used ground themselves in experiential transformational learning and align with the foundations of threshold concepts. The subject of learning has a rich history, encompassing multiple perspectives and large-scale debate. While it can be acknowledged that this area is vast, the focus of this section is not to present all possible theories and philosophies of learning, but instead to focus on the application of theory aligned to transformations and the acquisition of thresholds in learning.

During a typical three-year programme to become a sports therapist, students will learn scientific theoretical knowledge, practical skills, attributes, and behaviours to demonstrate proficiency to succeed in industry (Munro-Wilson, 2012, p. 682). There are said to be three key conditions for mastering skills necessary for developing expertise: ‘an environment that is

sufficiently regular to be predictable;’ ‘opportunity to learn these regularities through prolonged practice’; and ‘quality and speed of feedback’ from the educator (Kahneman, 2011, pp. 240-241). In contrast, some have suggested that professional practice and the learning interlinked are highly contextualised, responding to the ‘messiness,’ unpredictability and complexity of everyday working (Reich, Rooney, and Boud, 2015, p. 133). Opportunities for students to reflect on experiences which challenge or disrupt their worldviews and discuss experiences with peers can lead to ‘more powerful and generative understandings’ (Ryan and Carmichael, 2015, p. 22). This is an important contrast because in the context of sports therapy and learning clinical skills, students are often faced with unfamiliar problems in a dynamic environment (Wilson-Thain and Hammond, 2023, p. 191).

The ability to link theory to practice and see the practical relevance of learning can be key to advancing students’ identification with their profession (Heggen and Terum, 2013, p. 659). Literature suggests that meaningful professional learning and professional identity development can be fostered by authentic experiences in and around the workplace (Reich, Rooney, and Boud, 2015, p. 139). Progressive, guided practice with multiple opportunities to apply skills is needed to increase the authenticity and real-world applicability of clinical skills (DeBourgh, 2011, p. 145). Authentic learning experiences motivate and support students to learn by providing them with experiences that give ‘real-world’ exposure (Sutherland and Markauskaite, 2012, p. 749). The following theoretical frameworks support the role of authentic experience and learning context: experiential education theory, situated learning, and transformative education. Each of these theories assumes that effective learning occurs as a process of participation in the world (Prout *et al.*, 2014, p. 150).

When considering experiential education, ‘knowledge is created through the transformation of experience’ (Kolb 1984, cited in Quay, 2003, p. 106). Learning involves the construction and reconstruction of feelings and ideas that flexibly adapt as a sense of the experience is made (Moon, 2004, p. 49), and pivotal to the process is reflection, as seen in Kolb’s learning cycle. Developed further, this four-stage cycle includes: concrete experience; abstract conceptualisation; observation and reflection; and active experimentation (Moon, 2004, p. 126). Reconstruction of knowledge and the redefining of ideas seen in the latter stages of this

cycle are tenets of the “transformational” nature of threshold concepts (Meyer and Land, 2003, p. 5), addressed previously in this review.

Parallels have been drawn between the experiential learning process in socio-cultural settings and situated learning theory (Quay, 2003, p. 109). The key difference is that situated learning theory emphasises learning in context and the need for learners to engage with communities to gain knowledge. This suggests that student practitioners benefit from interacting with patients and other practitioners to solidify their learning and understanding, but in non-classroom settings (O’Brien and Battista, 2020, p. 484). In sports therapy, students have the opportunity to engage in this type of learning through their mandated clinical placement requirements. Some institutions offer the opportunity for students to undertake a placement year, resulting in their standard undergraduate three-year degree becoming four years in total, though not all accredited programmes offer this option of study.

Mezirow (1991) developed a theory of adult learning known as transformative learning theory, helping individuals to challenge current assumptions. Central to this theory is the process of making meaning from our experiences through reflection, critical reflection, and critical self-reflection, resulting in a cognitive shift as well as a behavioural one (Mezirow, 1997, p. 9). Transformative education is said to result in individuals who are more inclusive in their perceptions of their world view, able to differentiate, open to other viewpoints and able to integrate differing dimensions of their experiences (Dirkx, 1998, p. 4). These are essential skills for the budding practitioner and have been shown to be crucial for the development of clinical reasoning (Ziebart and MacDermid, 2019, p. 1057). Critical self-reflection appears central to this learning theory, as evidenced by Prout *et al.* (2014, p. 151), who highlight that transformative education begins with an awareness of one’s assumptions and the reflective examination of these assumptions. Transformational learning theory suggests that learning occurs when a learner changes the way in which they see the world, or there is a shift in the way meaning is made of the world or discipline (Schnepfleitner and Ferreira, 2021, p. 43). This reflects the nature of threshold concepts as described by Meyer and Land (2003, p. 1).

Learning is not always straightforward, as learners can have difficulty changing their approach to thinking and practice, because their worldviews of learning fit within their existing frames of reference (Mezirow, 1997, p. 7). Viewpoints can become so ingrained that it may take a

significant event or dilemma to shift a person's perspective. It has been argued that for transformation to happen, a critical or 'activating event' that results in critical self-reflection needs to occur (Prout *et al.*, 2014, p. 151). An example of this in the context of sports therapy learning could be when students are faced with an unknown or uncertain clinical situation. A practitioner's first experience of pitch-side trauma care comes to mind, though these events are unlikely to be the same for every student, given learning may take place in different timeframes (Holley, 2018, p. 19).

It is the process of critical self-reflection that appears to be the analogous feature between experiential, situated learning and transformative education. The role of critical reflection and self-reflection is particularly important in sports therapy, where there is a need to deliver evidence-based practice and be able to adapt to dynamic environments. Critical self-reflection is said to lead to significant personal transformations (Mezirow, 1997, p. 7), which reflects the 'transformative nature' of threshold concepts, seen in all three of the above theories of learning. Educators need to provide sufficient time and space for learners to reflect; otherwise, the value of reflection and potential for professionalism development may be lost (Johnson and Hammond, 2018, p. 295).

2.5 The struggles of learning sports therapy

In this section, I outline the key difficulties in learning to become a sports therapist, namely: the greyness of the discipline, the contextual challenges, approaches to teaching and the potential implications of pedagogical approaches drawing on neighbouring disciplines.

Common to many learning theories is a change in behaviour or knowledge through interaction with the environment, be that through experience, observation, or social interaction. Each theory of learning has a process of acquisition and describes the influence of internal and external factors, but what is less known is what makes learning a challenge.

The "troublesome" nature of threshold concepts comes not from the concepts themselves but from the way they fit together (Perkins, 2006, p. 41). This idea is well recognised in sports therapy, where students are required to integrate skills and knowledge to engage in one of the most fundamental aspects of their profession: clinical reasoning (Munro-Wilson, 2012, p. 68). Inherent to teaching clinical skills is the challenge for the learner to perform the skill, interpret the outcome, and discern implications with consideration for the patient as a whole (Jensen

and Mostrom, 2013, p. 144). When considering threshold concepts, what comes to mind are the parts of learning where students can encounter the biggest transformations, but also where students might struggle the most: the “troublesome” parts. In this context, “troublesome” means that learners encounter conceptual difficulty and/or emotional uncertainty as what they know is redefined (Barradell and Peseta, 2017, p. 349).

2.5.1 Curriculum design

The drawing together of fundamental knowledge to develop a more sophisticated understanding makes a threshold concept integrative, but may also contribute to the difficulty and uncertainty faced by learners navigating these gateways, likely because they expose previously unseen connections in content (Liljedahl, Palmgren and McGrath, 2022, p. 1458). Consequently, it is important that content delivered is not left in silos but is pulled together quickly, so that the students are able to recognise the connections and begin to emulate the behaviours and patterns of thinking necessary as a professional. The degree of integration is a prominent issue that should be addressed when designing curriculum to support the development of understanding. This provides an argument for not overloading the curriculum with unnecessary content (Kinchin, 2011, p. 212). When a curriculum is structured according to the aetiology of disease or on organ systems rather than integrated, the knowledge is stored in a way that is difficult to access when needed to solve clinical problems (Pinnock and Welch, 2014, p. 254). Students might struggle with emulating such patterns of behaviour or thinking because they are finding it difficult to pull concepts together (Wilson-Thain and Hammond, 2023, p. 195). This is not helped by concepts typically being delivered separately, because it is difficult, or perhaps because students are contending with different knowledge types (Perkins, 2006, pp. 33-47). Content may be further separated because it is designed and taught by different individuals, aligned with expertise. In addition, there may be emotionally challenging knowledge that can be uncomfortable or something learners are not in a position emotionally to deal with, which might lead to difficulties in learning (Hill, 2020, p. 666).

The “troublesome” part of a threshold concept seems to align most with that of conceptually difficult knowledge and with being foreign to the learner (Perkins, 2006, pp. 33-47). Certainly, in my professional experience, many sports therapy students describe the experience of learning

human anatomy as that of learning a foreign language because of the Latin names (Wilson-Thain and Hammond, 2023, p. 194).

2.5.2 Liminality in clinical contexts

The learning process, seen through the lens of liminality, has been described as ‘a special place in time and space, a kind of symbolic “social limbo,” loaded with promise, potential and the unknown’ (Turner, 1969, p. 97). Archer *et al.* (2024, p. 3) describe liminality as an ‘in-between’ space where learning is still happening. Like many other allied health professions, the learning of sports therapy can be filled with experiences of doubt, uncertainty, and ambiguity, which I associate with feelings of being “stuck” or “in-between” (Meyer and Land, 2005, p. 377). Ilgen *et al.* (2019, p. 799) use the term ‘certainty’ to describe the lived experience of an individual describing the extent to which they feel confident in the underlying cause or situation, for example, ligament damage causing pain and swelling. Uncertainty, therefore, relates to the not knowing or tentativeness around clinical situations. The variability of pathology seen from one case to another and the integrative nature of clinical reasoning are factors contributing to this uncertainty (Wilson-Thain and Hammond, 2023, p. 194).

Clinical decision-making in sports therapy is characterised by collaboration to understand the patient’s perspective (Geilsler and Lazenby, 2009, p. 56; Gruppen, 2017, p. 5), with each clinical encounter being different and presenting a continually shifting context. This variability and inconsistency can be a difficult notion for learners to grasp and may lead to feelings of uncertainty. The content is complex, it is variable by context, and the clinical case presented to practitioners requires therapists to integrate different forms, levels and topics of knowledge, which can feel “troublesome.” It appears to be in this space that students may become “stuck” (Meyer and Land, 2005, p. 377).

In the clinical setting, variability arises from individual differences presented from one patient to another, not only in their physical presentation of symptoms but also in the interpretation and communication of their condition. In the context of sports therapy, this includes anatomical variance, psychological and physiological response to injury, other contextual factors such as sport played, level of performance (e.g. recreational or professional), social influence, social determinants of health and clinician resources (Wilson-Thain and Hammond, 2023, p. 192). There are many similarities to be drawn from nursing when we consider potential threshold

concepts. For example, understanding and working with the biopsychosocial model, exploring patients' perspectives and goals, and evidence-based practice (Neve, 2019, p. 6). However, contextual factors such as the sport played, level of performance, and the whole rehabilitation process are what make sports therapy distinct from medicine and other allied health professions. There is no other allied health profession in the UK concerned with returning athletes to optimal performance, whether that be back to the pitch, court, or track, for example. Sports therapists are concerned with restoring physical, physiological, biomechanical, and neurological function in order for the athlete to reach their full performance potential following injury (Brukner and Khan, 2017, p. 286). There is also the requirement to consider multiple sports, multiple levels of participation (novice to elite) and other factors as outlined in the risk tolerance framework sports therapists use to return patients to activity (Shrier, 2015, pp. 1311-1315). The influence of these unique contextual factors over clinical decision-making means that learners can and will be faced with something that departs from a model or 'textbook' injury presentation; 'a grey area' (Wilson-Thain and Hammond, 2023, p. 192).

Operating in grey areas is an essential part of medicine, and clinicians need to develop the skills to cope with uncertainty and to be able to adapt (Ladher, 2019, p. 1). Though variability itself can be perceived as problematic for learners, it is the student's ability to cope with variability and adapt to departure from the textbook presentation that appears to be critical for success (Wilson-Thain and Hammond, 2023, p. 192). Learning to identify and manage uncertainty requires a complex set of skills and understandings. Introducing learners to threshold concepts and the notion that important learning often involves a struggle and takes time may also be useful (Neve, 2019, p. 7). Accepting uncertainty involves accepting the ongoing possibilities (Ilgen *et al.*, 2019, p. 800), and much of the uncertainty associated with mastering a threshold concept occurs whilst the learner is traversing the liminal space (Land, Rattray, and Vivian, 2014, p. 209).

The ability to let go of previously held assumptions and approaches and respond flexibly to new situations is what Hatano and Inagaki (1986, p. 28) labelled 'adaptive expertise'. To be an adaptive expert, learners need to develop the capability to respond to novel situations innovatively, and how we support students to do this might well be one of the most important questions facing health professions educators today (Jones and Hammond, 2023, p. 984).

Adaptive expertise is an emerging model of expertise in health professions education that directly addresses the challenge of preparing learners for uncertainty (Chaukos, Genus and Mylopoulos, 2023, p. 680). Mylopoulos (2020, p. 11) argues that education for adaptive expertise requires students to acquire procedural fluency and conceptual understanding for effective practice and problem-solving. Adaptive expertise requires similar levels of mastery of skills, knowledge, and procedures as routine expertise but also incorporates deeper conceptual understanding and insight, so that the adaptive expert can solve new problems, develop new processes or procedures for problem-solving (Cupido *et al.*, 2022, p. 1214). In exploring adaptive expertise, Betinol, Murphy, and Regehr (2023, p. 143) highlight that learners persistently attempt to impose certainty on inherently uncertain clinical situations. This lack of tolerance for uncertainty in the medical education setting can result in unnecessary investigations (White and Williams, 2017, p. 1200). In the context of sports therapy, this could result in unnecessary objective musculoskeletal assessment conducted in a routine order. This is problematic because it wastes valuable time and has the potential to irritate injured tissue unnecessarily.

Students seeking certainty is a familiar occurrence, something I have seen in the classroom on many occasions. For example, students might ask for a definitive answer or treatment choice when there are multiple possibilities; we are unable to predict the response of one patient to the next. Students can at times be so focused on the outcome and the requirements of an assessment that they are not able to appreciate the learning journey and the potential for growth as practitioners; instead, they rely on memorisation (Moon, 2004, p. 61). If creative problem solving is required to address the uncertainty of complex clinical situations, then it follows that recognising, accepting, and embodying uncertainty as a feature of clinical practice is first required (Jones and Hammond, 2023, p. 990). This suggests that adaptive expertise may be more than an approach to understanding and making use of a concept, and that it may be influential in transforming behaviours also. Barradell and Peseta (2016, p. 273) suggest:

The way that health professionals view their relationships with patients is an example of a threshold concept that goes beyond 'knowledge' of a concept to adopting a particular mindset. In the case here, the shift involves a student moving from a perspective of self (their own student-focus) to a perspective

that puts another's needs before their own (patient-focus) as a basis for professional practice. The idea that a threshold concept may be more than just 'knowledge' is especially important for a professional degree such as physiotherapy.

Drawing on the similarities between the musculoskeletal aspects of the physiotherapy profession and that of sport therapy, it could be suggested that the change in mindset described above and behaviour towards a more person-centred model is applicable to the sports therapy discipline also.

2.5.3 How and what we teach

Helping learners to cross “troublesome” thresholds so that they can accept and embrace uncertainty may be one of the most important roles of an educator (Neve, 2019, p. 6), and evidence suggests that helping students to embrace uncertainty is likely to assist the development of their adaptive expertise (Chaukos, Genus and Mylopoulos, 2023, p. 681). To do this, educators must provide learners with meaningful opportunities to effectively apply their knowledge to problems, create new knowledge to handle non-textbook scenarios, and encourage continuous learning (Mylopoulos, 2020, p. 12).

There is evidence to suggest that an integrated approach to teaching supports the development of adaptive expertise (Mylopoulos, 2020, p. 12), such as an approach that uses pedagogical tools explicitly linking clinical signs and symptoms with basic science explanations (Kulasegaram *et al.*, 2015, p. 67). However, the typical curriculum setup for sports therapy programmes may be something that makes this difficult, given the siloed nature of modules; it may also contribute to what is known as the ‘theory-practice’ gap (Salah, Aljerjawy and Salama 2018, p. 876). In nursing, the discrepancy between the educational and the practice environment is said to be confusing to students, presenting something that widens the ‘theory-practice’ gap rather than closes it (Mitchell and Kramer, 2023, p. 2). Betinol, Murphy and Regehr (2023, p. 143) speculate that the discrepancy between health professions training and medical training programmes might be that there are fewer opportunities for meaningful ‘ownership’ of patient problems and therefore fewer opportunities to be faced with the “troublesome” aspects of dealing with patient problems. Clinical content in physical therapy is traditionally taught in a laboratory setting and practised in more authentic clinical settings

(Reilly, Beran-Shepler and Paschal, 2020, p. 234). The same can be said for sports therapy, where there are fewer meaningful opportunities to take ownership of patient cases because of inauthentic classroom or laboratory settings. This could be one explanation for the 'theory-practice' gap described in the nursing literature as the discrepancy between theoretical knowledge and clinical practice (Salah, Aljerjawy and Salama 2018, p. 876). In the context of sports therapy, matching textbook descriptions of clinical scenarios with the reality of practice is an example of the theory-practice gap. Laboratory settings are meant to bridge the gap between theory and practice, but instead, they may limit the transferability of skills because the laboratory setting is not truly authentic (Newton *et al.*, 2009, p. 322). That said, early work by Eva (2004, p. 103) highlighted that working on a ward and interacting with a series of patients without additional focus on the individual context of the cases, as might be seen in the classroom or laboratory, may do students a disservice by weakening their analytical reasoning skills and instead relying on pattern recognition and non-analytical reasoning. To prevent students from becoming overwhelmed with clinical features, making it difficult to observe patterns, teachers should promote both forms of reasoning (analytic and non-analytic) in combination (Eva, 2004, p. 101).

Two things have been identified as core to developing adaptive expertise: procedural fluency and conceptual understanding (Mylopoulos, 2020, p. 1). A nursing student who published their reflections on the experience of the theory-practice gap stated that to master skills and apply them in a clinical setting, adequate practice in a controlled laboratory setting was essential and shared that this method of teaching had been found to reduce anxiety levels and increase feelings of confidence (Scully, 2011, p. 95). Though interesting insights, these are one person's reflections of their own experience rather than empirical findings of an investigation with generalisable findings. Therefore, these findings need to be interpreted with caution.

It is suggested that academics should consider using domain-specific threshold concepts across multiple settings, including the classroom, research laboratory, and informal learning environments (Holley, 2018, p. 27). The use of the term 'domain-specific' by Holley (2018) should be questioned, for one of the core characteristics of a threshold concept, as described by Meyer and Land (2003, pp. 5-6), is that concepts are 'bounded' within their discipline. This could suggest that a threshold concept cannot be stretched beyond a domain and become

generalised. There is clearly a need for balance between delivery in the laboratory setting and authentic clinical case experience, which enables students to draw different components of their learning together. It is important for educators to recognise that the traditional approach to clinical teaching, in which students are expected to master the basic biomedical sciences before proceeding to clinical problems might be unsuitable (Eva, 2004, p. 103), and might be an indicator that practice-based learning and the use of real clinical cases earlier in a programme is warranted. In contrast, Davies and Mangan (2007, p. 724) caution against the early introduction of threshold concepts, stating:

Introducing threshold concepts to students before they are in a position to use them to integrate prior knowledge creates problems. Students are likely to respond by developing an impoverished understanding of the concept that falls well short of being transformative, and which is likely to hinder any subsequent attempts to develop a full threshold understanding of the concept.

This requires educators to think carefully about thresholds identified and where the teaching of thresholds is best placed to avoid the scenario described by Davies and Mangan (2007, p. 724). In nursing, DeBourgh (2011, p. 145) found that progressive, guided practice with multiple opportunities to apply skills is needed to increase the authenticity and real-world applicability of clinical skills. Other disciplines, such as medicine and physiotherapy, are working to overcome the issue of authenticity and the theory-practice gap with the use of clinical simulation as part of teaching activity (Watson *et al.*, 2012, p. 657; Gormley and Fenwick, 2016, pp. 139-140). There is evidence to suggest that, although simulation will never replace real patient learning experiences, high-fidelity simulation-based clinical placement can be used to replace some standard 'real life' placements (25%), with no loss of competency in musculoskeletal physiotherapy (Watson *et al.*, 2012, p. 665). It has been found that the use of real-time patients and standardised patient encounters in teaching is common in athletic therapy education (USA) and medicine, which Armstrong, Walker, and Weidner (2018, p. 287) demonstrate are effective for improving student confidence and self-reflection; a skill that has previously been identified as critical in transformational learning (Ryan and Carmichael, 2015, p. 22). Interestingly, Armstrong, Walker, and Weidner (2018, p. 287) conclude that teaching and assessment methods used in the classroom or laboratory should parallel the types of

encounters that students will experience during their clinical practice, and advocate for teaching and evaluation methods that allow for the development of mental processes or illness scripts (Armstrong, Walker, and Weidner, 2018, p. 286). However, the notion of developing 'scripts' suggests a lack of creativity or adaptive expertise development discussed previously.

As previously indicated, there are three proposed conditions for mastering skills: 'an environment that is sufficiently regular to be predictable,' 'opportunity to learn these regularities through prolonged practice,' and 'quality and speed of feedback' from the educator (Kahneman, 2011, pp. 240-241). Whilst this echoes the notion of guided practice outlined by DeBourgh (2011, p. 145), an authentic clinical environment is often unpredictable. Therefore, sports therapy educators must strike a balance between sufficiently predictable/regular environments for skill mastery and exposure to authentic clinical experiences, where students will face challenges and need to exercise their 'adaptive expertise' (Hatano and Inagaki, 1986, p. 30). It could therefore be suggested that the regular and predictable use of case and problem-based pedagogies, using a threshold concept approach, would achieve this. This could be challenging for educators who come from a clinical practice background and who may not have expertise in pedagogy (Barradell, 2013, p. 268).

A student is unable to truly clinically reason if they simply follow a series of predetermined instructions or processes and lack underpinning knowledge (Wilson-Thain and Hammond, 2023, p. 194). This could have significant implications for the way educators teach. Staff and students can become overwhelmed by content, rather than exploring concepts that may allow for a deeper understanding and transformative learning experiences. This has been described as a tendency for educators to load their curriculum with content, transmitting large amounts of knowledge (Cousin, 2015, p. 4). It is suggested that students will only actively learn once the tutor shifts from transmission to facilitation (Gaunt and Loffman, 2018, p. 790). A threshold concept lens enables teachers to make refined decisions about what is fundamental to grasp the subject they are teaching, in a 'less is more' approach to curriculum design (Cousin, 2015, p. 4). A 'less is more' approach to curriculum design places more value on the insights gained through traversing threshold concepts than the volume delivered.

Content overload is not a problem distinct to sports therapy education; Amin (2019, p. 176) highlights that information overload, due to the enthusiasm of curriculum developers for

covering everything, is a problem within medicine also and the nursing profession seems to suffer from content overload too (Mitchell and Kramer, 2023, p. 2). A heavily packed curriculum can leave students little time to reflect on and consolidate their understanding (Walton, 2020, p. 29), and, as previously mentioned, reflection is known to be central to effective student learning (Ryan and Carmichael, 2015, p. 22). Learners can also be left feeling prepared for assessments but underprepared for the complex challenges presented to them in clinical practice (Walton, 2020, p. 29). The work of Walton (2020) is a useful comparison to make as it captured the perspectives of 115 physiotherapists, arguably the closest allied health profession to sports therapy in the UK. Drawing on their experiences, physiotherapists described training programmes as traditionally using pedagogy that prioritises rote memorisation and mimicry rather than allowing time and space for inventiveness, trial and error, and transference of competencies across contexts (Walton, 2020, p. 29). These are shared concerns for sports therapy curriculum.

Given that there are a considerable number of sports therapy competencies to be taught, students could be at risk of relying on memorisation. Students who approach learning in a surface manner and rely on memorisation of details can have difficulty making sense and seeing connections, and are fearful of failure (Healey 2008, p. 49). This is problematic in sports therapy where the integration of knowledge is essential and effective clinical reasoning relies on the student's ability to see and make connections between the subjective history, symptoms presented and their scientific understanding. This issue might be exacerbated by the nature of current assessments, lacking authenticity and often testing memorable knowledge, with little focus on the flexible use of that knowledge or the preparedness for continued learning (Mylopoulos *et al.*, 2016, p. 116). For example, the assessment of raw anatomical knowledge or the simple listing of contraindications to treatment.

The pedagogical challenge facing tutors and work-based mentors is to support learners to use all forms of knowledge in different ways, in different contexts, in relation to different purposes (Allan *et al.*, 2015, p. 78). In the context of sports therapy, this would include clinical supervisors. Clinical supervisors may find it difficult to support learners to use knowledge in different ways and contexts if they have little educational experience or inadequate educational preparation (Rothwell *et al.*, 2021, p. 5). Conversely, it could be argued that educators may not

have sufficient contemporary industry exposure to provide the variation in context that would facilitate this type of learning. The educator-practitioner role, where someone splits their time working between educational and clinical practice settings, might be best suited to achieve this.

A substantial amount of clinical learning is directed at learning signs, symptoms and differential diagnosis of conditions, and students can spend hours mastering the complete history and physical examination (Norman, Young and Brooks, 2007, p. 1144). This reflects sports therapy education. Students will often take a recall, memorisation, or rote learning approach to try to cover the vast amount of content with which they are faced (Moon, 2004, p. 59). This can result in students being able to label a bony prominence, but unable to offer much more in the way of detail or applied knowledge, for example. That said, returning to thoughts on content being siloed, students may find themselves in an anatomy module where the assessment is on the recall of anatomical structures with little or no necessity to apply the knowledge or make connections with other modules. This is typically the case at level 4 in sports therapy programmes. Students tend not to depart from the taught sequence, and links tend to be poorly developed where they do not have a clear picture of what they are trying to achieve or how to go about it because patients do not conform to 'textbook ideals' (Kinchin, 2011, p. 212). Students often learn the signs and symptoms of a common injury, but are perplexed when they see a different order or mix of presenting symptoms that do not match the textbook; they are unable to clinically reason.

Conversely, Long, Hobbs and Devenish (2018, p. 2) suggest that rote learning is not entirely redundant. Discussing pedagogical approaches in paramedic practice, they argue that rote learning can act as a clinical safety net for students, ensuring a solid grounding for foundational skills (Long, Hobbs and Devenish, 2018, p. 2). This could be the case in medical scenarios where skills need to be applied in stressful situations and when a clinician is fatigued (Long, Hobbs and Devenish, 2018, p. 2). Relying on a procedural response to a clinical case is an unlikely scenario for a sports therapist, unless they are working in a trauma environment, such as pitch side at a sporting event, where responses to an incident would be process-driven. A pragmatic approach would be to evaluate where this type of learning may be appropriate in the curriculum and which areas warrant a different approach. One such

approach might be that which Holley (2018, p. 27) suggests, where interdisciplinary threshold concepts provide a shared touchstone, enabling dialogue between students and settings, and providing a sense of belonging. If sufficiently integrated in the classroom, learning could be organised in a way that provides exposure to the reality sports therapists will face in practice, where it is necessary to consider multiple things at once, crossing sport and exercise science and therapy. Whilst Holley (2018, p. 27) offers a useful insight into the implications for pedagogical practice, it is important to note that the data comes from fifty neuroscience programmes in the USA and forty doctoral neuroscience students. Therefore, this offers a narrow perspective, and caution should be taken when applying this to undergraduate programmes and students, as the experience is likely to be different. For example, doctoral students will have studied for several years prior to reaching this level and, as seen in the responses of experts, may have difficulty recalling troublesome knowledge or thresholds they have long since crossed (Meyer and Land, 2003, p. 3). In contrast, doctoral students are likely closer to the experience of undergraduate students in terms of timing and may have better recollections of the challenges faced, which offers a useful perspective.

When occupying a liminal state, students may mimic the language and behaviours that they perceive are required of them, before full understanding is acquired (Kiley and Wisker, 2009, p. 432). The implication of this could be a belief for the educator that the student has passed through the conceptual gateway, when in fact they have not. The implications for students who are unable to pass through the gateway are that they are likely unable to progress or mature clinically (Mitchell and Kramer, 2023, p. 2). Walker (2012, p. 250) highlights that 'too much uncertainty in a liminal state and the learner will not be able to progress beyond a surface understanding', suggesting that students may require some elements of certainty in the liminal space. Perhaps then this is the most important place that educators can make an impact on student learning, in supporting them through liminality. This connects to what Davies and Mangan (2007, p. 724) caution against in relation to 'readiness' to learn a threshold concept, highlighting that students are likely to respond by developing a poor understanding of the concept that falls short of being transformative if they are not ready.

In sports therapy, students developing a superficial or incomplete understanding could result in students being limited by their inability to integrate their knowledge and undertake robust

clinical decision-making. Students may have good practical competency and may have a good level of therapeutic reasoning skills, but could be lacking in their ability to diagnostically reason. In nursing, Mitchell and Kramer (2023, p. 2) propose that a failure to reach a threshold means the student will remain 'stuck' and professional development will not advance. It is essential to have an effective assessment strategy in place to ensure student understanding can be measured effectively and to prevent any masking or mimicry as described by Meyer and Land (2003, p. 13). In addition, curriculum designers must achieve optimal balance in uncertainty in the liminal state to achieve the required transformation and ensure the learner can progress beyond a surface understanding (Walker, 2012, p. 250).

2.5.4 Insight from other disciplines

It could be suggested that students failing to pass through a conceptual gateway may withdraw from study if unable to pass the necessary requirements with successful mimicry of skills. If there is a poor assessment strategy on the educator's side, the student may scrape through passing based on safe practice, though perhaps not the most effective. The implication of this in practice is that the practitioner will be able to deal with basic case scenarios but will find themselves limited when addressing more complex cases that require a more adaptive approach to their thinking. Without yet knowing what the threshold concepts are in sports therapy, it is difficult to identify what the other implications of not passing through the thresholds might be, hence the purpose of this research.

Considering the thresholds identified from neighbouring professions such as physiotherapy, it is sensible to suggest that pain science, person-centred care and professional identity might feature (Smart, 2023, p. 3), in addition to clinical reasoning, as proposed by Wilson-Thain and Hammond (2023, p. 192). In physiotherapy, pain has been identified as complex and "troublesome" to understand due to the variability seen in individual presentation, and clinicians are encouraged to assess pain from a biopsychosocial perspective, rather than a purely biomedical one (Smart, 2023, p. 2). In the unique context of sports therapy, approaching pain science education from a biopsychosocial perspective could also be transformative for sports therapists. The notable difference between the professions is that sports therapists might be less likely to see long-term chronic pain conditions caused by illness or disease, given that the settings in which they work are typically with healthy, athletic populations. This

requires consideration of factors distinct from other health disciplines, including the needs of the sport. That said, those in clinical settings may be working with more similar populations. Smart (2023, p. 3) reports that clinically encountered pain is pervasive across healthcare-related settings, disciplines, and conditions, supporting the potential for crossover to sports therapy.

In medicine, person-centred care has been described as a threshold that requires students to explore patient perceptions and goals, which can be “troublesome” when the goals do not align with their own (Bhat *et al.*, 2018, p. 623). Despite this concept being identified as “transformative” and “troublesome,” the authors did not present data to support them being “integrated,” “irreversible,” or “bounded.” In the unique context of sports therapy, practitioners would have the additional considerations of goals aligned with club, team and management expectations, something only experienced working in the sporting environment.

Finally, in medicine, professional identity has been identified as something with multiple thresholds within it, such as being an active learner, the burden of responsibility, and plurality of the role (Bhat *et al.*, 2018, p. 623). Identity formation is likely the most “bounded” of these aforementioned thresholds, given that professional identity is about a person’s sense of self and their relationship with and within a profession (Sutherland and Markauskaite, 2012, p. 747).

2.5.5 Implications

How educators might facilitate a student’s movement through the learning of such threshold concepts is of interest. Understanding where threshold concepts feature in the sports therapy curriculum could help enthuse educators to recognise where learning is “troublesome” and enable them to help students with these aspects of their learning (Cousin, 2009, p. 206). An experienced educator understands that learners respond in varied ways. Thus, ‘the curriculum plan must be linked to the art of the teacher in dealing with individual differences’ (Lawton, 1996, pp. 21-22). It could be argued that a threshold concept approach assumes that all students will be challenged by the same “troublesome” content, not allowing for individual differences (Khatri, Knight and Wilkinson, 2020, p. 185). This is unlikely to be the case, and thus, caution should be applied when thinking about pedagogical practice implications. It would be prudent to suggest that while the threshold concept presents itself within a discipline, the

way students may transition through the liminal space could be flexible, in time and experience (Mac Suibhne, 2012, p. 134). Osberg and Biesta (2008, p. 326) suggest that the teacher's responsibility is not 'to bring about the successful transit of an object (a student) from point A to point B' but to complicate the scene, '...continuously re-opening subjectivity, unsettling closures, and unpicking destinations'. Complicating the scene aligns well with the experience of liminality and "troublesome" knowledge because this time can be unsettling. Walker (2012, p. 250) posits that uncertainty is essential if the learner is to make the required transformation into a fully participating member of a community of practice, and striking the optimal balance as part of curriculum design is essential to enable this. Transitioning through a conceptual gateway should lead to a necessary shift in perspective that may permit further personal development (Meyer and Land 2005, p. 377), and the task for educators is to identify the source of obstacles, and to help 'free up the blocked spaces', which might be achieved by redesigning activities through scaffolding (Meyer and Land, 2005, p. 377).

A co-facilitation model of enquiry-based learning for nursing students was introduced by Stacey, Oxley and Aubeeluck (2015, p. 526) to stimulate learning. This approach included the use of people with lived experiences being supported to co-facilitate enquiry-based learning sessions, using personal experiences of learning triggers. Following the facilitated sessions looking at recovery, students recognised that their depth of learning had been motivated by the co-facilitation model, because of the authenticity of the experience. Students identified how the co-facilitation model enhanced their learning, which had previously been based upon 'textbook' descriptions of symptoms or behaviour associated with a specific diagnosis (Stacey, Oxley and Aubeeluck, 2015, p. 526). In the context of sports therapy, such an approach might be successful in the learning of contextual responses to injury and the biopsychosocial model. However, it could be more difficult to use this method for exploring learning associated with practical competency in sports therapy, such as effective handling during the examination and assessment of a peripheral joint.

Later approaches to teaching threshold concepts have included the use of blended learning in the form of integrated online and face-to-face delivery in helping medical students overcome difficulties in laboratory courses, by improving their ability to self-learn, understand, and solve problems (Chen *et al.*, 2020, p. 10). Medical students and educators were surveyed on their

perceptions of a blended approach to learning threshold concepts in the laboratory setting, similar to where much of the practical sports therapy teaching is conducted. Results showed that at the end of the blended laboratory courses, most students held the opinion that the blended courses were more effective in accomplishing threshold skills and knowledge goals of laboratory courses (Chen *et al.*, 2020, p. 12). Performance data also indicated that there were improvements in laboratory quiz scores when using a blended learning approach (Chen *et al.*, 2020, p. 15).

In these examples of pedagogical approaches to threshold concept learning, the educator is central to the student's learning experience, operating like a compass, helping students to navigate their way through "troublesome" content. It is essential that the sports therapy discipline evaluates its curriculum content, design, and approaches to identify opportunities to maximise learning for students; hence the need for this research.

2.6 Summary

This research aims to identify "troublesome" knowledge and threshold concepts in the sports therapy discipline and explore the perceptions of key stakeholders for undergraduate sports therapy education in the UK. This will provide an opportunity to reflect on what is considered "troublesome" knowledge from multiple perspectives and to enhance the education of practitioners. Though there is common ground among other allied health professions, sports therapy is a domain whose education has been predominantly competency-based. Educators need to understand what "troublesome" knowledge learners face and how they navigate that "troublesome" knowledge. Barradell (2013, p. 268) highlights that threshold concepts align well with a student-focused approach to teaching and learning, because they provide an opportunity for academics to reflect on what is taught, why it is taught, how and when it is taught. Educators should be able to identify evidence of superficial understandings or mimicry so that they can help students progress through the liminal space. Using a threshold concept lens, educators can explore and understand why a concept is "troublesome" and find appropriate ways to support students (Neve, 2019, p. 7). Drawing on multiple sources of input from various stakeholders and participants in the teaching and learning process to achieve this has been advocated (Timmermans and Meyer, 2019, p. 357). This work has not previously been conducted in the sports therapy discipline.

Through this work, I aim to impact the education of sports therapy in the UK and potentially inform the professional regulatory statutory body (PSRB) guidance. More broadly, my findings may influence other branches of therapy and rehabilitation education internationally, such as athletic training (United States, Japan, Taiwan, South Korea), athletic therapy (Canada), sports physiotherapy and training (Australia), sports nursing (Spain), and athletic rehabilitation therapy (Ireland).

Chapter 3.0 Methodology

3.1 Chapter overview

This chapter explains my research approach and describes the philosophical and methodological framework supporting my research. This includes using an interpretivist philosophy and survey strategy to undertake the research. Justifications are given for the design and methodological approaches employed to address the research objectives:

- To explore stakeholders' perceptions of troublesome knowledge in sports therapy education.
- To identify troublesome knowledge and thresholds in sports therapy education.
- To explore the nature and categorisation of troublesome knowledge and thresholds.
- To provide recommendations for sports therapy educators.

The purposive and snowball sampling approaches are explained, and the challenges associated with the identification of threshold concepts are considered throughout, together with the limitations of the approaches used. This chapter also provides information on the data collection and data analysis carried out for each of the research phases. In phase one, I utilised a questionnaire, and in phase two, I used semi-structured interviews to collect the perspectives of stakeholders in sports therapy education. The phased approach is a distinctive feature of the design of this research and enables the expertise and perspectives of five different stakeholder groups to be analysed. Analysis of the data included descriptive statistics representing questionnaire and interview engagement, and thematic analysis of the qualitative data. The chapter concludes by reviewing the ethical considerations in my research and provides evidence of the relevant approvals.

3.2 Research philosophy and approach

Due to the exploratory nature of the research questions posed, a qualitative approach was undertaken, with the philosophical underpinning of the interpretivist paradigm. An interpretivist paradigm 'suggests a broader philosophical perspective' (Collis and Hussey, 2003, p. 47) where the focus is on 'exploring the complexity of social phenomena with a view to gaining interpretive understanding' (Collis and Hussey, 2014, p. 45). It offers a rich and nuanced approach to understanding social phenomena with emphasis on the importance of context,

subjectivity, and the meanings that individuals or groups assign to their experiences. Given the nature of the sports therapy discipline being so context-specific and with varied stakeholders (Johnson and Hammond, 2018, p. 293), it seemed fitting that this philosophical perspective be used. This paradigm was particularly suitable for my study as it emphasises the subjective meanings and experiences of individuals who are key stakeholders in sports therapy education, spanning both education and professional practice settings. By focusing on the subjective experiences of participants, I was able to gain a deeper understanding of their perspectives, motivations, and the meanings they attached to their educational experiences. By adopting an interpretivist perspective, I was able to highlight the experiences and viewpoints of individuals, while building up a picture of the views of stakeholder groups (Kankam, 2019, pp. 86-87). In the case of induction, the researcher gathers qualitative data, such as a student's experiences in the classroom, and establishes patterns drawing on theory. In contrast, a deductive quantitative approach involves the researcher testing an existing theory or hypothesis (Saunders, Lewis and Thornhill, 2019, p. 146). In my research, the approach used was inductive, gathering qualitative data to examine the perspectives of stakeholders in sports therapy education.

It has been suggested that qualitative researchers tend to adopt a constructivist ontological view of the world and are focused less on generalisability or external validity and more on the degree to which the data accurately represent attitudes, perceptions, and views of the population being studied (Broom and Willis, 2007, p. 26). This neatly captures the combination of approaches used in my research, where the focus was on gathering rich, value-laden data through questionnaires and semi-structured interviews with educators, newly and graduated therapists, educator-practitioners, industry professionals, and representatives of professional bodies. Such qualitative approaches can add richness to our understanding of people's perspectives (Bhangu, Provost and Caduff, 2023, p. 39), and this provides a useful foundation for exploring "troublesome" knowledge in sports therapy.

Although researchers may embrace different methodologies within a single research project, there can be a tendency for the analysis, including the conceptualisation of results, to be derived from one distinct philosophical standpoint and to take a positivist or constructivist/interpretivist approach (Broom and Willis, 2007, p. 18). However, good qualitative

researchers will adjust their approach in response to data that may contradict their initial assumptions or theories. Interpretive research is about subjectivity and complexity, and it seeks to represent rich, subjective experiences (Broom and Willis, 2007, p. 26). Qualitative methods endeavour to foster a context-rich understanding, yielding insights that reflect authentic experiences of individuals, while maintaining academic integrity due to its methodological underpinnings (Lim, 2024, p. 2).

As an applied sport and exercise scientist, I am inclined towards quantitative, positivist approaches to research, which I find provide a sense of reassurance and reliability, but, as an educator, I am fascinated by the interpretivist paradigm that allows us to shape reality around perceptions and experiences by delving into the subjective world, to better understand individual context. In the development of this work and my engagement with participants, I have felt truly connected with each perspective. I have enjoyed untangling the complexities within each interview and contributing to meaningful insights into the sports therapy discipline, beyond statistical tables and graphs.

As an educator with a background in musculoskeletal therapy, my personal and professional experiences have shaped my perspectives on sports therapy education, influencing both my engagement with the subject and my interactions with participants.

My identity as a white female academic informs my approach to this study. Having worked with students who have faced challenges in their learning for the last eighteen years, I bring a distinct lens to my analysis, one that promotes deeper understanding while requiring continuous reflexivity. As a 'participant insider,' I acknowledge the potential for bias and actively strive to navigate it throughout the research process. To ensure transparency and trustworthiness, I have employed reflexive practices such as peer discussions and member validation. By critically examining my assumptions and interpretations throughout, I aim to present findings that authentically reflect the lived experiences of participants rather than solely my perspective.

While my positionality inevitably influences this study, I remain committed to ethical research practices that prioritise the voices and experiences of those involved. Through reflexivity, thick description, and rigorous methodological choices, I have endeavoured to produce meaningful insights that are both credible and transferable.

3.3 Research strategy

The strategy employed for this research was 'survey.' Survey works well for collecting data on narrow and well-defined topics but less well for studying complex phenomena in greater depth (Johannesson and Perjons, 2014, p. 42). A strength of survey as a research strategy is that it allows for collecting large amounts of data (qualitative and quantitative) inexpensively and over a short period (Saris and Gallhofer, 2014, p. 6). It also allows for a variety of methods to recruit participants and collect data (Ponto, 2015, p. 168). This strategy was particularly suitable for my study because I needed to approach busy educators, practitioners, and professional body representatives. There was also a large number of potential participants, and so using survey as my research strategy, implemented via a questionnaire and semi-structured interviews, allowed me to get the information to a large audience, quickly (Johannesson and Perjons, 2014, p. 44). The use of both the questionnaire and semi-structured interviews allowed me to effectively answer the research questions.

Sampling is one of the main concerns in research; it can be both expensive and unachievable (Johannesson and Perjons, 2014, p. 43). An additional challenge in sampling is to determine whether results generated from a selected sample can be generalised to the population from which it has been drawn. Another disadvantage of a survey research strategy is the non-response error, but this can be addressed by designing user-friendly surveys and by including follow-up procedures for non-responders where applicable (Ponto, 2015, p. 169). Low response rates are a concern for questionnaire-based data collection (Shih and Fan, 2008, p. 250). However, low response rates from stakeholder groups were addressed with a bespoke communication to garner more interest from the nearly and newly graduated population (see Appendix A).

Both sampling and non-response can be factors which contribute to a risk of bias (Collis and Hussey, 2013, p. 207). For example, those who chose to respond may have different opinions from those who did not. Ensuring there was a reasonable response from all stakeholder groups and follow-up communications to non-responders assisted with reducing this form of bias. Learners may have very individual experiences to share, which are unlikely to be generalisable. As this research does not aim to generalise the results to the rest of the population, this is less of an issue in the context of sports therapy education. I am hopeful that

the perspectives shared from the various stakeholder groups will be reflective of the sector, both in the education and professional practice groups.

Survey strategies implemented through questionnaires may not explore the complexity and depth of the issues being explored, such as respondents' feelings or motivations behind their responses, if the questions are not effectively structured (Collis and Hussey, 2013, p. 212). In addition, data can be superficial when individuals do not have the time or inclination to provide detailed answers to the questions posed by the researcher (Johannesson and Perjons, 2014, p. 143). These issues were mitigated by using open-ended questions in the questionnaire and by phase two of data collection, where stakeholders took part in a one-to-one, semi-structured interview. Although interviews can be costly and time-intensive (Ponto, 2015, p. 170), they provided the opportunity to explore stakeholder perceptions at greater depth than the questionnaire would allow.

3.4 Sampling

Non-probability sampling is used to study existing theoretical insights or develop new ones using non-randomised methods to draw the sample (Collis and Hussey, 2013, p. 132). I have used non-probability sampling in my research because the data was not to be statistically analysed, and I did not wish to generalise the findings from the sample to the rest of the population. In addition, I wanted to recruit a very specific set of stakeholders. The advantage that this brought to my research was that I was able to target stakeholders who belong to the specific stakeholder groups and have both the necessary experience and qualifications represented in those groups. These are considered information-rich participants (Shaheen, Pradhan and Ranajee 2019, p. 34). This method of sampling is considered less expensive, less complicated and easier to apply compared to its counterpart, random sampling. While one of the major shortcomings of non-probability sampling is that the findings may lack generalisability, this was not an issue for my research because I wished to associate the findings with a specific educational experience and context: sports therapy. Non-probability sampling allowed me to research this area and generate valuable insights into sports therapy education that are novel.

For this research, I used a combination of purposive and snowball sampling. In purposive sampling, the goal is to identify a small number of individuals who can provide especially

valuable information through privileged knowledge or experiences about the topic being explored, for example, through their professional roles or educational experiences (Johannesson and Perjons, 2014, pp. 43-44). For this reason, the researcher may personally invite potential participants to be part of the sample. Within this process, there was some variability in sampling for each of the stakeholder groups, explained in a later section. This sampling strategy was appropriate for my research because I was looking for a very specific population to take part and wanted to capitalise on my professional connections and networks within the industry. Drawing on multiple sources of input from various stakeholders and participants in the teaching and learning process to identify threshold concepts has been advocated (Timmermans and Meyer, 2019, p. 357).

To utilise the professional connections of others, snowball sampling followed, also known as 'chain referral' sampling (Shaheen, Pradhan and Ranajee, 2019, p. 34). In this method, the sample is collected in various stages. This method was useful for building on original contacts and using my professional networks to recruit other willing participants (Nicola-Richmond *et al.*, 2019, p. 570). It began with the collection of data from a small number of my contacts. Afterwards, I asked those contacts to pass on the study information to colleagues, nearly and newly graduated therapists and contacts in the industry. The benefit of this approach was that I was able to get a suitable number of participants to take part. The disadvantage was that there was a reliance on others to spread the opportunity, and this had variable results.

To recruit educators, educator practitioners and representatives of professional bodies, professionally accredited programmes were identified, and individuals were contacted, including course leaders, lecturers, programme contacts via the professional bodies and professional body representatives. For industry practitioners and nearly and newly graduated therapists, a combination of personal invitations and more generic calls to recruitment were made via email and through my professional online networks. In total, forty individuals were directly contacted, of which thirty responded. Other responses were indirect as a result of the snowball sampling. Professional bodies were asked to send the study information to their members. The Society of Sports Therapists was successful in doing this, but I did not receive a response from the British Association of Sport Rehabilitators and therefore do not know the outcome of this approach. For non-responders, follow-up communication was made to

encourage engagement. A total of forty-six professionally accredited, undergraduate training programmes for sports therapy education in the UK were approached to take part in this research, either directly or indirectly (see Appendix B).

Participants who were employed by a higher education institution (HEI) and teaching on an undergraduate degree in sports therapy and rehabilitation, or an equivalent named award, were allocated to the educator stakeholder group. Those holding dual roles in higher education and clinical practice were allocated to the educator practitioner group. Nearly and newly graduated therapists included any participants in their final term of study, up to one year post-graduation. Industry professionals were participants working as full-time therapists and professional body representatives held roles (paid and unpaid) within The Society of Sports Therapists (SST) or the British Association of Sports Rehabilitators.

3.5 Data collection methods

Using a phased approach, two data collection methods were used in this research to collect qualitative data: an online questionnaire (see Appendix C) and an online, semi-structured interview. A key advantage of online qualitative questionnaires is openness and flexibility to address a wide range of research questions, with methods which allow access to data that range in focus from people's views, experiences, or practices (Braun *et al.*, 2020, p. 642).

In phase one of data collection, questionnaires were used in an attempt to reach stakeholders and yield a good number of stakeholder perspectives. This was both a time and cost-efficient way of gathering the initial data from willing stakeholders (Saris and Gallhofer, 2014, p. 6). The strength that the questionnaire brought to the research was that it allowed me to reach stakeholders across the UK, enabling me to gather a diverse range of perspectives (Thomas, 2023, p. 218) in terms of geographical location. The questionnaire also allowed for simple sharing, which helped with the snowball sampling method. Using open-ended questions, I was able to get a superior quality and depth of answer from participants (Atkins and Duckworth, 2019, p. 224). This approach enabled the exploration of initial themes and helped to set the focus for phase two of the data collection. Additionally, the questionnaire was useful for sparking an initial interest in this work, and many stakeholders followed through to phase two of the research, volunteering to take part in an interview. A potential limitation of the use of open-ended questions is that the analysis requires the interpretation of the researcher,

increasing the risk of bias in the analysis process (Smith and Noble, 2025, p. 2). That said, a strength of the open-ended questions was that they captured stakeholders' perceptions in their own words, which brought a richness to the data that statistics would not have. Another limitation of the questionnaire could be that the questions were misinterpreted, with the inability for participants to ask questions or clarify things during the process of responding to the questions. Additionally, questionnaires have been criticised for lacking depth and the opportunity for researcher and participant to build a rapport (Brown and Danaher, 2019, p. 78). This was mitigated by a follow-up opportunity to take part in a semi-structured interview, phase two of data collection.

Interviews are regarded as a communicative process between people in a face-to-face or other form of verbal exchange, for example, telephone, internet, where one person tries to elicit information from another person to produce knowledge (Maldonado-Castellanos and Barrios, 2023, p. 2). Semi-structured interviews were conducted in phase two of this research and brought a different dimension to the data collection (Mashuri *et al.*, 2022, p. 25). The semi-structured interview enabled me to explore stakeholder perspectives in greater depth, allowing for real-time adjustments in thought and reflection (Mashuri *et al.*, 2022, pp. 22-23). Participants were able to provide context and elaborate on their points of view (Brown and Danaher, 2019, p. 78).

The balance of structure, flexibility and adaptability was a strength of using the semi-structured interview approach (Mashuri *et al.*, 2022, p. 22), while allowing me the autonomy to explore ideas that came up (Adeoye-Olatunde and Olenik, 2021, p. 1364). The semi-structured interview allowed me to explore experiences in depth and to understand the stakeholder perspectives in a way that the questionnaire did not allow for; participants were able to properly express thoughts and opinions (Pervin and Mokhtar, 2022, p. 424). This will have been especially important for anyone who struggled to articulate themselves in written form or who misinterpreted the open-ended questions in the questionnaire.

Interviews were conducted online via Microsoft Teams. In-person, face-to-face interviews would have incurred significant cost and travel time given the geographical spread of participants. For that reason, the online interviews were beneficial for reaching stakeholders across the UK, inexpensively. One of the limitations of online interviews is that they lack social

context cues such as aspects of the physical environment and nonverbal behaviours, which are said to play a crucial role in successful qualitative data collection (Lobe, Morgan and Hoffman, 2022, p. 1). This was mitigated in Microsoft Teams by having stakeholder cameras turned on and ensuring there was sufficient time given to allow for appropriate pauses in conversation. This prevented me from talking over or interrupting the participant when they were in good flow. It also allowed me to notice non-verbal cues such as nodding or shaking of the head.

One of the strengths of the online interviews was the ability to record and include auto-captioning, later used for transcription. Using artificial intelligence, Microsoft Teams converted the participants' speech into text during the interview. This method incurred no additional costs, only researcher and stakeholder time (Lobe, Morgan and Hoffman, 2022, pp. 3-4). The online format of the semi-structured interviews required each stakeholder to have a digital device with a functional camera and microphone; most utilised a desktop computer or laptop, and a small number used a smartphone and similar devices (Lobe, Morgan and Hoffman, 2022, p. 2). One key limitation of this approach could be that those without access to such technology may have felt excluded (Adeoye-Olatunde and Olenik, 2021, p. 1364), though this did not pose an issue within my research.

3.6 Data collection

3.6.1 Phase one

Phases one and two were designed to address the following objectives:

- To explore stakeholders' perceptions of troublesome knowledge in sports therapy education.
- To identify troublesome knowledge and thresholds in sports therapy education.
- To explore the nature and categorisation of troublesome knowledge and thresholds.

Qualitative approaches to data collection, in the form of a questionnaire and semi-structured interviews, were used, allowing rich data to be collected from a range of key stakeholders in sports therapy education. Stakeholders known to me were contacted directly via email (see Appendix D). Posts via my professional online networks were also used to encourage participation and help to spread the invitation more widely across the discipline.

Over seven months, a short questionnaire was used to gather data on what stakeholders perceive to be “troublesome” knowledge in sports therapy education (see Appendix C). These methods were used as they enabled me to gather initial data, collate it and use it to inform the second phase of data collection, providing a focus for semi-structured interviews. My questionnaire was first planned in a Word document and then constructed within JISC Online Surveys (previously Bristol Online Surveys). The first iteration of the questionnaire (see Appendix D) included five questions and was refined, resulting in three core questions (see Appendix C). This process of refinement involved discussions with two therapy educators and researchers who subsequently did not take part in the final data collection.

In January 2024, I undertook an assessment of stakeholder engagement, which revealed that a limited number of nearly and newly graduated therapists had taken part (n=3). Reflecting on the original communication sent out, I realised that the approach was not as inclusive as it could have been. The communication was appealing to academics and practitioners but was not accessible to the nearly and newly graduated. As such, I compiled a bespoke communication for this stakeholder group and asked academic course leaders to forward this to potential participants (final year students and recent graduates; see Appendix A). A second round of advertisements on my professional online networks was also used to generate more engagement from this group. A revised, more ‘student-friendly’ questionnaire (see Appendix F) was created to secure more data from this stakeholder group and to reduce the time taken to conduct a 1:1 semi-structured interview (see Appendix G). The questions posed were preceded by some basic threshold concept information and examples. This approach was reviewed by another educator in the field who agreed that it was more inclusive and likely to yield better response rates from this stakeholder group. This approach was successful in yielding eleven additional responses from this stakeholder group. It would have been easy to leave this group with a low number of responses, but I felt that this would weaken the student voice in the findings and potentially misrepresent the outcomes of this work.

It has been highlighted that when conducting research, the researcher should, where possible, avoid separating the stages of study design, data collection, and analysis, but instead move backward and forwards between the raw data and the process of conceptualisation, to make sense of the data throughout the entire process (Agius, 2013, p. 205). Throughout the process,

the researcher must also try to avoid imposing their preconceptions on the data and the analysis, placing emphasis on capturing and interpreting research participants' true perceptions (Agius, 2013, p. 205). This was more straightforward in the questionnaire because I was not at risk of influencing the answers, but I needed to be more mindful of this in phase two of the research, which included a semi-structured interview.

On completion of the questionnaire, each participant was directed to a participant debrief statement (see Appendix H). This served to thank the stakeholders for their time, remind them of the privacy notice and anonymity, and reiterate the research contact details should they wish to follow up. Once questionnaires were completed, they were downloaded from JISC online surveys and stored as password-protected PDF files, in a password-protected folder on the cloud, accessible only by the researcher.

3.6.2 Phase two

Following the questionnaire, forty-five-minute one-to-one semi-structured virtual interviews were completed with stakeholders who expressed a willingness to do so (n=32). An interview structure was used to guide the conversation and ensure that all key areas were covered (see Appendix G). This was a useful tool for referring to when participants deviated too far from the original topic area and ensured a level of consistency in the discussions across all stakeholder groups.

In my research, each semi-structured interview began by confirming that I had received participant informed consent and reminding participants of methods in place to retain their privacy and anonymity (see Appendix I). I then invited each participant to provide a brief history of their training and experiences to date. This allowed me to get to know the stakeholders a little better and to settle any nerves they may have felt at the start of the interview. This also allowed me to assign them more accurately to a stakeholder group as I was able to fully understand their current roles and experiences. This was followed by a verbal summary of threshold concepts and a description of the threshold characteristics (Meyer and Land, 2003, pp. 5-6). The purpose of this was to familiarise the participants, focus the discussion, and seek out the potential threshold concepts and troublesome knowledge rather than asking the individual to list them. At the end of the interview, I explained the objectives of the research and how the data would be used to evaluate stakeholder perceptions, finishing with a reminder

regarding anonymity in the write-up. Participants were also given the opportunity to ask questions. Several participants were keen to know what other stakeholders identified as troublesome, and many expressed an interest in reading the write-up of this research.

3.7 Data analysis strategies

Descriptive statistics were used to analyse the stakeholder engagement with questionnaires and semi-structured interviews. This included representation statistics for each stakeholder group. Thematic analysis followed and was undertaken for the questionnaires and interviews, respectively.

3.7.1 Questionnaires

Thematic analysis was employed to examine the questionnaire responses and the data from the semi-structured interview transcripts. This approach was used to uncover patterns in thinking amongst the stakeholder groups. Further examination of the themes identified in the thematic analysis was undertaken to seek transformative insights and evidence of threshold characteristics (Meyer and Land, 2003, pp. 5-6), forming a two-part, interwoven, analytical process.

Thematic analysis involves the identification and reporting of patterns in a data set, which are then interpreted by the researcher (Clarke and Braun, 2017, p. 297; Xu and Zammit, 2020, p. 3); these patterns can be found based on understanding the meaning of keywords and phrases used by participants. Using thematic analysis, a researcher can generate codes and themes from qualitative data, providing a framework for organising and reporting observations related to the research question (Clarke and Braun, 2017, p. 297). Thematic analysis, with its balance of descriptive and interpretive analysis, aligns well with the interpretivist paradigm, which focuses on subjective descriptions of reality (Naeem *et al.*, 2023, p. 8).

Using this method of analysis, the researcher immerses themselves in the data and allows themes to emerge organically, allowing the co-construction of knowledge between researcher and participants (Clarke and Braun, 2017, p. 297). One of the benefits of thematic analysis is its flexibility to explore patterns within and across data in relation to participants' lived experience, views and perspectives, behaviours, and practices; what participants think, feel, and do. (Clarke and Braun, 2017, p. 1)

I began with the process of thematic analysis by familiarising myself with the data. I did this by immersing myself in the questionnaire responses. I began the process of analysis by identifying information relevant to the research objectives. This process was particularly useful for providing a focus for the analysis and guiding the extraction of crucial data from the transcripts (Thomas, 2006, p. 241). In addition, I started to extract words and phrases associated with the characteristics of threshold concepts and began assigning the findings to codes. This is what is known as inductive coding. Inductive coding refers to the process of gathering keywords with the purpose of creating an organised list of codes. Liu (2023, p. 2) suggests that this task involved the cognitive process of categorisation, putting things into a limited number of domains, categories, or families for easier processing. Inductive coding is exploratory and involves generating codes from the data to allow patterns and themes to emerge (Fereday and Muir-Cochrane, 2006, p. 83), reflecting the unique experiences of participants (Thomas, 2006, p. 241). I completed this process by hand, with the use of coloured pens and sticky notes. I then created an Excel spreadsheet to capture the themes and codes (see Appendix J) that I had identified within the transcripts (see Appendix J).

I am aware that there are more modern ways to conduct this type of analysis, for example, using software such as NVivo to assist the process. However, concern has previously been expressed, highlighting that the practicalities of data entry, coding and retrieval using software might distract researchers from the task of understanding, thinking about and explaining meanings of the research, which can result in distancing researcher from their data (St. John and Johnson, 2000, pp. 395-396).

Liu (2023, p. 10) suggests that coding reliability may be achieved through an improved understanding of the cognitive processes undertaken as part of the thematic analysis process. These cognitive processes include 'prototyping,' the action of using one piece of data as the model for categorising other data. Prototyping ensures that the categorisation is not influenced by the researcher's views but is a true reflection of the data; this improves the reliability of the data (Liu, 2023, p. 5). The process of prototyping was challenging with the data that I had because stakeholders articulated their views in such varied ways, but it was still possible. I used stakeholder perceptions to act as a marker for other responses when categorising the data. In practice, this involved pulling out clear and explicit examples to measure other data

against. For example, data that suggested something was “troublesome” and provided an example of this acted as a template to reflect on when considering other participant responses.

The validity and trustworthiness of the findings of thematic analysis can be improved through careful consideration of the keywords selected, and effective coding can transform raw data into more insightful, manageable units for further examination (Naeem *et al.*, 2023, p. 8).

Detailed evidence in the form of quotations from interviews and questionnaires has been presented in this research to offer thick textual descriptions. This is done to demonstrate the trustworthiness of the data and subsequent interpretation (Agius, 2013, p. 205).

3.7.2 Semi-structured interviews

Transcription of the semi-structured interviews was an automated function of recording the interviews in Microsoft Teams. Once the transcripts were downloaded from the Microsoft Teams recording, they were stored as password-protected Word files in a password-protected folder on the cloud, accessible only by the researcher. Transcripts were reviewed for accuracy alongside the video and audio recording, which provided an opportunity to rectify any mistakes in the automated transcription and gave the researcher an initial feel for the data and themes raised. Effective transcription is not about including every detail, but selecting parts relevant to the research objectives, to facilitate a focused and manageable analysis (Naeem *et al.*, 2023, p. 5). As such, not every mistake was corrected, but those relevant to content that would be used in the analysis were addressed.

Saldaña (2011, p. 90) explains that ‘since qualitative research design, fieldwork, and data collection are most often provisional, emergent and evolutionary processes, you reflect on and analyse the data as you gather them and proceed through the project’ while the ‘continued reflection and more systematic data analysis’ takes place in the post fieldwork period. This reflects my experience of the data collection process. I started to build up a picture of emerging themes before the formal analysis of the data had started, which helped me to become familiar with the data. Research has highlighted that doctoral students experience anxiety in the later stages of undertaking qualitative work, due to the growing ‘pile’ of recordings and notes waiting to be transcribed (Gibbs, 2018, p. 18). The transcription was not a difficult component for me, as they were automated, but the size of my data pile was certainly making me feel anxious about approaching the analysis of my work.

Once all transcriptions had been reviewed for accuracy and fully anonymised, they were printed. They were then thematically analysed as described in section 3.7.1. Following the completion of the analysis and discussion, where data had been presented, physical copies were stored in a lockable cabinet, accessible only by the researcher.

Phases one and two of my data collection present a novel contribution to the field of sports therapy education, as it is my understanding that the use of this combination of key stakeholder groups has not previously been used to explore “troublesome” knowledge and threshold concepts within any discipline. A two-phased approach is also unique in this context for evaluating stakeholder perceptions. Whilst threshold concepts and/or “troublesome” knowledge have been identified for some disciplines, attempting to understand potential connections between them is a novel approach.

3.8 Trustworthiness

There are said to be four criteria under the interpretivist paradigm that should be met to achieve a trustworthy investigation. These are: credibility, transferability, dependability, and confirmability (Guba and Lincoln, 1982, p. 246).

Validity in qualitative research refers to how accurately the account represents participants’ realities (Creswell and Miller, 2000, p. 124). Guba and Lincoln (1982, p. 246) argue that ensuring credibility is one of the most important factors in establishing trustworthiness. From a sampling perspective, the credibility and transferability of my data were improved by the breadth of experience covered in the five stakeholder groups. Unlike many investigations, participants of my research were not all from the same institution, representing one experience. This was advantageous and offers insights more likely to be reflective of what the wider sports therapy discipline. This approach is said to provide a more credible and stable view of reality (Shenton, 2004, p. 66).

To ensure the credibility and transferability of my findings, several measures were employed. Firstly, participants were given the opportunity to reflect on what had been said in the semi-structured interviews by intermittent member checking (Birt *et al.*, 2016, p.1802). I did this by reflecting their answers to them and summarising what had been said. Guba and Lincoln consider member checking the single most important provision that can be made to strengthen a study’s credibility (Shenton, 2004, p. 68). In addition to member checking, I was able to

cross-reference the findings with the questionnaire data, performing what is known as triangulation (Johannesson and Perjons, 2014, p. 55). The process of triangulation serves to ensure the confirmability of the data and reduce the investigator bias (Shenton, 2004, p. 72). However, I was only able to do this using two sources of information.

By providing rich descriptions of the data, using participant quotes, I hope to present a comprehensive view of the data, which in turn can improve the dependability of my findings (Creswell and Miller, 2000, p. 129). Additionally, I took a reflexive approach to this process, reflecting on my own experiences and biases throughout, to ensure that these did not affect the data.

Reliability in qualitative research under the interpretivist paradigm refers to undertaking processes that establish the authenticity of the findings (Collis and Hussey, 2014, p. 53). To ensure the processes followed are dependable, I have documented the research processes, including the refinement of questionnaires, how participants were sampled and how data have been analysed. In addition, I used a standardised approach to interviewing, using the same duration and interview structure for all stakeholders.

3.9 Ethical considerations

Ethical approval was granted on 5th May 2023, by University of Gloucestershire's research ethics panel for the School of Education and Humanities (Ref: EDU202325, see Appendix K), The research was designed to ensure it was conducted with integrity throughout, employing the most appropriate methods for the research purpose (Hammersley and Traianou, 2012, pp. 2-3).

Roberts and Allen (2015, p. 98) conducted a review of the ethical use of online surveying in educational research in higher education contexts, identifying it as a setting in which students and/or staff are adults and are engaged with an educational institution of their own volition. It was suggested that ethical issues associated with online surveys in educational research mirror "generic" ethical issues in the use of online surveys, but with an overlay of complexity resulting from the sensitivities of conducting research within educational contexts. It was established that five key ethical issues should be addressed when considering the use of questionnaires in an educational setting: dual teacher/researcher roles; informed voluntary

consent; use of incentives; privacy, anonymity, and confidentiality; and data quality (Roberts and Allen, 2015, p. 95).

The British Educational Research Association Ethical Guidelines for Educational Research stipulate ethical principles including minimising harm, respecting autonomy, protecting privacy, offering reciprocity, and treating people equitably (BERA, 2024, pp 1-39). These principles were embedded in the process of my data collection by ensuring different interests, values, and perspectives were heard.

The methods in this research were designed to ensure that participants came to no physical, psychological, and/or professional harm as a result of participation (Roberts and Allen, 2015, p. 96). This was done by carefully considering the questions of the questionnaire and the guide questions, and the topics of the semi-structured interview. Participants who formed the stakeholder groups were not from vulnerable populations, and the methodologies used were designed not to unearth any sensitive content.

Participants were directed to a privacy statement (see Appendix L), an information sheet (see Appendix M), and accompanying informed consent (see Appendix I) for completion before the study began. The information sheet detailed basic study information, including why participants have been asked to take part and clarified the right to withdraw from the study (including timelines). The information sheet was set as the first page of the online questionnaire, with participants required to check a box to indicate consent before accessing the questionnaire (Mahon, 2014, p. 126). This was done to ensure participants were as fully informed in the online research as in other types of research. The questionnaire was constructed in such a way that would not let the participants continue to the questions until they had read these documents, confirmed their understanding, and consented to participation. Only then could they access and respond to the questionnaire.

Data protection information was outlined in a university privacy statement as part of the initial questionnaire process. Participants were anonymised with an identification code assigning them to a stakeholder identity, and all data was stored in a password-protected file, on a secure cloud, only accessible to the researcher (Roberts and Allen, 2015, p. 100). During semi-structured interviews, participants were reminded of the privacy statement and assured that their data would remain anonymous and confidential as outlined in that document. Receipt

of full informed consent (digital) was also confirmed at that stage, and an opportunity for questions was given.

To ensure there were no issues of reciprocity, educators from my home institution (whom I was line managing at the time) were not invited to participate. Upon leaving the institution, stakeholders at this institution were invited to participate. Similarly, no current students from my home institution were invited to participate in this research, addressing the potential issue of dual teacher/researcher roles outlined by Roberts and Allen (2015, p. 97), where the students' educational needs are at risk of being secondary to the needs of the research. Though not considered a vulnerable population in traditional terms, students may be considered vulnerable when the research is conducted by someone with whom they have an educational relationship, such as a lecturer (Ridley, 2009, p. 537). This validates the decision not to recruit students from my home institution. To prevent students from other institutions from feeling that their responses would have any influence on their studies, a statement was added to the questionnaire to confirm that students understood that their participation would have no influence on grades or module outcomes (Ferguson, Yonge and Myrick, 2004, p. 63).

Privacy was achieved by conducting all interviews in a private office, using headphones at times where participants might have been overheard by offices in proximity (Maldonado-Castellanos and Barrios, 2023, p. 4).

Measures taken to avoid deception included an introduction to the topic area and appropriate examples relating to threshold concepts during the semi-structured interview and by providing full informed consent (Tai, 2012, p. 220). To ensure that the participants had the opportunity to confirm the accuracy of the data, their responses were intermittently reflected back to them. This allowed the opportunity for them to correct what had been heard. Questions posed by participants were answered as honestly and openly as possible, whilst not sharing what other participants had divulged. At the end of each interview, participants were informed of the next steps and the process that their data would undergo. During data collection and storage, anonymity was achieved by allocating an identification number to questionnaires and interview transcripts. This was an automatic function of the JISC survey, but was completed by hand for the semi-structured interview transcripts. Extra care was taken to reassure participants of their privacy and anonymity in the write-up of this research, given that some of the discussions had

the potential to speak of specific higher education institutions (HEIs) and professional bodies in the UK.

During the writing-up process, anonymity was achieved through the allocation of pseudonyms and by retaining the anonymity of associated HEIs, helping to ensure privacy and dignity of individuals could be maintained. Together, these approaches helped to ensure that we were able to have honest and transparent conversations during the interview process and noticeably put participants at ease. As noted by Collis and Hussey (2013, p. 33), this approach encourages greater freedom of expression and more open responses. In addition to the allocated pseudonym, stakeholders were given a code to identify their stakeholder group. This means that the reader can more easily appreciate the stakeholder perspective in the context of their role.

3.10 Summary

In summary, this research follows an interpretivist paradigm, employing a survey strategy, using mixed methods to collect qualitative data. Using questionnaires and semi-structured interviews, this research has addressed the following objectives:

- To explore stakeholders' perceptions of troublesome knowledge in sports therapy education.
- To identify troublesome knowledge and thresholds in sports therapy education.
- To explore the nature and categorisation of troublesome knowledge and thresholds.
- To provide recommendations for sports therapy educators.

Chapter 4.0 Analysis and Discussion

4.1 Introduction

This chapter begins with an analysis of the questionnaire and interview engagement data, representation statistics, and descriptive analysis of the stakeholder groups to help contextualise the findings. Codes and themes generated during the analysis of this work are presented in Appendix J. This chapter is organised into the following sections to address the research objectives: To explore stakeholders' perceptions of troublesome knowledge; identify troublesome knowledge and threshold concepts for sports therapy; explore the nature and categorisation of troublesome knowledge and threshold; and to provide recommendations for sports therapy educators. The sections are as follows: 4.3 Exploring stakeholder perspectives, 4.4 Identifying thresholds, and 4.5 Implications for educators. Included in these sections are themes which emerged from the analysis of the surveys and interview transcripts, discussed using anonymised quotes for illustrative purposes. Outside of these themes, insights into differences in perceptions and barriers to learning are offered. Findings from the questionnaire and the semi-structured interviews have been woven together to form the analysis and discussion chapter. The analysis and discussion have been presented in this way to keep the narrative engaging and prevent the reader from needing to switch between data and separate interpretation sections. This approach ensures that each piece of analysis is immediately contextualised, maintaining good clarity and flow, helping the reader to follow the argument and more easily see the connections between the evidence and my interpretation. In this chapter, I will argue that uncertainty, "connecting the dots," and professionalism are "troublesome" concepts in sports therapy education; I will then present five thresholds for learning and propose the idea of "threshold mindsets."

The main purpose of this chapter is to combine my findings and the existing literature to provide a robust justification for recommendations made in the concluding chapter. The chapter finishes with a set of researchers' insights touching on some of the lesser acknowledged themes.

4.2 Engagement statistics

A total of forty-six professionally accredited, undergraduate training programmes for sports therapy education in the UK were eligible to take part in this investigation (see Appendix B).

Results included educator representation from 41% of Society of Sports Therapists (SST) accredited programmes and 30% of British Association of Sport Rehabilitators (BASRaT) accredited programmes.

A total of fifty-six questionnaire responses were received (see Table 4.1). Responses to the questionnaires demonstrated good engagement from three of the core stakeholder groups, these being: educators, nearly and newly graduated therapists and educator practitioners. Engagement from industry professionals and professional body (PSRB) representatives was lower, with the latter as expected due to the size of this population. There are two leading professional bodies for sports therapy and rehabilitation in the UK: The Society of Sports Therapists (SST) and The British Association of Sport Rehabilitators (BASRaT). These are relatively small organisations with mostly voluntary directorship roles. Several professionals hold dual roles in industry and education, and therefore were allocated to the educator-practitioner group. The rationale for placing them in this stakeholder group was to reflect the position of educator-practitioners and to ensure their perspectives were included in this work.

Table 4.1 Shows the number of participants as a total and a percentage of stakeholder representation in questionnaire responses.

Stakeholder Groups	Number of Participants
Educators	16 (29%)
Nearly and newly graduated (<1 year)	15 (27%)
Educator-practitioners	14 (25%)
Industry professionals	6 (11%)
Professional statutory regulatory body representatives	5 (9%)

Thirty-two participants took part in one-to-one semi-structured interviews (see Table 4.2). Fewer participants engaged with the interviews in comparison to the questionnaire; this was expected given the time commitment associated with the one-to-one interviews. Nearly and newly graduated therapists appeared less willing to engage with this opportunity to share their views, but began responding well to the modified questionnaire (see Chapter 3, p. 54).

Table 4.2 Shows the number of participants as a total and a percentage of stakeholder representation in semi-structured interviews.

Stakeholder Groups	Number of Participants
Educators	10 (31%)
Nearly and newly graduated (<1 year)	3 (9%)
Educator-practitioners	10 (31%)
Industry professionals	5 (16%)
Professional statutory regulatory body representatives	4 (13%)

Throughout the discussion, participants have been allocated pseudonyms to retain their anonymity. Pseudonyms and associated stakeholder positions have been grouped (see Table 4.3), and only those included in the discussion of findings are represented for illustrative purposes. Throughout the analysis and discussion, the use of italics has been reserved for participant quotes from my research to distinguish them from existing literature.

Table 4.3 Presents the anonymised participants and stakeholder group allocations.

Educator (Ed)	Nearly and Newly Graduated (Gr)	Educator Practitioners (EP)	Industry Professionals (IP)	PSRB Representative (Rp)
Dione	Carmel	Kamil	Amy	Hannah
Lucy	India	Kathryn	Charlie	Mathew
Eric	Emma	Jamie	Carlos	Shabir
Patrick	Gemma	Max	Johannes	Ranvir
Davide	Ahmed	Janine	Clarke	Giuseppe
Assan	Craig	Cohen	Tanita	
Karim	Orla	Seren		
Nic	Beatriz			
	Jude			
	Puja			

4.3 Exploring stakeholder perspectives.

In this section, I present the stakeholder perspectives related to what is troublesome in sports therapy, using the following themes: variability and uncertainty, connecting the dots, and professionalism and professional identity. The issue of authenticity appeared at every turn of the research and so is woven amongst these three core themes.

4.3.1 What is troublesome and why?

Authors rarely explicitly address all five characteristics of threshold concepts when endeavouring to identify them. However, it is proposed that consideration of all the characteristics may facilitate a more comprehensive and nuanced understanding of student learning (Barradell and Peseta, 2017, p. 368). As such, a mindful approach was taken when interpreting the findings from the questionnaires and interview transcripts. In practice, this included referring to the characteristics and noting where evidence of “transformational”, “troublesome”, “irreversible”, “integrative” or “bounded” concepts was mentioned by participants. To determine which aspects stakeholders perceive as “troublesome,” evidence was sought of students encountering difficulties with concepts or experiencing liminality (Meyer and Land, 2005, p. 377). An illustrative example of this is provided by Ranvir (Rp), a representative of a professional body.

Ranvir (Rp): *As soon as you start to push them [students] a little bit more, they feel uncomfortable because you are introducing new topics and new concepts, and a lot more terminology. It's that bit that they find unsettling because what they were comfortable with, they realise it's not what they thought it was.*

Ranvir's (Rp) use of the terms ‘*uncomfortable*’ and ‘*unsettling*’ is likely an indicator of the “troublesome” characteristic of threshold concepts being present. Interestingly, Ranvir (Rp) is referring to the learning of new topics and concepts as being “troublesome”, but much of the uncertainty associated with mastering a threshold concept occurs whilst the learner is traversing the liminal space (Cousin, 2009, p. 204). In this liminal space, the learning is typically no longer new but is something that the learners could have been grappling with for a considerable time.

Interview data revealed that many stakeholders recognise the concept of uncertainty as being “troublesome” and, in the case of the nearly and newly graduated therapists, something for

which they were unprepared. Evidence of students finding the concept of uncertainty “troublesome” is seen in the responses of all stakeholder groups. When talking about their own experience of being a newly qualified practitioner, educator Dione (Ed) recalled moments of feeling ill-equipped, but that the realisation that things are uncertain was itself “transformational”.

Dione (Ed): *I thought I was out of my depth and kind of lost, if that makes sense, because I wasn't having a clear answer...But we can't be certain about anything, and there are so many things going on, and it's not always tissue-related, it's a lot more biopsychosocial... so I guess that was my transformation.*

Although Dione's (Ed) recollection of feelings relates to being a newly qualified practitioner, the realisation is likely informed by the fact that they are now an educator with more experience. This equips educators like Dione (Ed) with a unique perspective of having seen many students make these transitions through liminal spaces, and it might be that the notion of uncertainty and, as they explained, of '*...so many things going on...*' is a perspective only seen, having had that experience. This point of view offers a contrasting perspective to existing literature, which has previously suggested that experts can find it hard to recall moments of transformation or threshold concepts (Meyer and Land, 2003, p. 5). This contrast in perspectives is likely because these practitioners are in an educational context and see students go through these conceptual gateways regularly. Whereas, it is likely that experts who are working in the professional environment are less exposed to seeing the transformations of students.

4.3.1.1 Theme 1: Variability and Uncertainty

In this section, I contend that uncertainty is both “troublesome” and “transformational”, shaped by the inherent variability and ambiguity within the discipline of sports therapy. The first and perhaps most prominent concept that stakeholders found “troublesome” was the notion that this discipline is ‘grey’ and uncertain. Uncertainty can be defined as pertaining to something that is not known, not reliable, or not definite, but can extend conceptually to any complex or unfamiliar situation (Hancock *et al.*, 2014, p. 114). Variability and uncertainty are “bounded” in the unique context of the ‘athlete as patient’ within the sports therapy discipline, arising from individual differences presented from one patient to another. This variability relates to an

athlete's physical presentation of symptoms and also to the interpretation and communication of the condition; all of which have been associated with the 'troublesome' nature of clinical reasoning (Wilson-Thain and Hammond, 2023, p. 192), a core skill for practitioners. It is this variability that contributes to the uncertainty students face in much of their learning.

Questionnaire responses from nearly and newly graduated therapists associated the struggle with variability with the need to accept or overcome uncertainty, while also experiencing a lack of confidence. References to experiences such as a lack of confidence or the presence of fear are indicative of the "troublesome" nature of threshold concepts and the experience of occupying the liminal space (Rattray, 2016, p. 67). Language such as '*...don't want to sound like you don't know...*' and '*...made me feel unconfident and probably affected my presentation and abilities*' is evidence of this in the graduate responses of Gemma (Gr), Craig (Gr) and Ahmed (Gr).

Gemma (Gr): *You have all these possibilities and theories in your head of what might be wrong, and sometimes the issues are vague and hard to figure out; you also don't want to sound like you don't know what you are talking about.*

Craig (Gr): *...the sheer number of possible conditions that need to be known, and then the applicable tests to narrow it down. The most challenging thing was not being able to 100% know if the diagnosis is correct or if the symptoms do not match. It made me feel stupid, which in turn made me feel unconfident and probably affected my presentation and abilities.*

Ahmed (Gr): *The main thing to overcome is that each patient is different, meaning that there is no set procedure to follow when rehabilitating...*

This data suggests that the variability seen within the sports therapy discipline is a key factor in what students might experience as "troublesome". Each of these stakeholders is referring to the variability in the discipline, but is coming from slightly different perspectives. The language used by Gemma (Gr) and Craig (Gr) puts emphasis on content and knowledge, noting that there are '*...all these possibilities...*' and '*...number of possible conditions.*' However, Ahmed (Gr) alludes to the notion of person-centred care by acknowledging that everyone is different and will therefore respond in different ways. Both sets of views are meaningful, but Ahmed's (Gr) appears to demonstrate thinking that is more developed than Craig's (Gr) and Gemma's

(Gr). Ahmed (Gr) could be described as having undergone a transformation, as Ahmed (Gr) now appears to demonstrate an acceptance of uncertainty.

My data suggests that there should be an awareness and acceptance that, from a treatment perspective, individuals will respond differently despite presenting with the same injury and may also respond in unexpected ways, as outlined by graduates.

Emma (Gr): *Understanding that patients are not always going to have the “textbook” symptoms of an injury, for example, then having to navigate your way around this based on clinical presentation to devise an appropriate course of treatment and rehabilitation. Not only does this take physical presentation into account, but also having to appreciate that every patient responds differently, physically and psychologically, to different approaches that a sports therapist may adopt – it is not a “one size fits all” approach...*

Like Ahmed (Gr), Emma (Gr) demonstrates an acceptance of uncertainty and an awareness of the importance of person-centred approaches, emphasising the importance of the ability to accept or tolerate uncertainty. A student's ability to cope with uncertainty or ambiguity has been defined as the way they perceive and process information about ambiguous situations or stimuli when confronted by unfamiliar, complex, or contrasting indications (Furnham and Ribchester, 1995, p. 179). Variability and the associated influence of unique contextual factors over clinical decision-making mean that learners can and will be faced with uncertainty: a 'grey area' (Wilson-Thain and Hammond, 2023, p. 192). Emma (Gr) uses the phrase '*...having to navigate your way around this...*' in the context of facing variability in patient presentation and providing an appropriate course of treatment. This describes the action or skill of clinical reasoning and, specifically, therapeutic reasoning as opposed to diagnostic reasoning (McBee *et al.*, 2017, p. 2). This is evidence that embracing the variability and uncertainty of patient cases is a critical skill within the sports therapy profession and yet therapists can often become stuck trying to find an answer or specific diagnosis, looking to label a set of symptoms. Accepting that each patient can present differently is essential, but also being able to progress clinically without an exact diagnosis, exercising therapeutic reasoning, is important (McBee *et al.*, 2017, p. 2). In the classroom, this will require a harder shift to focusing on what the patient's limitations are and the available treatment options, rather than working to label the condition. For example, a patient has a limited range of motion through shoulder flexion, rather

than the patient is suffering from a deltoid strain. Graduate Gemma (Gr) proposes that a sense of pragmatism and openness is essential in facilitating the acceptance of uncertainty.

Gemma (Gr): *You need to have an open mind, even if something presents similar to something you have seen before, don't just assume the problem and the way you treat will be the exact same, a lot of the time, what works for one patient may not work for another.*

Here, Gemma (Gr) is showing a maturity in their practice, understanding that practitioners might need to be flexible in their thinking or creative in how they approach problems, even if on the surface, the problems seem the same. This echoes what Cristancho *et al.* (2017, p. 2) describe as the need for clinicians to continuously reconstruct and redefine their understanding of ill-defined problems even as they are trying to solve them. This requires creative problem solving in the face of complex and uncertain clinical situations, an essential component of clinical expertise (Ilgen *et al.*, 2019, p. 798).

The nearly and newly graduated stakeholder group are proposing a set of preparatory needs or expectations. Practitioners need to have an awareness that the discipline is 'grey,' and they need to know that there is much variability in the context of individual differences, and they require creative problem-solving skills to be responsive to these challenges. While there might be a temptation to predominantly teach within the "greyness" of the discipline, for example, using clinical scenarios that remain unanswered or have no discernible outcome or diagnosis, there were some concerns from educators that this could be detrimental.

Kamil (EP): *They [students] are going to have to deal with the grey as a graduate, so I don't think that reducing it down into black and white is safe, but in making them feel like they can reduce it down enough to understand, it is really important from a confidence perspective.*

Conversely, while educators need to prepare students for the variability and uncertainty of sports therapy, presenting everything in this way is likely to have a negative impact on student confidence. Teaching all sports therapy content with the caveat: '...but it will be different for everyone...' or 'we don't know what the outcome will be...it depends,' is likely to be destabilising for students and even more so for those who may be outcome-focused. This is not helped by students finding themselves in modules that have been designed in such a way

that the assessment is based on certainty and having the right answer (Geisler and Lazenby, 2009, p. 54). This is explored further in a later section.

There needs to be some level of certainty and procedure to allow students to find their way to some answers, so the textbook presentations of things are not entirely redundant. This aligns with the idea that while an entirely mechanistic approach to clinical practice is not appropriate (Long, Hobbs and Devenish, 2018, p. 2), elements of it may provide a solid grounding for foundational skills and act as a clinical safety net for students. In contrast, Betinol, Murphy and Regehr (2023, p. 145) present a more fluid idea of expertise development identified by variable perspectives from participants. For example, some participants described the importance of standardisation of care and predictable outcomes of treatment or knowing all the answers, while others saw expertise as having to constantly adapt to situations. The same variation in views was not seen in this investigation. Rather, all stakeholder groups recognised problem-solving and using adaptive expertise as integral to sports therapy practice. This difference in perceptions seen between my data and the previous literature was likely seen because healthcare concepts such as 'standardisation of care' and 'predictable outcomes of treatment' may be more important for measuring or evaluating healthcare profession standards and outcome metrics, where the focus is on illness or disease. In contrast, sports therapy relates to musculoskeletal injury and not medical conditions. There is also no official monitoring of standards of care and patient outcomes as seen in the NHS outcomes framework (NHS Digital, 2025).

Preparing students for uncertainty was something that all stakeholders agreed was necessary, but that is not presently sufficient in sports therapy education, as outlined by educator-practitioner Kathryn (EP).

Kathryn (EP): *I'm going to be very controversial here...I don't think we do prepare students well enough for the grey. I think we try...I think as an educator, we try to keep things really simple because we very much have that attitude, we need them to be safe practitioners when they leave the university (which I wholeheartedly agree with).*

Kathryn (EP) raises a tension here between traditional competency-based assessment to ensure practitioners are 'safe' and preparing them for the realities of the real-world; the 'grey' areas. There is a sense here that '*...keeping things simple...*,' keeps things 'safe' in terms of

practice. Kathryn (EP) has also chosen to be specific in thoughts about the educational offering and the shortfalls that exist in preparing practitioners for the “variability,” “uncertainty” and “greyness” of this profession. Kathryn (EP) expresses that the views shared are ‘...very *controversial*...’, but this was a shared view. The majority of stakeholders agreed that practitioners are underprepared for real-world practice. Perhaps this has become a bit of a taboo topic, where no one is talking about it because everyone thinks it might be controversial, likely for reasons beyond the scope of this work. This is the first time this discipline has been able to pull together this collective view on the matter. Kathryn (EP) continues:

Kathryn (EP): *...I also think we almost set students up for failure when they leave because we haven’t talked enough about the fact there are so many grey areas. Everybody you meet will be different, and you can see two exactly the same injuries in the same sex and age group and same sports, but you are going to treat those two people in completely different ways.*

What Kathryn raises here is the idea of person-centred care aligning with the previous perspectives provided by nearly and newly graduated therapists. Although Kathryn (EP) has not used the phrase ‘person-centred’, the language adopted reflects the consideration of individual context and the philosophical approach to treatment that enables the practitioner to consider factors beyond those which are purely biomedical. In the context of sports therapy, this is something that we have not seen evidence of in the literature before. Examples of evidence that therapists need to adapt, think creatively and critically can be seen in the responses of stakeholders Davide (Ed) and Orla (Gr).

Davide (Ed): *Given that people/patients may well not present exactly as a practitioner was taught, the ability to contextualise and think critically, applying fundamental principles to adapt potential conclusions to the most probable diagnosis whilst simultaneously avoiding gamblers fallacy, sunk cost fallacy or anchoring bias is a troublesome component to develop in others and yourself.*

Davide (Ed) offers an educator’s perspective on how to face the challenge of uncertainty and is utilising the terminology that might be seen on an assessment rubric, asking if students are contextualising, thinking critically and ‘*applying fundamental principles*’, to adapt conclusions. Davide’s (Ed) perspective recognises that these are “troublesome” skills to learn, but also to teach. This echoes the thought that an educator’s role in the learning process continuously

exposes them to new uncertainties and opportunities to think about teaching in new ways, which could be “transformational” for both students and educators (Neve, Wearn and Collett, 2016, p. 851). The nearly and newly graduated therapist's perspective is somewhat different, though they agree with the underlying message that practitioners need to adapt.

Orla (Gr): *...it can be tricky if you are still unsure of an accurate diagnosis. It might mean you have to cut down certain aspects of your assessment to find out the relevant information. This is something that university does not teach you because once you get into the real-world application, you have to figure it out for yourself and won't have teachers to help you anymore.*

Orla's (Gr) perspective appears to focus more on the realities of practice, for example, Orla (Gr) mentions '*...cutting down certain aspects of your assessment...*', illustrating how a practitioner might need to adapt their approach in the moment. I notice that the language used here does not reflect that of an assessment grid but of real-life experience and a sense of independence, perhaps not previously experienced. Orla's (Gr) perspective mirrors what Ilgen *et al.* (2019, p. 800) describe in medicine:

Clinicians can comfortably adopt a pragmatic treatment-oriented categorisation of illness, grouping a subset of possible diagnoses in ways that allow them to confidently initiate...while remaining uncertain about the actual diagnosis. In these situations, perfect certainty regarding diagnosis is not a goal...Instead, clinicians monitor their patients' progress to ensure they are indeed achieving the anticipated outcomes and pivot towards further evaluation or a change in management if the illness progression deviates from the anticipated path.

Ilgen *et al.* (2019, p. 800) refer to a sense of pragmatism that we have seen stakeholders' reference previously and the ability to pivot towards different options, attributes of “adaptive expertise”. Mylopoulos (2020, p. 11) emphasises that education for adaptive expertise requires students to acquire procedural fluency and conceptual understanding for effective practice and problem-solving. This emphasises the importance and balance of procedural clinical competency and conceptual understanding required in sports therapy education.

Though variability itself can be perceived as problematic for students, it is the student's ability to cope with variability and departure from the textbook presentation that appears to be critical

for success, as outlined by Wilson-Thain and Hammond (2023, p. 192). Operating in 'grey' areas is an essential part of medicine, and clinicians need to develop the skills to cope and adapt to this (Ladher, 2019, p. 1). In a scoping review by Jones and Hammond (2023, p. 987) looking at threshold concepts in medical education, emerging themes included: uncertainty; care of patients, and professional identity. Other "troublesome" concepts included practical skills, clinical judgement, decision making, tolerance of uncertainty and person-centredness. My data has, for the first time in the field of sports therapy, unearthed evidence of uncertainty, tolerance of uncertainty, and person-centred care being crucial but "troublesome" components of learning to become a sports therapist.

As discussed, nearly and newly graduated therapists' perceptions often alluded to being unprepared for practice in the industry, specifically highlighting a gap in sports therapy curriculum in preparing students for coping with uncertainty. These perceptions were echoed by other stakeholder groups, and some of the contributing factors will be discussed in later sections. Remaining with the theme of uncertainty and feeling underprepared, fear of failure was a strong theme among the stakeholder groups. My findings show that in sports therapy, these feelings are often associated with fear of not knowing, fear of getting things wrong and fear of hurting the patient. This could be seen as a barrier to learning, but those who described it tended to talk about it in the context of confidence to do things, which seemed to be rooted in the acceptance of uncertainty, as described by graduates.

Gemma (Gr): *You have all these possibilities and theories in your head of what might be wrong, and sometimes, if the issues are vague and hard to figure out, you also don't want to sound like you don't know what you are talking about.*

Beatriz (Gr): *I feel that confidence, or lack of, would hold me back because I would worry so much that everything I did had to be "perfect" as opposed to accepting early on that we only learn to become better therapists when we build up certain amount of experience and exposure to a plethora of clients, injuries and mechanisms of injuries. I feel like I was my own worst enemy sometimes, and I really wish I'd noticed that sooner.*

Graduates' fear of 'doing the wrong thing' seemed to be a factor that dissolved over time in practice and through exposure to clinical cases and success. Kathryn (EP) described time in placement as being pivotal to overcoming these fears in the context of rehabilitation.

Kathryn (EP): *I realised how much I didn't know and how basic my knowledge was, and fearful of trying new things and fearful of hurting someone...*

Kathryn (EP) is an educator practitioner with considerable clinical experience. Here, Kathryn (EP) reflects upon their experience as a newly graduated therapist and highlights the same sense of fear and lack of knowledge that more recent graduates have presented. Kathryn (EP) went on to explain how these fears continued from the final year of study into post-graduation.

Kathryn (EP): *I can't remember why, I just couldn't get my head round it [rehab], loading is probably what I would say, in the early stage ...probably third year and a couple of years after I graduated, I was chronically underloading because I was frightened, whereas now I will push people to the very edge and be confident doing that because I know generally the outcomes will be far better...but in the early stages...a real fear that I was going to really hurt someone.*

Kathryn's (EP) recollections of finding something “troublesome” and the associated ‘fear of failure’ related to the skill of clinical reasoning, specifically, deciding on the loading suitable for injuries, which is likely connected to the complexity of cases and the multiple factors requiring consideration and integration as part of the rehabilitation process. Rehabilitation is a common topic raised amongst the stakeholder groups. It is the place where conceptual and practical knowledge needs to come together, including the context, the needs of the individual, the tissue types, and the requirements of the sport or activity you intend to return the athlete to (Brukner and Khan, 2017, p. 286). Rehabilitation is complex and likely something that can only be developed through exposure, as evidenced by what Kathryn (EP) said next.

Kathryn (EP): *I don't know where that fear came from...probably lack of knowledge...I wasn't exposed to it [pushing people to the limit] at university, I was on my placement, so I think probably my learning experience for rehab was because of them and the way they supervised me, which I will be forever grateful.*

Recognition of this aspect of uncertainty (fear of failure) was made by educators and professional body representatives. Mathew (Rp) expressed the destabilising nature of these new learning encounters.

Mathew (Rp): *...they're [students] scared of doing something wrong or missing something and they're so used to being and receiving scaffolded support and guidance that when they have to*

take the reins, it can be very destabilising. It's threatening to their reality on some sort of level, and that additional cognitive and affective stress makes it even harder for them to think clearly about this...it's active and energy-consuming. They're listening to a patient and sometimes barely able to write the notes, let alone think about the next questions or sub-question is or might mean; I think that's very threatening to them.

This is evidence that failing is an unfavourable, anxious, tough experience, generating a sense of fear that has an impact on one's performance, as described by Choi (2020, p. 401).

Learning to identify and manage uncertainty requires a complex set of skills and understandings (Neve, 2019, p. 7). The findings from my research point towards helping students to be 'okay' with uncertainty and not to fear the unknown. It has been highlighted that clinical reasoning models often emphasise having a diagnosis, which can lead students to think that 'not knowing' prevents action, while 'knowing' justifies certainty in decision making (Ilgen *et al.*, 2019, p. 804) suggesting that students need more emphasis on embracing uncertainty and adapting accordingly. Success in problem solving might also rely on a student's ability to integrate their knowledge and draw on multiple areas, such as biomechanics and physiology, for other ideas, a skill that is essential for clinical reasoning (Wilson-Thain and Hammond, 2023, p. 195). This is another theme that has been identified as "troublesome" within my research.

4.3.1.2 Theme 2: Connecting the dots

The second theme identified within the data relates to the skill of integrating knowledge, pulling things together from different modules and experiences to undertake effective clinical reasoning. I have termed this "connecting the dots."

Clinical reasoning is the ability to sort through a number of features presented by a patient to develop an appropriate treatment strategy (Eva, 2004, p. 98). To do this effectively, practitioners need to integrate knowledge with the contextual factors of the individual situation and arrive at an adaptive solution (Koufidis *et al.*, 2020, p. 445). "Connecting the dots" is "troublesome" because students need to acquire the foundational concepts that require integration before they can connect them. Once acquired, students need to be able to think about concepts in a different way (Meyer and Land, 2003, p. 8). This is what represents the transformation, the redefined perspective. Of note is the idea that integration is a characteristic

of threshold concepts (Meyer and Land, 2003, p. 1), and in sports therapy (and other allied health professions), the skill of integration or “connecting the dots” is itself “troublesome”. So, to achieve a threshold concept, a practitioner must be able to connect the dots, but “connecting the dots” can be challenging for students.

The sports therapy profession and many other allied health professions are uncertain by their very nature, given the individualised variability of each clinical case, signs, symptoms and presentation. For that reason, it follows that this theme would emerge from the stakeholder data and align with the previous findings from medicine, for example. It is interesting to see how students and educators have identified the challenge of integrating knowledge with contextual factors, as outlined by educator practitioner Jamie (EP).

Jamie (EP): *Students find it near impossible to draw everything together to apply in a clinical setting. Unless this is done throughout their studies, I think it is hard to apply at a later stage.*

The suggestion from Jamie (EP) is not only that “connecting the dots” is difficult, but also that it can become more difficult if not practised. Later, I discuss the importance of authentic experiences for students. What is not being said by Jamie (EP) is that students are finding it ‘*near impossible*’ because they are not getting enough exposure, consistently throughout their studies, to promote mastery of this skill. As a clinical supervisor, Jamie (EP) will have noticed a student’s difficulty in “connecting the dots” in a clinical setting. Those in educator roles alone may not be seeing the same challenges, as there are fewer, if any, opportunities to see the students working in an authentic environment. While my findings align with those from medical education (Koufidis *et al.*, 2020, p. 445), they are the first to emerge in the sports therapy discipline. Another stakeholder group that provided evidence of this theme were the nearly and newly graduated therapists.

Gemma (Gr): *For me, the most difficult thing is trying to apply all the knowledge you have learnt over the three years, especially when dealing with a patient, trying to think of absolutely everything in a short space of time when in front of a patient, not being able to come up with answer can be very stressful.*

The impression from Gemma (Gr) is that there is either too much content or a lot of content to juggle, and that the skill of sorting through the information effectively, to help make decisions,

has not been fully embedded. There might be several reasons that this would be the case, but certainly the structure and volume of the curriculum come to light in the interview data.

Previous research has established that prescriptive models of delivery underestimate the importance of authentic clinical experiences in the acquisition of expertise (Marcum, 2012, p. 960). However, evidence from my research suggests that sports therapy curriculum continues to be prescriptive as shown in the responses of educators, educator practitioners, industry professionals and PSRB representatives.

Patrick (Ed): *You can only clinically reason when you have the content to reason with. Typically, sports therapy courses are prescriptive in their approach, requiring the student to replicate techniques in assessment. E.g. conduct an E&A of the ankle. This requires the student to work systematically through active range of motion, active range of motion with overpressure, passive range of motion, strength, etc, much like a recipe. In my experience, some courses limit true clinical reasoning to the latter stages of the course and therefore, graduates can often struggle upon graduation. It is troublesome owing to the limited exposure.*

This educator's concern about the lack of exposure to authentic environments reflects the data from the educator practitioners and the nearly and newly graduated groups. Patrick (Ed) also notes factors that may contribute to the "troublesome" nature of "connecting the dots", such as curriculum structure. Patrick (Ed) specifically mentions courses leaving opportunities to clinically reason to the later stages of a programme, and content being delivered in a prescriptive way. These findings confirm what the literature suggests regarding a practitioner's ability to solve clinical problems by integrating knowledge. When curriculum is structured according to the aetiology of diseases or on organ systems, rather than integrated, the knowledge is stored in a way that is difficult to access when needing to solve clinical problems (Pinnock and Welch, 2014, p. 254). This could be the very reason that students are struggling with their clinical reasoning; it is not being helped by the current mode of delivery. An early focus on developing strategies to manage clinical scenarios rather than focus on memorisation of protocols or 'recipes' as stakeholders put it, is likely what the discipline needs to move towards support of the development of this 'troublesome' skill (Gormley and Fenwick, 2016, p. 138). Further evidence that the curriculum design may be impeding students' ability to effectively reason or acquire this "troublesome" skill of "connecting the dots" was seen in

nearly all the educator responses. Clear examples of students grappling with the idea of integrating concepts and pulling necessary ideas together, connected to the way curriculum is structured, were seen in the responses of Eric (Ed), Jamie (EP) and Patrick (Ed).

Eric (Ed): *Students struggle with the ability to draw on concepts across modules to understand the holistic nature of what a therapist is required to do. I think because of the way education is set up...our curriculum is often developed in a way that doesn't necessarily facilitate more of that interconnectedness.*

Jamie (EP): *I feel like modules now, particularly in our institution, they're so separate, and I feel like it's wrong. I was speaking to XXX who I work with really closely and said I don't even know what you teach. It's so separate and in the same year...it doesn't seem to work.*

Patrick (Ed): *In answer to why I think it's troublesome, I think it's how we teach it, and I think we've set them up on processes with recipes...I don't think we've set up courses to do clinical reasoning from the outset.*

These experienced educators come from three different higher education institutions, but their perceptions are the same: something in the design and/or delivery of education for sports therapists is problematic. The curriculum does not appear to be supporting students in learning the “troublesome” skill of “connecting the dots”, something that is vital for effective clinical reasoning. Content is separate, siloed and too prescriptive. Findings from the educator groups reflect what Geisler and Lazenby (2009, p. 54) describe as a ‘top-down’ scenario in which athletic therapy students are taught to perform predetermined evaluations that include almost every plausible history question, manual muscle tests, and special tests relevant in an attempt to come up with a plausible impression or diagnosis. In this scenario, students are not supported to engage in critical inquiry or making connections between content; instead, they rely on memory. Students taught in this way get lost during the process of the evaluation and struggle to arrive at a rationale and scientifically sound impression (Geisler and Lazenby, 2009, p. 54). This foregrounds the importance of looking carefully, not just at what we teach but how we teach it in sports therapy.

While the nearly and newly graduated therapist group identified the skill of “connecting the dots” as being “troublesome” and something they were either not taught or felt prepared for,

they did not make the connection between curriculum design and delivery, and the “troublesomeness” experienced. This is because they are unlikely to see this as the problem, for reasons beyond the scope of this work, such as power dynamics, students may feel unable to question such things (Ferguson, Yonge and Myrick, 2004, p. 56).

In addition to how modules are set up hindering the development of students' ability to connect the dots, the volume of content for both educators and students to contend with in the curriculum is high and may pose challenges or contribute to the “troublesome” nature of this skill. As indicated previously by graduate Gemma (Gr), maybe there is too much or at least, a lot to manage. This problem is not unique to sports therapy, as highlighted by Amin (2019, p. 176), who suggests that ‘information overload, due to the enthusiasm of curriculum developers for covering everything’, is a problem within medicine also. This is mirrored in the nursing literature, described as a ‘plague of content overload’ (Mitchell and Kramer, 2023, p. 2). One of the nearly graduated stakeholders presented a good example of volume and uncertainty combined, and the associated impact on the confidence of students.

Craig (Gr): *...the sheer number of possible conditions that need to be known, and then the applicable tests to narrow it down. The most challenging thing was not being able to 100% know if the diagnosis is correct or if the symptoms do not match. It made me feel stupid, which in turn made me feel unconfident and probably affected my presentation and abilities.*

There is an additional observation worth noting here: the indication of not having accepted uncertainty or being comfortable in lieu of diagnosis, which, for context, is far less problematic in sports therapy compared to medicine or nursing, where a diagnosis of an illness could be time-critical and potentially life-threatening. Notwithstanding, sports therapists need to be able to accurately identify red flags and contraindications to treatment as a priority.

Stakeholders alluded to extensive content within the curriculum, which has the potential to be a barrier to learning if there is ‘content overload’ (Mitchell and Kramer, 2023, p. 2). Volume of content may be seen as something influenced by the requirements of the professional body. An alternative viewpoint shared by a professional body representative related to the complexity of the content being delivered and questioned the educators’ influence in this.

Shabir (Rp): *Quite often, I think people in education try to make things too complicated and too hard. It's about understanding what the real kind of fundamentals of knowledge are, as opposed to spending so much time on particular things at a particular point... For the majority of people, that's not going to work. I don't think educators have always picked out the really important stuff, and I think that's the challenge for a lot of educators...they are bogged down in all the technical volume but don't really understand the context of it themselves necessarily or the importance of it.*

Three things that stand out from this data are: the sense that educators try to overcomplicate things, are not focusing on the most important aspects, and may not understand the context themselves. What Shabir (Rp) is insinuating here echoes what Amin (2019, p. 176) described as enthusiastic curriculum developers causing information overload by attempting to cover everything. However, it is unclear whether this relates to how educators have interpreted things like professional competencies or frameworks provided by the PSRBs, or if this represents something about their knowledge. The presence of extensive content could be because of what the teacher wants to include, rather than what the student needs to know to become a successful graduate, as suggested by Barradell (2013, p. 268). I would think this is unlikely to be the case based on the previous data from my research highlighting the prescriptive nature of the teaching seen in sports therapy.

Approaches to teaching could be influenced by educator experience, if, as Barradell (2013, p. 268) suggests, those with teaching and learning knowledge and experience are often experts in their discipline but may well be novices in pedagogical theory. This idea remains current as highlighted by Correia *et al.* (2024, p. 27), who propose that the role of university educators is pivotal in navigating the dynamic nature of contemporary knowledge; however, many lack specific pedagogical training, which can present a barrier to effectively addressing the evolving needs of learners. None of the educators or educator practitioners who took part in this investigation were novice practitioners. That is not to say that they are not novices in best pedagogical practice.

It is insightful that the educators tended to apportion blame with the professional body for the overcrowded curriculum, and the professional body representative placed some blame on the educators' inability to keep things simple. Shabir (Rp) mentions '*...technical volume...*,' but the

likelihood is that educators feel that '*technical volume*' comes top down from the professional body. There is clearly some disagreement here amongst these stakeholder groups, though the size of the PSRB representative group is far smaller and therefore may not represent the full picture.

Something that appears to be contributing to the "troublesome" nature of "connecting the dots" comes from the students' concern with the assessment of a module rather than the integration between content and the wider learning opportunity. Evidence of an outcome focus was clear within the responses of the educators.

Karim (Ed): *...They [students] really struggle, this is actually something they massively struggle with, regardless of year. Even in the third year! They very much want it to be black and white and feel the need for it to be black and white just to help them in terms of their understanding. They're very much assessment-led, it's like what do I need to do for this assessment...tunnel visioned in that sense... There's this whole focus on assessments and grades, and outcomes as opposed to learning it for the sake of being interested in it.*

Karim (Ed) makes mention of two combined issues here. First, the issue of uncertainty being "troublesome" for students, confirming previously discussed findings. Secondly, Karim (Ed) mentions that students are assessment-led, not seeing the assessment itself as a learning opportunity and not learning for the sake of being interested. It is beyond the scope of this research to explore, but it is worth referring to the UK education system and student preparation for university. If students are coming to university from a context which has been performance and exams driven for SATs, GCSEs, and A-levels, for example, then it follows that this mentality would carry through into higher education.

I have previously raised the issue of students not experiencing authentic experiences that will prepare them for the real world, as evidenced by the findings of my research. Patrick (Ed) suggests that students are not thinking about life, but they are unlikely to if the modules we design and the content we teach use inauthentic settings and approaches.

Patrick (Ed): *They're [students] trying to remember what they need to do for the assessment; they're not thinking about life.*

We must ask ourselves as sports therapy educators if the way that we are currently doing things is the best we can do to a) support transitions into university and b) support students in transitioning out of university into professional practice. While educator Eric (Ed) confirms what others in the educator stakeholder group have presented, relating to students being outcome-driven, I can see a return to the previous issue of curriculum design.

Eric (Ed): *Everything is geared towards how this will enable them to do the assessments, so students compartmentalise within compartment of modules. What do I need to know from this module to get the assessment done?*

This suggests that students being outcome-focused is likely multi-factorial. They come from an education system that encourages students to be outcome-focused, and they enter higher education where the design of the curriculum is also predominantly outcome-focused.

Returning to the idea of uncertainty and connecting this with outcomes-focused students, I can draw similarities with something highlighted as learners 'persistently attempting to impose certainty on inherently uncertain clinical situations (Betinol, Murphy and Regehr, 2023, p. 143). It has been proposed that such a contextual, structural, and functional difference in adult learning compared to primary and secondary education poses challenges, pressure, and stress on students (Choi, 2021, p. 2108), perhaps contributing to the fear of failure described previously. I assume that Choi (2021, p. 2108) is relating this to a shift in the requirements for independent learning, because primary and secondary education are also extremely stressful environments for students, given the focus on performance in SATs and GCSEs (Jerrim, 2021, p. 508).

Despite being present in the responses of educators and professional body representatives, the observation of outcome-focused students did not appear in the responses of other stakeholder groups, likely because this is not the context within which they operate. Nearly and newly graduated therapists have not been exposed to any other way, and they are working towards the learning objectives in pursuit of a good performance in their assessments. They are likely no longer thinking about module outcomes, as many of those have now been passed. By this stage, final year students are more concerned with overall degree outcomes, and assessments for new graduates are likely a distant memory. Educators are concerned with module engagement, and the professional body is concerned with module performance and

upholding competency standards. Each of these stakeholder groups has a different lens through which to view the students and performance.

Passing multiple individual competency-based assessments rather than authentic and practice reflective assessment may be hindering students' ability to embody professional expectations, connect the dots and take a more holistic approach to their diagnosis and treatment. It may also hinder the ability to accept variability and uncertainty. Shifting from an outcome or assessment focus to a way of being or practising would require more authentic assessments that would allow students to respond in a way that was not solely a competency check. Students would need to be engaging in assessment practices that encourage or necessitate the need to integrate knowledge from other modules, while educators balance the risk of over-assessment across modules. Modules need to connect in deliberate and transformative ways (Mitchell and Kramer, 2023, p. 3) and to achieve this will require thoughtful curriculum design and planning.

Students appear to be striving towards the development of what Hatano and Inagaki (1984, p. 5) described as 'routine expertise': knowledge-based procedural skills highlighted by effectiveness and efficiency in stable environments (Betinol, Murphy and Regehr, 2023, p. 143). As originally conceptualised, routine expertise requires mastery of skills, knowledge, and procedures so that carrying out the processes or actions associated with those skills and knowledge are both efficient and accurate (Cupido *et al.*, 2022, p. 1214). While this reflects many elements of clinical competency, it does not reflect the realities of clinical practice. This emphasis runs the risk of creating a mechanistic, tick-box approach to skill acquisition in students, rather than a focus on ontological transformation (Wilson *et al.*, 2013, p. 1223). This leads the discussion to the next likely contributor to the "troublesome" nature of both dealing with uncertainty and "connecting the dots": authenticity.

A lack of authentic experiences has been a strong theme from the data in what appears to make the acceptance of uncertainty and "connecting the dots" "troublesome" for students, as illustrated by the educator and educator-practitioner stakeholder groups.

Patrick (Ed): *I think it's hard when we are always dealing with non-clinical/ pathological students. It's very difficult, isn't it, asking them to palpate when there is no swelling there, there is no pain, there aren't these things, so we are in a very artificial environment.*

Patrick (Ed) outlines the challenge of teaching in an inauthentic environment. So far, the focus has been on the challenge of learning “troublesome” components, such as “connecting the dots” and accepting uncertainty, but the environment itself seems to make it “troublesome” for educators, too. This could be a valuable and interesting piece of future research.

Educator practitioner Seren (EP) explores some of the challenges for students facing authenticity for the first time. It is clear once again that confidence in practical skills may be affected if students are not adequately prepared for the “grey.”

Seren (EP): *You learn all the special tests, you practice on your peers, you feel happy and confident with them. You have little mock tests within lectures, and you’re smashing them. Then you go and assess a patient for the first time and it’s a different kettle of fish...it’s nerve-wrecking, you forget everything and all of a sudden you don’t feel confident. You’re handling goes out the window...It is difficult to teach students who have limited clinical knowledge and experience to apply clinical reasoning confidently to cases...I feel sports therapy/rehab students are not exposed enough to clinical experiences or work placements (particularly in elite sport setting) to build their contextual understanding of applying theory into practice, specifically, being exposed to setbacks in rehab or the non-linear nature of rehab so when students do experience this in their practice, their confidence is damaged.*

Seren (EP) neatly encapsulates the problem here. We need sports therapists to be able to clinically reason, yet they have limited clinical knowledge and experience, which is making things “troublesome.” We need to do something about it, but it appears not to be without challenge, as indicated by educator Assan (Ed).

Assan (Ed): *The most obvious and, equally, I think the most transformational aspect of the whole programme for them [students] is really when they are in situations where they have to apply the clinical skills and reasoning inside the whole package together. I think when you’re in that situation, it absolutely focuses the mind; it’s hard to replicate that in the classroom sometimes.*

Three things that jump out here from experienced educators talking about ‘educating’:

‘...it’s very difficult...’, ‘...it’s difficult to teach...’ and ‘...it’s hard to replicate...’

This is clear evidence that educators are struggling themselves to teach the content authentically; no wonder the students are struggling too.

The findings of “unpreparedness” within this data conflict with other findings in the literature. Specifically, for example, in occupational therapy where previous findings highlight that graduates (<18 months) believe they are prepared and can demonstrate being prepared for practice (Nicola-Richmond *et al.*, 2019, p. 578). This is likely because many of the settings where occupational therapists practice are structured and supervised settings, unlike graduate sports therapists, who may be entering the profession as self-employed, unsupervised practitioners. Nicola-Richmond *et al.* (2019, p. 578) report final year students still being in the liminal space for some thresholds, including clinical reasoning, when compared to experienced practitioners with five or more years of experience, which aligns with the findings of nearly and newly graduated therapists feeling underprepared.

Authenticity is something that has previously been raised as problematic in clinical reasoning, specifically in athletic therapies (Wilson-Thain and Hammond, 2023, p. 193). Laboratory settings have been identified as limiting the transferability of skills because they are not authentic (Newton *et al.*, 2009, p. 325). This is important because much of the sports therapy curriculum is typically delivered in a classroom or laboratory environment.

In medicine, Norman, Young and Brooks (2007, p. 1144) highlight that much clinical learning is directed at learning signs and symptoms. Emphasis on this kind of knowledge and skill underestimates the importance of actual clinical experiences in the acquisition of expertise (Marcum, 2012, p. 958). Although students get opportunities to apply their practical knowledge and develop it procedurally in the classroom, students lack the authenticity of the real world. Their experiences lack authenticity because they are unable to engage in the complexity of interaction with patients, as outlined in the nursing literature (Newton *et al.*, 2009, p. 324). In nursing, educators have been encouraged to integrate training that aids abilities to make informed decisions amidst ambiguity, including enhancing critical thinking, promoting evidence-based practice, and using simulation-based learning, to prepare nurses for the complexities of real-world scenarios (Shabestari *et al.*, 2024, p. 8). If educators can provide more authentic learning opportunities in sports therapy, then it follows that we might also be able to assist students in the development of professional attributes necessary for succeeding, whilst helping

students to form a professional identity. Evidence that the challenges pervade professional practice is seen in the responses of industry professionals, either working with or supervising sports therapy students in practice.

Carlos (IP): *When I'm supervising students on placement as a practitioner there seems to be the same kind of narrative [as my own experience] these students seem to have the same sort of problem in connecting the dots between their clinical findings and right how am I going to get them to sprint again? It's that bridging the gap, and they can't really apply the mechanical theory and neuromuscular concepts and theory to articulate how they are going to program an athlete to be able to tolerate those demands again.*

Carlos (IP) outlines the disconnect between 'neuromuscular concepts', 'mechanical theory' and programming, content that might ordinarily be taught in isolated modules. This data suggests that there is a clear need to support the development and integration of all the interconnected components of practitioners' professional knowledge (Wilson *et al.*, 2013, p. 1223). This foregrounds once again the importance of "connecting the dots," this time in connection with developing attributes of professionalism, leading me to the next theme.

4.3.1.3 Theme 3: Professionalism and Professional Identity

Professionalism refers to behaving according to the underpinning ideas and values, within the specific context of a particular profession, possessing specialist knowledge, membership of the professional community, and a sense of genuine value for your work (Wilson *et al.*, 2013, p. 1223). Much of the interview and questionnaire data from this research explores the knowledge and skills required to do the work of a practitioner and, to some extent, to think like a practitioner, but there were mentions of the skill that reflects "being" a practitioner. The PSRB representative stakeholder group were particularly vocal about professionalism and professional identity development in sports therapists, as illustrated by Hannah (Rp).

Hannah (Rp): *Students are often able to identify professionalism in others, describe it academically and often display aspects of professionalism, authentically, as part of their learning tasks or assessed work. However, it appears to be troublesome for students to demonstrate clinical professionalism authentically while also identifying as students. This seems to be because a professional is viewed as binary rather than a capability that grows and develops with an individual, and is accepted as this by others.*

This view suggests that the students may find the notion of professionalism “troublesome.” I cannot help but connect this to this issue of authenticity and wonder if the way in which content is designed and taught hinders a student’s ability to see and be exposed to examples of professionalism or model the behaviours that we might associate with professionalism. There was also evidence amongst the data of professionalism and professional identity being “transformational,” as Shabir (Rp) describes.

Shabir (Rp): *The bit I think is the real kind of watershed moment for students is understanding professional characteristics and how they behave and approach everything they do... It's not limited to a specific subject; it's more about how they approach everything. How do they approach anatomy, pathology, their attitude, motivation. How that fits into their life, the importance of it as well and how those fit into patient care, what you are as a clinician, working with patients and having that position of authority. When students can get to that, that's the hard bit...they are very different people, they're much more empathetic, they are much more thoughtful about their practice, they are successful in their careers too, so I think that is the big watershed moment for a lot of people.*

Shabir (Rp) uses the phrase ‘*watershed moment*’ to describe a transformation in practitioners, not just in the way that they think, but in the way they approach all aspects of their roles as professionals. The transformation goes beyond practical skills and understanding concepts, it filtrates their whole philosophy. This is likely the strongest evidence and best example for professional identity being “transformational” and “integrated.” We know that it is also “troublesome” as presented above by Hannah (Rp). Previous authors note that identifying key moments of integration and associated evidence on an ontological shift can be critical to the identification of a threshold concept in allied health professions (Hill, 2020, p. 675). Data from my research suggests that concepts themselves may not be the only acquisition during a transformation and that the way practitioners think may be a threshold in itself.

The sports environment presents a unique set of challenges for sports therapy students in developing professionalism and professional identity (Johnson and Hammond, 2018, p. 291). These appear to be reflected in the findings as a tension between being yourself and being able to adapt your identity to different settings, as exemplified by graduate, Carmel (Gr).

Carmel (Gr): *I'm almost like with two different personas, like if I was like seeing a client and in my clinic on a Friday, it's very much that you come across as much more professional, whereas I feel like when you're in with the changing room like in your medical room, things like that, I've got the music on, it's much more chilled area, you almost become like one of the lads, so they open up to you. We definitely don't get taught that. I feel like you don't get taught enough to be like how you would act amongst a sports team compared to a clinic.*

Here we see further evidence of students being underprepared for clinical practice, and in this example, specifically, the notion of having to wear different professional masks in different settings. Graduates were not alone in their thinking; several industry professionals and educators agreed.

Charlie (IP): *How you represent yourself and how you carry yourself and your demeanour regarding private practice and sport is very different...you have to display yourself in a different light, different manner.*

Patrick (Ed): *I think when a student goes and works in sport for the first time, how much teaching do we do to prepare the students to think about their communication and this sporting environment? Coaches are all different...you know, there are behaviours that you need to develop, and you need to develop different personas. It's hard to teach that, and that's a thing you get with experience.*

This presents yet another layer of uncertainty for students learning to become practitioners. An alternative perspective was presented amongst the data that seemed to focus on the importance of practitioners being themselves. Those who highlighted 'being themselves' tended to come from the industry professional and educator practitioner groups.

Tanita (IP): *I think I learned this later on. You need to be yourself, like wholly and truly yourself. Don't try and be anyone else. Don't try and be like your best friend. Don't try and be like anyone else, because that's not you...I've definitely thrived because I'm myself, and people who book with me want to see me because they are comfortable being around me, and I'm confident knowing that.*

Jamie (EP): *Being yourself is something that we were never taught, and that whole bedside manner stuff, I don't think it can be taught to be honest...you either have those interpersonal*

skills or you don't. I don't think you can acquire them...In a group of therapists or a group of graduates, they all have really similar skill set. But what sets them apart is their personality and how/ whether people like them or not, and if someone comes back to you...it's because they get on with you and they feel comfortable...I think realising that if you just be yourself, it becomes so much easier to listen and empathise with people. I think that was something that bettered my own practice.

Both Tanita (IP) and Jamie (EP) have significant experience working in sport and clinical settings outside of “high-performance”, where therapists typically might attempt to “fit in” with a particular coaching style or set of behaviours. Jamie’s (EP) perspective is illuminating, stating that the softer skills, perhaps focused on communication and empathy, are something that cannot be acquired. Certainly, they would be difficult to acquire if students are not given the opportunity to experience authentic clinical or sporting settings to enable this, or if they are not open to the possibility of learning these skills.

Some stakeholders suggest that it is a necessity to be able to mould to different environments, and others cite the importance of being themselves. These shared perspectives from the various stakeholder groups reflect what has been presented in the literature as one of the challenges for therapists (Johnson and Hammond, 2018, p. 292), with mention of cultures within sports clubs or teams, often set by the manager or coach. Cultures, relationships, and levels of autonomy given to practitioners may vary considerably from team to team (Johnson and Hammond, 2018, p. 292). A practitioner’s development is likely to be something that is variable by person and over time, as indicated by Scott (2015, p. 1) who summarises: ‘we may think we know who we are, but these ideas are constantly changing, shaped by our experiences, relationships, and interactions’.

The tension between being yourself and the need to adapt to different settings came from the responses of nearly and newly graduated therapists and those working in industry and educator practitioner roles. The findings reflect what Johnson and Hammond (2018, p. 292) describe as the variation of working environments that can cause conflict in the development of professionalism, with some values and behaviours being enhanced. It is this tension or conflict that is likely contributing to the “troublesomeness” experienced by students.

While few educators raised these issues as something “troublesome” within the discipline, the notion of professionalism or professional identity is something that professional body representatives held at the forefront of their minds. What stands out is the emphasis on what this field tends to call “soft skills,” as illustrated by Giuseppe (Rp).

Giuseppe (Rp): *How do you talk to that person [patient]? We don't teach our students to [talk], so the earlier you expose them to talking to people, the better practitioners they will become.*

Barradell and Peseta (2016, p. 264) highlight that the inclusion of professionals in the stakeholder analysis foregrounds the experiences of the practising professionals who can reflect specifically on the demands and realities of the workplace, and how a curriculum can better prepare work-ready students. Educator practitioners like Max (EP) offered this perspective in my research.

Max (EP): *You've got to be reliable. You've got to turn up on time. You've got to have good levels of communication and it doesn't matter how efficient you are in massage, your injury assessment, they are all developmental skills but what I tend to find is if you can't communicate, you're always late, they [those attributes/behaviours] will carry on then into industry...If you haven't got those soft skills, you haven't got these basic skills; there's absolutely no point in them being there [on placement]. The best students I've had [placement] are the ones who turn up on time, are always available.*

It seems that for success, there is emphasis on professional attributes and behaviours, rather than the practical hands-on skills and knowledge that students are being taught in the classroom. Of course, practical skills and knowledge are necessary to be able to practice at all, but, interestingly, professional attributes and behaviours are the things educators tend to spend the least time on or formally teach and give students the least exposure to. Dione (EP) highlights the “transformational” nature of professionalism once again, this time from the perspective of the educator practitioner.

Dione (EP): *Attendance, it's not a theoretical concept in that way, but once they understand the importance of it and how that professional engagement and they're going out to be a professional, how important that is, then yeah, you know it is transformational. Once they get it, they get it.*

Literature suggests that meaningful professionalism learning and identity development can be advanced by authentic experiences in the workplace and by providing opportunities for guided, critical reflection (Neve, 2017, p. 93), which is further justification for the need to increase authenticity in learning. Though multiple educators and practitioners raise the importance of professionalism, it seems the opportunities to discuss the development of professionalism have been lost, likely due to the high volume of skills or competency-based teaching and assessment in the curriculum. Further, given that most learning experiences may be inauthentic for trainee sports therapists, it could be the case that professional identity development has become a secondary thought. Conversely, students may struggle to maintain professional expectations set within the classroom because of the lack of authenticity. Evidence suggests that by helping students to develop a sense of their place within the discipline and acquiring disciplinary ways of thinking and practising, we could see transformations in sports therapists, as evidenced for the first time by these stakeholder perspectives. This is consistent with what Barradell (2013, p. 268) presented in physiotherapy as epistemological and ontological transformations.

By viewing threshold concepts in the context of stages of conceptual change, crossing thresholds can lead to changes in 'ways of thinking and practising' which is intrinsically linked to the reshaping of a learner's identity (Jones and Hammond, 2023, p. 989; Davies and Mangan, 2007, p. 724). The idea of 'ways of thinking and practising' has been a useful addition to threshold concepts, helping to adopt a more extensive view of curriculum (Barradell, Barrie, and Peseta, 2018, p. 267). 'Ways of thinking and practising' are described as:

Offering the richness, depth and breadth of what students might learn through engagement with a given subject area in a specific context. This might include, for example, coming to terms with understandings, forms of discourse, values, or ways of acting which are regarded as central to graduate-level mastery of a discipline or subject area (McCune and Hounsell 2005, p. 257).

This aligns with the idea of professional identity and philosophy being identified as thresholds for learning, and in this case, specifically, for sports therapy. The emergent, complex, and contextual nature of professionalism learning is increasingly being recognised, as is its potential as a "transformational," life-changing process (Wilson *et al.*, 2013, p. 1234).

Professionalism and the development of professional identity, therefore, seem to fit the lens of threshold concepts for disciplines with shared territory, such as the allied health professions. For the first time in this field, stakeholders have provided insights into transformations they had experienced both personally and while supervising students.

4.3.2 Transformational moments

Connected specifically to the recollection of transformations, ontological shifts and changes in practice, the findings of this research unearthed two key things. The first was that many practitioners appeared to experience a major transformation after graduating and the second was explicit associations with the impact of real-world experience and the influence of other practitioners in their transformations. It has been argued that for transformation to occur, a critical or 'activating event' results in self-reflection and sometimes feelings of guilt, fear, anger, or shame (Prout *et al.*, 2014, p. 151). The participants displayed similar feelings in their reflections on transformation in my research.

4.3.2.1 The post-graduation realisation

The educator and educator practitioner groups were consistent in their descriptions of post-graduation realisations that occurred.

Eric (Ed): *I think so much learning is achieved post-graduation and I think it's a shame that we effectively are creating a manufacturing line of very standardised therapists leaving all the universities and then the rich learning, the deep learning and the clinical justifications and rationale tends to happen more in the years after graduation...it's almost like we need a fourth year.*

Similar findings are present in the occupational therapy discipline by Nicola-Richmond *et al.* (2019, p. 577) in relation to clinical reasoning. Specifically, they found that confidence and ability to articulate clinical reasoning were still under development at graduation for fourth-year students, but there was no discussion of why this might have been. There is no equivalent of a newly qualified or early career years after graduation for sports therapists, as seen in teacher education, but some degree programmes do offer a sandwich year placement between the second and third year of study. Those who mentioned sandwich years were few, but those who did, recalled seeing more maturity in the returning students and many benefits of having experienced a full year in practice.

Johannes (IP): *I've noticed that when people have a year out fully in the world and then go back to the final year, I just find them a lot more rounded as therapists.*

It is unlikely that all degree programmes would be able to service a sandwich year placement structure, given student numbers. As such, educators may need to consider alternatives to providing students with exposure to authentic clinical opportunities. Other stakeholders presented evidence of a “struggle” and simply feeling underprepared for life and practice beyond the course, suggesting that the experience was “troublesome.”

Kathryn (EP): *I've never been an arrogant or cocky person, but I left university feeling confident, I'd come out with a first-class honour, and I don't think I was set up at all for the absolute plunge that was in front of me. I felt like I was diving off a cliff with no parachute and no soft mattress below me...I went from feeling quite confident to then having a bit of a wobble...I think because I realised how much I didn't know.*

Looking back on experience, Kathryn (EP) described the post-graduation shock as a ‘...plunge...’ and went on to explain that it seemed to be the immersion in an authentic setting that helped things to sink in.

Kathryn (EP): *...because I was seeing it in a real-life scenario, I think I just grasped it, and then everything else just kind of fell into place around it. So that was a definite lightbulb moment for me.*

Kathryn (EP) was talking here quite generally and holistically about sports therapy practice, rather than about a specific concept or skill. Barradell and Peseta (2015, p. 364) present findings from a qualitative research synthesis and conclude: ‘the messiness of the practice world was explicitly mentioned as something to be faced and navigated by students, and therefore included in curriculum’. Had the ‘messiness’ of the real world been something that was included in the curriculum for sports therapists, perhaps the post-graduation realisation would not have felt like such an extreme contrast in experience for Kathryn and other practitioners.

Interestingly, many interviewees associated the practitioner transformation with the skill of learning to drive, in that much of the change was seen after graduating from university.

Kathryn (EP): *I certainly talk about it [own experience] with my students now. I compare it to teaching you to learn to drive in that when you pass your test, you are safe to be on the road, but it doesn't mean that you're an experienced and good driver at that point in time, you know, we're just getting you on the road so that you can start being an experienced and safe driver. And so, I've really tried to put that across to them...there's an awful lot more you're going to have to do on leaving university to get yourself where you want to be!*

I see connections here between the post-graduation realisations and transformations, with the lack of exposure to authenticity. In addition, there are connections here with the volume of content within the curriculum. Volume is seen as a barrier by educators and educator practitioners, yet there are multiple references to learning to drive a car and the notion of having a basic set of skills allowing you to pass a driving test, but further learning is a process that is prolonged. Perhaps this is a moment to rethink and rebalance in terms of how much is taught before graduation and what the expectations on learning are, post-graduation.

Educators need to consider what, if anything, can be shifted to the post-graduation stages, knowing that students will learn as they go. There is also a need to explore if professional bodies are expecting too much from students in terms of their undergraduate competency, or conversely, how educators can enable graduates to feel more secure in their competencies.

It could be suggested that these post-graduation transformations happen because the graduates have built up some “patient mileage.” However, I propose that these realisations could occur earlier if the students were given more opportunities for real-world exposure and sooner, something which the following discussion supports.

4.3.2.2 Real-world exposure and experience

In addition to clear examples of post-graduation realisations, there were multiple indicators of “transformational” moments in training, but these tended to be outside of the classroom and instead were experienced on placement and in clinical modules, typically towards the end of programmes. The findings from stakeholders would support the idea that real-world experiences should be included in the curriculum, as they have been pivotal in the transformations of practice. Here we see those moments described by nearly and newly graduated therapists as having a ‘...*massive impact*...’ and making the ‘...*penny drop*...’

Puja (Gr): *Direct exposure to injuries and sports therapy in a working environment has impacted me massively. Being able to see how the tools are implemented in practice improved my understanding and really boosted my confidence in applying the skills myself.*

Carmel (Gr): *I got my placement really early...when the first injured player came through I started doing like an assessment and doing range of motion and everything like that, everything that we had been learning in that first couple of months, I literally sat there and went ah this is why we're doing that...actually seeing it out into practice made me realise why we were doing it and in what sort of environment we would do it and then that just like, it just made the penny drop.*

Both graduates detail meaningful experiences, and particularly Carmel (Gr), who describes this happening early on in training. For Carmel (Gr), it brought everything from the classroom to life. The impact of having those early authentic experiences, even if just observational, clearly aids in the securing of knowledge and transformations around threshold skills. Knecht-Sabres (2013, p. 22) describe this learning in context as essential for understanding and applying course material, resulting in improved clinical skills such as clinical reasoning. Arguably, then, these transformations could not happen with learning in context alone but require the balance of classroom and practice experience.

Within the interview data, there was some concern regarding the quality of placement activity as an example of an authentic setting, and importantly, the challenge of assuring the quality in environments away from the academic setting, as outlined by industry professionals.

Carlos (IP): *I think we can acquire professional membership without having a significant amount of work experience, and I know some people go and work where they are left to their own devices and they're not actually taught anything, or they don't develop. So, I think it's good quality work experience that we are lacking in...when you look at physiotherapy degrees the number of hours that have to apply and it's in a setting where they are going to be tutored, that's where the bulk of their learning is done. And I'm not saying that we replicate that completely, but I feel like we need more emphasis on exposing students to high-quality, and more clinical work experience. I think this could solve a lot of problems in terms of connecting the dots and contextualising everything.*

Carlos (IP) pulls together several themes here, including authenticity, “connecting the dots,” and contextualising or working with uncertainty. Carlos (IP) refers to differences between other professions getting time in practice, which must be of a certain quality, and that is likely more stringently quality assured. I detail this further in the next section. Both the quality and amount of authentic experience are the problem here, and these present barriers for students being able to contextualise their learning and integrate their knowledge or connect the dots. In addition, there is no mention of post-graduation support. Instead, graduates can be ‘...*left to their own devices...*’ which appears to be the case in supervised scenarios as described by Carlos (IP) as well as expected for those working for themselves. Perhaps graduate mentorship is something that new graduate sports therapists would benefit from. An additional concern, related to quality assurance for placement and potential unlearning that needs to take place because of poor-quality placements, as explained by professional body representative Ranvir (Rp).

Ranvir (Rp): *You see a difference in approach depending on the placements they’ve been on. Probably one of the biggest barriers we see is that they can come back from placement with the mindset that the supervisors must be right. So, no matter what you’ve told them in the past and what they’ve learnt, if the supervisors have told them something different, they’ll go with the supervisors because they are the person they have seen in clinical practice so you end up unpacking why that approach may not be the best way to do things and there might be options.*

Ranvir’s (Rp) insight suggests that students might lack a level of criticality in appraising the approaches of supervisors, but I do not believe this is any fault of their own. In the placement situation, students experience an unfamiliar environment and power dynamics that perhaps they have not experienced before. Educators need to help students think critically about the profession and teach them about the influence of power dynamics on their own learning in practice. If we can bring more authentic practice into the curriculum, we can prepare them for the variability and uncertainty they will face and therefore avoid or at least address the scenarios described by Ranvir (Rp). This echoes what Geisler and Lazenby (2009, p. 53) raise as an issue in athletic training, where there is a risk of gaps between teaching and learning, when students enter chaotic and uncertain clinical environments and are passive in their participation. This could be because the clinical supervisors do not offer them the opportunity

to use their initiative, or a conscious response of the students in the face of scenarios, they feel unprepared for.

In addition to the quality of clinical activity undertaken, there was also a strong sense of needing to build up ‘...*patient mileage*...’ to develop a bank of experiences that can assist with clinical reasoning, as outlined by the nearly and newly graduated therapists, professional body representatives, and industry professional stakeholder groups.

Emma (Gr): *I think that it is hard to replicate a clinical setting whilst at university, and the only way to do this is through getting real life experience – you don’t get to work independently until you graduate, and I think this is where the real development of both practical and personal skills come. I feel that university teaches the fundamentals, but it is hard to teach the soft skills that are often required in a workplace setting once graduated.*

Linked to the previous findings from my data, more independent work in an authentic setting needs to be encouraged. Only then can student therapists effectively prepare for the ‘real world’ and develop context-critical ‘*soft skills*’ that Emma (Gr) mentions. These views were supported by the PSRB and industry professional groups.

Shabir (Rp): *Some of my best students got themselves easily over 1000 hours. I suppose because of their attitude, they understood the importance of patient mileage and seeing as many patients as possible, and they really worked to make sure they got as many experiences as possible.*

Clarke (IP): *I think that having the knowledge from the degree itself is going to play a huge part, but it’s probably just observing enough patients, enough injuries over that period [that helped it sink in].*

Seeing other professionals in action seemed to be a turning point for many in the nearly and newly graduated stakeholder group and amongst the industry professionals when talking specifically about their own journeys. This puts increased emphasis on the importance and value of good quality placement activity and reflects the idea of transformational learning theory (Schnepfleitner and Ferreira, 2021, p. 43), which suggests that learning occurs when a learner changes the way in which they see the world or there is a shift in the way meaning is made in their discipline, neatly captured by graduate Jude (Gr).

Jude (Gr): *I completed a placement year in professional sport. This made me widen my scope when looking for injury causes and not refine my investigation to a set procedure. It made me think of injuries like a puzzle in a way.*

When students were asked what experiences or interactions had been the most “transformational,” they said learning from other therapists, shadowing practitioners and witnessing other approaches to practice. Prout *et al.* (2014, p. 158) conclude that experiential, interprofessional educational experiences can provide students with opportunities to develop into effective and reflective practitioners. It is evident that these practice-based learning experiences can be “transformational,” but the opportunities seem limited. This is a challenge that is unique to sports therapy. Professions such as physiotherapy and nursing have guaranteed placement experience hosted within an NHS or other supervised environment, a requirement of programme validation (Chartered Society of Physiotherapy, 2022, p. 12; Nursing and Midwifery Council, 2023, p. 13). Hours may vary according to discipline, but for professions like physiotherapy and nursing, placements are sourced and in place for the students and have been known to dictate recruitment numbers on programmes. For example, if a trust can only offer 30 placements, then that could be the maximum a course can recruit. The practice placement expectation for nurses in the UK is ‘no less than 2300 practice learning hours, of which a maximum of 600 hours can be in simulated practice’ (Nursing and Midwifery Council, 2023, p. 13). Sports therapy students often need to source their placement activity, and the professional requirements are much lower; a minimum of 200 hours for programmes accredited by The Society of Sports Therapists (SST), whether they take a sandwich year placement or not. There is a requirement of 400 hours for programmes accredited by the British Association of Sport Rehabilitators (BASRaT). Therefore, medicine and allied health professions appear to have significantly more time in practice throughout their training and in a quality-assured environment. This will inevitably offer more opportunities for students to develop their professional identity and philosophy, with more opportunities to navigate uncertainty and more opportunities to learn from authentic experiences and other practitioners (O’Brien and Battista, 2020, p. 484).

Betinol, Murphy and Regehr (2023, p. 143) suggest that there is a discrepancy between health professions training and medical training programmes specifically relating to opportunities for

meaningful ‘ownership’ of patient problems. This raises questions of whether these health professional students are exposed to experiences and learning environments sufficient to enable the development of adaptive expertise prior to their transition to independent practice (Betinol, Murphy and Regehr, 2023, p. 143). If the discrepancies exist between health professions such as physiotherapy and medicine, then they most certainly exist between sports therapy and other allied health professions.

While it is clear to me that educators need to make space for learning experiences sufficient to enable the development of adaptive expertise and transformations, balancing where this happens in the curriculum is important. Increasing such opportunities might be at the risk of displacing other content in the curriculum, and thus understanding what should be delivered and when is critical. Sandwich years might be the only way to approach this without displacing other content if it is deemed unsuitable to displace things. Alternatively, educators could look at the structure of the curriculum and whether different combinations allow for more fruitful outcomes, such as more integrative pedagogies (Mylopoulos, 2020, p. 11).

Students who are lucky enough to find themselves in an authentic, high-quality clinical placement setting can undertake a true transformation, as evidenced by industry professional Carlos (IP) when talking about their own experience.

Carlos (IP): *I first kind of had a light bulb moment and realised how much I didn’t know while I was at XXX [football club] and even though we covered rehab concepts within my undergraduate it wasn’t until I got to XXX [football club] that I realised how much I didn’t know of rehab and it was that working experience that kind of like triggered that thought process of ohhh and I started having more questions than I did answers.*

Johannes (IP) had a similar reflection regarding students they had supervised in practice, as a placement provider.

Johannes (IP): *I had a penny drop moment a couple of weeks ago, I was shadowing another therapist. I was watching them thinking, I do know this. You do know what you are doing, you just need that confidence...*

Johannes (IP) is an industry professional who has demonstrated that realisations can be lifelong. Although Johannes (IP) uses the term ‘...penny drop...’ as others have done when

describing “transformational” moments, this example appears to be more a case of confidence or assurance of one’s practice.

Johannes’ (IP) confidence was boosted by observing how others work and interacting with other practitioners. This is in keeping with the findings of Betinol, Murphy and Regehr (2023, p. 146), who demonstrate that recently graduated physical therapists sometimes expressed more adaptive expertise, describing the value of colleagues who might have very different perspectives as enabling the co-creation of knowledge and supporting the stretching of one’s viewpoints. Johannes (IP) has not described anything that I can attribute to being “troublesome” or causing an ontological shift, and thus I have not interpreted this as evidence of a transformation.

4.3.3 Themes unshared

In the analysis of this data, there were themes that arose that were not shared across all the stakeholder groups. That is not to say that these could not be identified as thresholds, but there was insufficient collective agreement across the stakeholder groups, and the number of stakeholders within groups who mentioned these concepts was also low. It was therefore deemed insufficient evidence to identify these as thresholds at this time. Themes or concepts included: pain, anatomy, and barriers to learning. These will be presented briefly to inform future work of educators.

4.3.3.1 Pain

Indications that pain and pain theory might be considered a threshold in sports therapy education comes from the insights of Clarke (IP) and Lucy (Ed) who reference the learning of pain theory to be ‘...*really hard for them*...’ (troublesome) ‘...*light bulb moments*...’ (Transformational)..., ‘...*transforming how they communicate*...’ (Transformational), ‘*interfacing into everything they ever do*...’ (Integrated and irreversible).

Clarke (IP): *I think pain in terms of pain theory...it’s hard for them (students) to get their head around that they might be in pain, but there’s nothing wrong with them, at least in terms of tissue damage. From a student perspective, once you get your head around that, I think that could be a light bulb moment. I think we’re at fault as lecturers and staff, always going down the classic ATFL or ACL route, whereas we probably don’t think so much about pain....Wrapping their head around that (pain theory) would transform how they would*

communicate with people and how they might educate their clients or the people that are working with them on placement, but also how they would provide them rehab.

Lucy (Ed): *I think pain is a big one, and they don't really understand the concept of pain. The theory is quite difficult to learn, but once they've got that, it probably interfaces with everything they ever do because most patients will present with pain...*

Though stakeholder groups shared many common perceptions as illustrated by the development of the themes, there is also an indication that different thresholds or “troublesome” knowledge may feel important to different stakeholders at various times in the learning journey. This is likely because of a combination of context and timing, which would support the idea that transformations may be sudden, or take weeks, months or even years (Meyer and Land, 2006, p. 376).

Pain is a concept that seemed to come up in the educator and industry professional groups, but not in the nearly and newly graduated or PSRB representative groups. For nearly and newly graduated therapists, this is likely because it has not been a big feature of their education or because they have not yet seen or been able to appreciate its influence on their practice. Though there was probably not enough evidence to identify pain as “troublesome” or a threshold concept, evidence from other professions does suggest that pain theory could be considered as a threshold (Smart, 2023, p. 5). Pain science and management has already been characterised as “troublesome” and “transformative” within the literature (Smart, 2023, p. 3) and efforts have been made to integrate more pain education into healthcare professionals’ curricula (British Pain Society, 2018) to support the development of clinical competencies (Jones and Hush, 2011, p. 208). Certainly, pain and the understanding of pain science connect to biopsychosocial approaches to patient care and have therefore been highlighted here as having the potential for being a threshold, though not formally identified and supported by evidence relating to this work.

4.3.3.2 Anatomy

In addition to pain theory, anatomy was a theme that most stakeholder groups mentioned when discussing “troublesome” areas of sports therapy, but that did not appear to be as strong a theme as the others. There was also evidence of anatomy being “transformational.”

Graduate India (Gr) provided a strong illustration of the liminality associated with learning anatomy as well as the transformative nature of it sinking in.

India (Gr): *I just couldn't get my head round it. If you're rotating one way, which facets are opening, which neural foramen is opening and then suddenly, I feel like I just came in one week and went, oh yeah, well how did I not? How did I not know what was going on, and how did I not understand that? I don't know what happened. I was obviously looking at it in a different way...that was definitely a moment for me.*

Not only does India's (Gr) insight demonstrate the "troublesome" nature of learning and applying the anatomy, but it also shows evidence of an ontological shift. Evidence of the "troublesome" and "transformational" nature of anatomy was also seen in the PSRB representative and educator stakeholder groups.

Ranvir (Rp): *The reason they [students] struggle with anatomy is that they don't have the application of it; it is far too insulated.*

Patrick (Ed): *When you learn anatomy, everything becomes so much easier across the whole programme...*

In all cases, as the discussions unfolded, it was clear that stakeholders were referring to the application of the anatomy being "troublesome," rather than the raw anatomy itself.

Jamie (EP): *It's the application and functional side [of anatomy]. But it's really difficult to teach because they [students] don't know the importance of it yet, but they've got to know it to go any further. Yeah, I find that really difficult... It's not actually the raw anatomy. Like I say, it's the concept of how to learn it and how to retain it.*

The nearly and newly graduated stakeholder group did not appear to raise anatomy as "troublesome" to the same degree as the educators and educator practitioner groups. The educator groups are most likely seeing students struggle with anatomy in siloed anatomy modules and associated assessments. Subsequently, they see students who fail to secure this foundational knowledge being impacted in later modules, where the application of their anatomy is key.

It is well understood that threshold concepts are distinct from core concepts within a subject; whilst a core concept must be understood, it does not necessarily lead to a different view of subject matter (Meyer and Land, 2003, p. 4). Core concepts have been described as a simple abstract concept with a local transformative effect, such as replacing a term already known and present in everyday language (Correia, 2024, p. 28). However, terminology which can be memorised or mimicked will not lead to a transformation in learning (Mitchell and Kramer, 2023, p. 3). In the context of sports therapy, knowing the term 'kneecap' and then learning the correct anatomical term 'patella' is an example of this.

Core concepts function as a 'building block' of discipline knowledge, accumulated in overlapping layers. In contrast, the change promoted by a threshold concept has a qualitative nature. If we view raw anatomy (for example, the patella) as core knowledge, it appears that the application of that knowledge in various contexts is what might be "transformational" to practice. Examples of applying anatomical knowledge included the formation of rehabilitation plans through understanding how to effectively target specific structures and what loads to apply. Others included the clinical justification for a particular approach to treatment, based on foundational anatomical knowledge. What prevails is that it is not the raw anatomy itself that is the potential threshold, but what we can do with that knowledge by applying it. Raw anatomy also seems to be something that continues to grow with practice. Simplified with a more well-known example, the anatomy of a car would be that it has an engine, a clutch, and an accelerator. The application of that knowledge helps us with finding the appropriate 'bite' between clutch and acceleration when pulling away. Arguably, the latter is "troublesome" at first, "transformational" once understood. Anatomy is difficult to learn, but it is a case of memorising the names and locations of structures. Practitioners could reasonably forget what anatomical structures were called, but if they know their function or how they can be damaged, they could still operate as a therapist. For me, that's evidence that raw anatomy is not a threshold concept but is a core concept in this discipline. It is nice to see that the nearly and newly graduated therapists have all but forgotten about the struggles of learning anatomy once they are at the end of their programmes or newly graduated.

My findings are consistent with those presented by Hill (2020, p. 676), who found that participants who demonstrated a 'textbook' view of anatomy, where everyone is the same (that

is, no anatomical variation), suggested that their knowledge was not yet integrated. Hill (2020, p. 676) concludes that although anatomy itself was “troublesome”, it was not a threshold.

4.3.3.3 Barriers to learning

There were multiple mentions of barriers to learning, some where the ownership seemed to sit with the student or was placed on the student (motivation, commitment, attendance, engagement) and others where factors outside of the students (and possibly educators) control were noted (curriculum volume, competencies, time available, engagement affected by environment or context, for example, cost of living). These seemed to be at the forefront of many educators’ minds, but with little mention from the nearly and newly graduated therapists, PSRB representatives or industry practitioner groups. These perspectives were strongest in the questionnaire data, where arguably participants had not yet been fully introduced to threshold concepts. When the issue of engagement was raised by educators it tended to be connected to motivation and subsequent attendance, with less focus on contextual factors and no mention of the complexity of barriers to participation linked with the diversity of student experiences or background (for example, socio-economic status, cost of living crisis, first in family, care experience). Although these insights are interesting, the exploration of barriers to learning in its fullness is beyond the scope of this research.

In summary, variability and uncertainty, “connecting the dots,” and professionalism are “troublesome” components of learning to become a sports therapist, as supported by the stakeholder data. The current design of programmes and approaches to delivery do not reflect sufficient authenticity, integration of learning, or promote the development of adaptive expertise, all of which contribute to the “troublesome” nature of this profession. My data has shown that “transformational” moments happen in real-world settings, with time spent working alongside other professionals. I will now identify five thresholds for learning in the sports therapy discipline.

4.4 Identifying thresholds

4.4.1 Transitioning from themes to thresholds

The analytical process for identifying thresholds was different from the process of identifying themes in the data, but the two were interwoven. Thematic analysis helped to uncover patterns in thinking amongst the stakeholder groups and led to the identification of three themes. It was

the examination of these themes seeking transformative insights and evidence of threshold characteristics (Meyer and Land, 2003, pp. 5-6) that led to the proposal of thresholds and subsequent recommendations, presented in the concluding chapter. Thematic analysis revealed what is “troublesome” in sports therapy education, while the identification of thresholds highlights the opportunity for transformation. For example, what the practitioner would need to do to overcome what is troublesome.

This research acknowledges the challenges associated with the identification of threshold concepts, and using a threshold concept lens, has been mindful of all the threshold characteristics, presenting a rounded and richer conception of stakeholder perceptions and, more broadly, student learning (Barradell and Peseta, 2017, p. 368). The following thresholds have been identified where there was consistency across stakeholder groups in highlighting these areas as “troublesome” and “transformative.” Throughout, the characteristic of “irreversibility” was taken as embedded in the findings of “troublesome” and “transformative” characteristics because for something to be “transformational”, it is likely to be unforgotten. The characteristic “integrative” was inherent in the research, especially given the “troublesome” nature of “connecting the dots” and being able to clinically reason. Given the paucity of research in sports therapy, the characteristic of “boundedness” was applied to the view of being confined within the allied health professions, where most of the literature was drawn to support this work. In addition, the unique sporting context that sports therapists find themselves in means that every skill, concept, and mindset is uniquely “bounded” within the profession and can be distinguished by the context of working with the ‘athlete as patient’ (Wilson-Thain and Hammond, 2023, p. 195).

I propose five thresholds from the findings of this research: acceptance of uncertainty; adaptivity; integration (“connecting the dots”); clinical reasoning; and professional identity and philosophy, necessary for addressing the identified themes. Figure 4.1 shows how these five thresholds have been informed by the themes identified in the data (green).

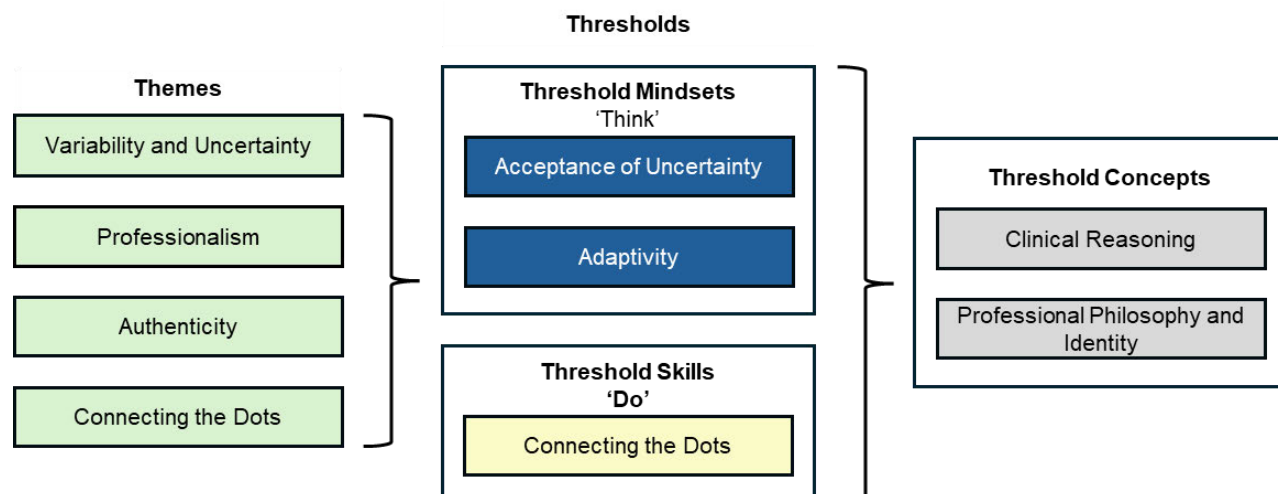


Figure 4.1 A visual representation of how the themes identified in the data inform the thresholds identified, and associated categorisation.

The green boxes house each of the themes from my data, excluding those unshared. Collectively, these themes informed the development of the thresholds, which I have named “threshold mindsets” and “threshold skills”. I propose that it is these thresholds that are required for threshold concepts, such as clinical reasoning and professional identity, to be secured. For example, to overcome variability and uncertainty, a therapist must accept or embrace uncertainty and become adaptive in their thinking; this is where the transformation takes place, as indicated by the data. The theme of “connecting the dots” led to the proposal of the necessary threshold skill of application and integration. Again, something transformational, without which the therapist is unable to clinically reason.

4.4.2 Threshold categorisation and acquisition

In Figure 4.1, I address the third research objective: To explore the nature and categorisation of troublesome knowledge and threshold concepts. From this research and its findings, I propose a new way of thinking about specific learning thresholds; the first I have termed “threshold mindsets”, where the passing of the threshold requires a cognitive shift in the practitioner’s approach and understanding, and represents more about ‘thinking’ like a practitioner rather than the ‘knowing’ or ‘doing’ aspects of undertaking clinical practice. The second I have termed ‘threshold skills’, which represent more of the ‘doing’ aspects of undertaking clinical practice. I propose that it is these mindsets and skills that facilitate the acquisition of threshold concepts (clinical reasoning and professional identity and philosophy),

presenting, for the first time, the nature and categorisation of thresholds in sports therapy (see Figure 4.1).

In Figure 4.2, I present the order in which these thresholds might be acquired, based on the data. In part, this aligns with the notion that threshold concepts should not be seen as a checklist or hierarchy but as a web (Davies and Mangan, 2007, p. 724). However, it does present a form of progression, where one threshold precedes another, among the thresholds for learning, which Davies and Mangan (2007, p. 724) suggest is not a requirement. In contrast, my approach aligns with the work of Barradell (2013, p. 268), who argues that as part of curriculum mapping, educators should identify “transformative” and “troublesome” aspects of curricula, integrating concepts vertically and horizontally, considering what concepts need to precede and integrate others. In my proposal (see Figure 4.2), core concepts are the necessary foundations for acquiring “threshold skills,” but necessary “threshold mindsets” must be achieved to secure particular concepts.

The proposal of “threshold mindsets” aligns with the thoughts of Barradell and Peseta (2016, p. 273) who conclude that the way health professionals view their relationships with patients is an example of a threshold concept that goes beyond understanding of a concept, to adopting a particular mindset. In addition, considering adaptivity as a “threshold mindset” aligns with the work of Betinol, Murphy and Regehr (2023, p. 143), who propose that it is possible that the goal of striving towards adaptive expertise is a mindset that may function like a ‘threshold concept’.

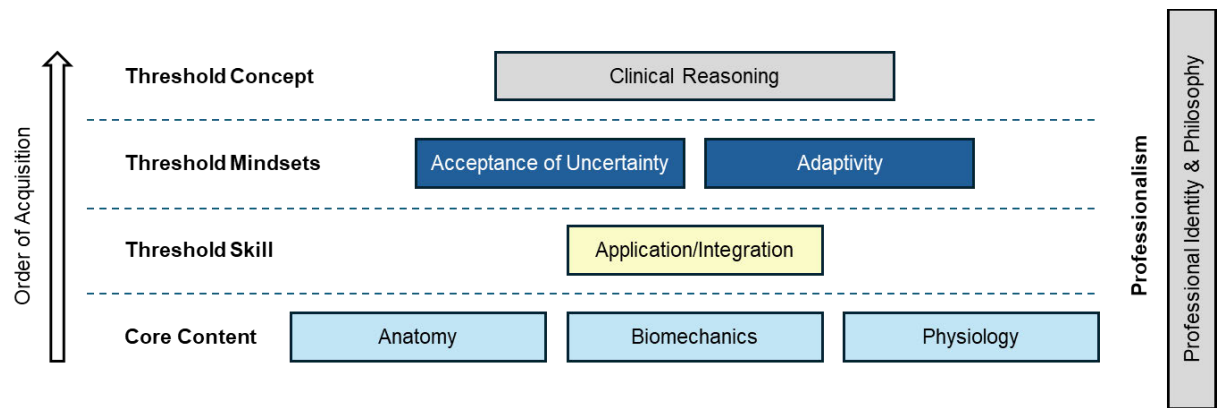


Figure 4.2 A visual representation of the threshold mindset, skill and threshold concept distinction in sports therapy. Light blue = core content examples; Yellow = threshold skill; Dark blue = threshold mindset; Grey = threshold concept.

Examples of core content indicated by light blue blocks (see Figure 4.2) represent knowledge necessary for acquiring the foundational understanding as a practitioner; this list is not exhaustive. Mitchell and Kramer (2023, p. 1) argue that core concepts become levelled and advance through the curriculum; hence, the example of levelling presented here with anatomy, physiology and biomechanics forming the foundational core knowledge.

The yellow block represents what I propose is a “threshold skill”, and the dark blue blocks illustrate what I have proposed as “threshold mindsets” (see Figure 4.2). These represent necessary transformations in practitioner thinking and cognitive skills that will facilitate the acquisition of the threshold concept of clinical reasoning, for example (see Figure 4.2). Without foundational core concepts, a practitioner would not have the knowledge required for “connecting the dots,” a necessary “threshold skill”. The ability to integrate knowledge and apply this to different contexts enables the identification and acceptance of uncertainty. The recognition of uncertainty allows the practitioner to pivot and address problems using adaptive expertise. I propose that the combination of these allows the practitioner to carry out effective clinical reasoning, drawing all concepts, skills, and mindsets together. The dashed lines represent the thresholds to be crossed.

Evidence from stakeholders positioned the development of professional identity and philosophy, such as person-centred care, as concepts which were “troublesome” and led to transformation. Professional identity and philosophy have been presented as a threshold concept, but have been positioned vertically alongside the acquisition of thresholds in sports therapy (see Figure 4.2). Professionalism seemed to be the concept where the transformations could happen at different times and where the journey could be different for individuals. Presented this way, it represents the evolving nature of this threshold as described by Johnson and Hammond (2018, p. 295). In addition, over the course of acquiring core concepts, skills, and mindsets, the practitioner is likely integrating and developing various aspects of their professionalism, such as critical reflection and communication. This aligns with Neve, Lloyd and Collett (2017, p. 105) who suggest that grasping thresholds such as ‘uncertainty’ could be

important for helping students to accept and appreciate the less tangible aspects of professionalism. The outcome, a practitioner who is secure in their position as a professional within the discipline; they have a professional identity.

4.4.3 Threshold 1: Acceptance of uncertainty (mindset)

Based on the findings of this research, I propose that “acceptance of uncertainty” is a “threshold mindset” in sports therapy education. I have demonstrated that variability and uncertainty are “troublesome” for students and have provided evidence of transformations aligned to the acceptance of uncertainty in practitioners. While other disciplines have highlighted uncertainty or tolerance of uncertainty as a threshold concept, my findings are novel in the sports therapy discipline. In addition, the proposal of this concept as a “threshold mindset” is a novel contribution. The unique context and remit of the sports therapist means this threshold can be acknowledged as “bounded.”

Learning to identify and manage uncertainty requires a complex set of skills and understandings; it requires learners to let go of the idea that there are absolute answers, which can be anxiety-provoking and frightening (Neve, 2019, p. 7). Educators could assist learners through such liminal spaces by encouraging them to adopt a growth mindset (Limeri *et al.*, 2020, p. 2). A growth mindset results in learners viewing challenges in learning as opportunities to improve, which could be a useful strategy for tackling some of the uncertainty that comes with being in the liminal space. Creating a ‘growth mindset culture in the classroom’ and ‘praising students for their effort’ has been said to yield long-term benefits (Dweck, 2006, p. 18). A growth mindset is different to the proposed “threshold mindset” because a growth mindset focuses on the learner’s strategy for approaching the learning, and belief that intelligence can improve with effort and responding to constructive feedback (Limeri *et al.*, 2020, p. 1). The “threshold mindset” proposed by my research emphasises a cognitive shift, a transformation required to clinically reason and to facilitate the development of professionalism and professional identity. This aligns closely to ‘ways of thinking and practising’ which captures the scope of a discipline’s nuances and connects to a discipline’s distinctiveness (Barradell, Barrie and Peseta, 2018, p. 267), which seems essential for the development of professional identity.

In reaching the “threshold mindset” of accepting uncertainty, learners might cease the search for a textbook answer or, as Betinol, Murphy, and Regehr (2023, p. 143) put it, ‘...attempting to impose certainty on inherently uncertain clinical situations’. Instead, students could embrace patient differences and be confident in their approach to tackling clinical scenarios. It is clear that to do this, learners require time in authentic and uncertain clinical situations. Only then will they see that this discipline has great variability and begin to shift their approaches to patient care, to be more person-centred. In the context of sports therapy, reaching the “threshold mindset” of “acceptance of uncertainty” includes understanding that the discipline is “grey,” knowing that each patient encounter has the potential to be different, and accepting that you do not need to have an answer to be able to progress.

4.4.4 Threshold 2: Adaptivity (mindset)

The results from my research have, for the first time, shown, in the context of sports therapy, that practitioners need to become adaptive experts to cope with the aforementioned uncertainty. An “adaptive mindset” is essential for helping students to tackle many elements of the profession, including the variability and uncertainty found within the unique context of sports therapy (including different sport, level, position and demands); within each patient presentation and experience of injury; and with each patient response to treatment. It seems that without an adaptive mindset, therapists would be unable to effectively reason their way through such complexities, and therefore, this presents a critical threshold for practitioners. As evidenced by the stakeholders, this is a threshold that seems to be crossed post-graduation and may be being impeded or delayed by the way sports therapy curriculum is currently designed and delivered.

Evolving work (Cupido *et al.*, 2022, p. 1225) suggests that adaptive expertise may be a mindset that is stimulated by the realities and complexity of authentic clinical practice and programmes that allow learners to use and reflect on their adaptive expertise. Educators, therefore, need to provide students with sufficient exposure to authentic clinical situations that will give them the opportunity to face uncertainty, accept this inherent feature of clinical practice and develop an adaptive mindset which allows them to think creatively and problem solve (Mylopoulos, 2020, p. 12). Students need to have secured core concepts and be able to integrate these in order to apply an adaptive mindset; hence, there is a progression or

necessary order of acquisition of knowledge and skill formation. Framing adaptivity as a “threshold mindset” situates it as a necessary threshold to support the acquisition of other critical concepts, such as clinical reasoning.

4.4.5 Threshold 3: Connecting the dots (skill)

I propose that “connecting the dots” is a “threshold skill” and, as demonstrated in the data, the current undergraduate sports therapy curriculum may not be set up in a way that assists the early development of this skill. According to Meyer and Land (2003, p. 5), integration is one of the core characteristics of a threshold concept, and as later highlighted by Perkins (2006, p. 41), integration and “connecting of the dots” may in fact be the most “troublesome” aspect of threshold concepts. Evidence from educator practitioners and professional body representatives provides further confirmation that students find the integration of knowledge “troublesome.” Cohen (EP) suggests that making the connections, once understood, can be ‘...*hard to undo*...’ which aligns well with the threshold characteristic of being ‘irreversible’ (Meyer and Land, 2003, p. 5).

Cohen (EP): *I think most people [students] from a rehab perspective really struggle, they don’t have strong enough knowledge around the anatomy or the pathologies...and they perhaps can’t link the two...students really struggle to work out what muscle is actually contracting... I think once you get your head around it, it’s hard to undo...*

This mirrors what Meyer and Land (2003, p. 8) concluded about having the necessary parts to be able to integrate knowledge. This likely includes an array of core concepts, such as anatomical knowledge, in the case of sports therapists. A concept that integrates prior understanding is transformative because it changes a learner’s perception of their existing understanding. If a concept integrates a spectrum of prior understanding, then it is more likely to be “irreversible” because it draws together a learner’s thinking about many different phenomena (Davies and Mangan, 2007, p. 712). In sports therapy, clinical reasoning is an example of something that requires practitioners to adopt a “threshold mindset” and integrate multiple concepts and skills in order to tackle a problem.

4.4.6 Threshold 4: Clinical reasoning (concept)

While clinical reasoning has already been proposed in adjacent disciplines as meeting the characteristics of a threshold concept (Nicola-Richmond *et al.*, 2019, p. 571), it has only once

been connected to these characteristics in the context of sports therapy (Wilson-Thain and Hammond, 2023, p. 191), but this was in the absence of empirical evidence. My research has, for the first time in this discipline, provided evidence to support the proposal of clinical reasoning as a threshold concept. Findings come from the interconnectedness of a therapist's ability to embrace variability and uncertainty, connect the dots and work adaptively in response to the unique context of sports therapy. As previously shown, the emphasis for sports therapists appears to hang on the side of therapeutic reasoning as opposed to diagnostic reasoning, which tends to blur the lines for students, and as evidenced through this work, contributes to the feelings of uncertainty, fear of failure and low confidence. As shown in Figure 4.2, to be able to clinically reason, practitioners need to have acquired core concepts, be able to connect the dots, and have adopted the necessary "threshold mindsets".

4.4.7 Threshold 5: Professional identity and philosophy (concept)

Professionalism and professional identity have been identified as a threshold concept in other disciplines (Neve, Lloyd and Collett, 2017, p. 97; Bhat *et al.*, 2018, p. 623) and have been proposed within the field of athletic therapies, which is inclusive of sports therapy (Johnson and Hammond, 2018, p. 294), but once again, these proposals were made in the absence of empirical evidence. My research, for the first time, presents the idea of professional identity and philosophy as a threshold concept, supported by the perspectives of key stakeholders in this discipline. Specifically, having a person-centred philosophy of care and therefore making full consideration for factors beyond the purely biomedical can be transformational for therapists. Securing the "threshold mindset" of acceptance of uncertainty is central to being able to develop a philosophy such as person-centred care, and thus, once again, the order of acquisition of these thresholds is made clear (see Figure 4.2).

Helping students to develop a sense of their place within the discipline and acquiring disciplinary 'ways of thinking and practising' could promote epistemological and ontological transformations (Barradell, 2013, p. 268). If we can provide appropriate support and scaffolding whilst students are transitioning through conceptual gateways, we can ensure irreversibility despite the liminality of learning. Though not a key feature of this work, my data shows that there are layers of acquisition for the professionalism concept that exist and mean that students can display varying degrees of this concept at different times, and hence I have

presented this concept vertically (see Figure 4.2). This aligns with what Nicola-Richmond *et al.* (2019, p. 578) suggest is happening for occupational therapists, able to operate at a junior level, citing the importance of supervision and support provided to junior practitioners.

In summary, this work provides seminal evidence which has allowed for the identification of five thresholds for learning to become a sports therapist that are “troublesome,” “transformational,” “integrative,” “bounded,” and “irreversible.” These include the “threshold mindsets”: acceptance of uncertainty and adaptivity; “threshold skill”: integration (“connecting the dots”); and threshold concepts: clinical reasoning and professional identity, and philosophy. Mathew (Rp) offers a sound description of transformation, inclusive of these thresholds.

Mathew (Rp): *The realisation that you don't have to have the answer in the initial assessment but that you can plan your intervention or support based on their presentation...this for me personally, was a big shift and that then opened the door to I don't have to have that pressure and there are different ways of dealing with things, so knowing that you don't have to come up with a definitive clinical impression, you can have differentials, but as long as you are treating the person as a person and addressing the needs that they have there and then that was, I think, transformative*

4.5 Implications for educators

There are several pedagogical issues that should be considered when trying to support students in grasping the identified thresholds. A threshold concept lens can provide educators with a way to acknowledge critical elements of helping students master skills in a real-world context (Barradell, 2017, p. 364). Educators need to teach students the core concepts that form foundational knowledge while alerting them to the variability and uncertainty within the discipline. Helping students to integrate their knowledge and develop their awareness and tolerance of uncertainty as a natural part of the learning process will also be essential. Educators will need to develop and implement a pedagogy capable of bridging classroom knowledge and clinical experience by increasing the authenticity of the learning encounters and alerting students to the different categories of thresholds that they will face.

Taking account of the need for embracing and accepting uncertainty and shifting away from labelling the injury, there may be more holistic approaches to delivery that will better facilitate

learning and a student's journey through the liminal space. Educators must contextualise and integrate learning to reinforce understanding, make it “irreversible,” and support students through the liminality of learning (Barradell, 2013, p. 268). Three ways that I propose educators can facilitate this include: making connections, making it real, and making the learning future-proof.

4.5.1 Make the connections.

Helping students to integrate their knowledge is essential for assisting them in passing through learning thresholds, and for sports therapists specifically, it is essential that students can connect the dots to effectively clinically reason (Wilson-Thain and Hammond, 2023, p. 195). So, it follows that educators need to assist students in exploring the “threshold skill” of “connecting the dots” and provide authentic opportunities for them to integrate their knowledge. Evidence suggests that the benefits of time spent integrating prior understanding can outweigh the benefits of acquiring new knowledge that may remain isolated and unconnected (Kinchin *et al.*, 2011, p. 212). This reflects what Mezirow (1997, p. 10) wrote of transformational learning:

New information is only a resource in the adult learning process. To become meaningful, learning requires that new information be incorporated by the learner into an already well-developed symbolic frame of reference, an active process involving thought, feelings, and disposition.

Considering the “troublesomeness” associated with “connecting the dots”, a skill of integration, as presented by this research, educators need to ensure that sound clinical reasoning can be developed. This is more likely to be achieved where the curriculum is well constructed, not siloed, and not overwhelmed with excessive content. Educators and students working through limited content in greater depth and with more focus on real-world examples and problems would be what Toohey (1999, p. 56) describes as a cognitive approach, where the suggested aim is higher quality thinking, where students are better at analysing, identifying, and solving problems. Later work has demonstrated that an integrative pedagogical approach can be successful in developing social skills, the learning of domain-specific skills, generic academic skills, creativity, and independence (Tynjälä *et al.*, 2016, p. 15). The pedagogical features of integrative pedagogy are said to be aimed at expertise development for adult learners, in workplace environments (Wallin, Nokelainen and Mikkonen, 2019, p. 361), which is applicable

in the context of sports therapy education, in the higher education sector. Case-based instruction is hailed as generating four types of knowledge, represented in integrative pedagogy: sociocultural, theoretical, practical, and self-regulatory (Lyons and Bandura, 2020, p. 475). Whilst Lyons and Bandura (2020, p. 475) make no connection to threshold concepts, there is mention of the ability for new learning to be influenced, as well as choices and behaviours, practical and conceptual knowledge, and familiar language from the threshold concept literature. This suggests that case-based instruction could be a legitimate option for helping students with the integrative nature of threshold concepts and learning to connect the dots in sports therapy.

An alternative approach could be a concept-based curriculum, designed to teach knowledge in a programme through mechanisms enhancing conceptual understanding rather than rote memorisation of facts (Mitchell and Kramer, 2023, p. 1). Mitchell and Kramer (2023, p. 1) propose that the identification of threshold concepts may expand our thinking about the delivery of concept-based curricular designs. Though specific to the nursing discipline, there are several features of this research that are shared with sports therapy, and therefore, the thinking may be extrapolated. For example, Mitchell and Kramer (2023, p. 2) argue that teaching needs to move away from traditional lectures towards a more dynamic and authentic learning strategy, using robust and scaffolded assessments that promote irreversibility and knowledge retention. As we have seen, stakeholders of sports therapy education have also encouraged a shift away from prescriptive methods.

In education, there are examples of intensive training and practice (ITaP) models which use a scaffolded approach to integrate evidence-based principles with practical application, combining short periods of focused practice, exposure to expert feedback, and integration of theory and practice (DfE, 2022, p. 26). This structure is said to provide a coherence that contributes to the comprehensibility, manageability, and meaningfulness of learning, which in turn can positively impact student attitudes, values, and aspirations (Heggen and Terum, 2013, p. 665). The ITaP model strengthens links between evidence-based theory and classroom practice (DfE, 2022, p. 26). To take this approach, educators need to understand which concepts should guide the curriculum structure; something that a threshold concept lens could assist with.

Threshold concepts rather than the core concepts appear to guide current discussions of what should be considered key curricular content and may be a resolution for the ‘theory-practice’ gap (Salah, Aljerjawy and Salama 2018, p. 876). Giuseppe (Rp) suggests that many students do not understand the importance of the foundational science that underpins the sports therapy profession.

Giuseppe (Rp): *Sport science forms a strong foundation; it has to be there, but students often first year often don't understand why they are doing so much (science), they don't see it as a science course.*

I am unconvinced this is simply a case that students do not ‘understand’ the sport science relevance, but they are likely more resistant to it because it does not naturally fit or has not been presented in a way that connects things together, with the more practice-based elements, for example. This data aligns with literature that highlights that students’ experiences of liminality might manifest in a resistance to learn content that seems to fall into the ‘theory-practice’ gap (Mitchell and Pereira-Edwards, 2022, pp. 34-35). Examples of this in sports therapy are typically research, biomechanics and elements of physiology, the underpinning sport science content.

Educators need to do more to help students make connections between fundamental sport and exercise content and viewing sports therapy as an applied sport and exercise science. This can be achieved by assisting students in integrating their understanding of the use of key procedures with foundational concepts, in view of the threshold (Davies and Mangan, 2007, p. 724). Educators need to make some of the initial connections for the students, or at least make it as easy as possible to draw the lines between content. This likely involves structural modifications to modules, structuring of content, and approaches to delivery and assessment in order to create a more aligned and integrated curriculum.

4.5.2 Make it real.

Better preparing students for the reality of clinical practice as early as possible is vital. With that comes inevitable uncertainty and failure both in students’ clinical practice and as part of the natural course of learning. Educators could do more to provide insights into the different environments in which students may find themselves, so that the post-graduation realisations are less staggering and students are better prepared for industry. Exposing students to the

'uglier' side of the profession and how to advocate for themselves could be profound in helping them to find their professional identity. Such insights may have been "transformational" for someone like Charlie (IP).

Charlie (IP): *I remember getting pulled into a meeting because it was the second time he[player] had a hamstring injury. The university didn't really prepare me for it, but I was in the boardroom with the owner, and he was shouting at me. Expletives were used, and it was costing them £3000 to pay this player. He told me I needed to do a better job. You're going to get grey hairs, and you are going to get it wrong, but that's part of development as a therapist.*

Educators' approaches should include sharing the "troublesome" yet transformative aspects of this discipline with students and providing them with opportunities to embody what it means to be a sports therapist, a professional. Educators need to do this in multiple settings, including the classroom, the research laboratory, and informal learning environments (Holley, 2018, p. 27). This will involve helping learners to cross "troublesome" but vital thresholds so that they are able to accept and embrace uncertainty (Neve, 2019, p. 7). This is a strong theme within the literature and throughout the stakeholder data:

Amy (IP): *Provide them with those awkward experiences...link up with a team because I think the team stuff that really throws you.*

Carlos (IP): *I think we need to push students more and make them uncomfortable with more case scenarios, get them to problem solve... I think as much exposure to real patients, so they can physically see someone's irritable, you know, and actually they don't get down to the three tests, they've done four, and patients are actually painful...It's actually quite normal for it not to go to plan, and you have to kind of be adaptable...confidence to be able to recognise those sorts of things...Before I think you then start questioning things, your own ability, and you feel like you're not confident...it's mentally challenging for people, and it's a tough experience.*

Nic (Ed): *We have a responsibility to give examples of variability...the more they can understand that throughout their journey, they're not to panic and not to doubt themselves because then they start to think they're not a good clinician, but actually that's just part of the process...*

Respondents within a study by Meyer and Land (2003, p. 5) reported the challenges experienced by expert practitioners looking back across thresholds they have long since crossed and attempting to understand the difficulties faced, from a student perspective. The “irreversible” nature of threshold concepts means that a difficult concept may now seem obvious to educators, and they may not remember what was once “troublesome” to understand. Supporting students to make their thinking visible can help identify and address the missing step in their understanding (Neve, 2019, p. 7).

Guided reflection is one way that educators might be able to assist students in making their thinking visible. Reflection helps to form connections between new and existing knowledge. By reflecting on what has been learned, the student can make the necessary connections between different pieces of information and gain a better understanding of how they all fit together (Mann, 2016, p. 259). At the same time, reflection can support the development of professional identity and enhance diagnostic accuracy (Wald, 2015, p. 696). Opportunities for supported authentic reflection will allow students the time to discuss and analyse their experiences and to support their epistemic and ontological shift as they evolve as professionals (Johnson and Hammond, 2018, p. 296). Keeping a reflective account of the thresholds and the experience of moving through the liminal space would be a useful tool for learners and for those taking part in mentoring or peer-assisted learning schemes. It may also prove useful when students graduate and become more experienced practitioners, and find themselves supervising students on an industry placement. It could be a more valuable experience if they themselves are able to recall the thresholds they were faced with and anything that may have helped them to move through the liminal space. An approach modelled by Reilly *et al.* (2020, p. 236) includes getting students to engage in a critical self-reflection following early and frequent exposure to experiential learning opportunities; this resulted in improved student performance both in clinical skills and reasoning.

Among the data, stakeholders agreed that some of the biggest transformations in practice came from observing, shadowing, and working with other practitioners. Being open and transparent with students about experiences and expectations could be pivotal in helping them through uncertainty and in reducing potential power dynamics at play. For example:

Janine (EP): *I use a lot of examples where you might not be right the first time...I've missed that, but it happens, we're human, we don't have X-ray vision....So I'm just really honest with them...Once you've experienced practice for a few years, you know that it doesn't really matter [knowing the answer]...I think they [students] put a lot of pressure on themselves, don't they, on placement, particularly to think they need to know everything. In practice, I don't expect my students to come in knowing everything; I just want them to be willing to learn and ask loads and loads of questions and get as much as they can out of it. I remember what it was like being a student and not really confident.*

Finally, sharing firsthand experiences can be beneficial. The way experts interpret problems in the context of their wider understanding is often hidden from the students and remains implicit while teaching. The links between expert understanding and teaching should be made explicit, so that the process of theorising a subject can be modelled for students; this will help them to 'think' like practitioners (Kinchin *et al.*, 2011, p. 212). To support students to achieve a mindset where "acceptance of uncertainty" is possible, requires educators to enlighten students of the notion that clinical knowledge does not exist in a binary format of 'knowing' and 'not knowing' (Ilgen *et al.*, 2016, p. 437). Through integrated learning, mentoring, and dialogue with practitioners, students can refine their thinking skills, helping them become skilled in translating knowledge to real-life situations, improving teamwork, communication, and interpersonal skills (Jette *et al.*, 2020, p. 203). In addition, educators need to provide this transformational experience in a timely manner, capitalising on the opportunity to help students feel more prepared for practice prior to graduation.

4.5.3 Make it future proof.

Teaching students about threshold concepts could help to develop the skilled, flexible, and fearless approach to lifelong learning that is required from professionals (Gaunt and Loffman, 2018, p. 790). Educators need to lean into potentially transformative philosophies such as biopsychosocial models, and person-centred approaches to achieve education for sustainable futures and prepare the next generation of therapists as outlined by Mathew (Rp):

Mathew (Rp): *The realisations of what a true biopsychosocial lens is...Appreciating that the patient is a person, being able to combine all of those competencies of active listening, empathy, co-construction of interventions, decision making...*

Taking a more person-centred approach is not a new concept, nor is the biopsychosocial model, but these are not signature philosophies of educational programmes; rather, they can be afterthoughts or small sections of a curriculum. Shifting to a spiral curriculum with biopsychosocial models at the centre might allow practitioners to embody a professional sense of self that again enables them to be accepting of uncertainty. Moving away from a purely biomedical model would require a meaningful change in the way that some programmes are organised and how material is taught.

Educators can assist this by providing students access to patients, promoting highly contextualised learning that occurs in a community of practice, where patient care is central (Jensen *et al.*, 2017, p. 867). When students become responsible for patient care in an authentic setting, they can fully appreciate what is needed for adaptive expertise (Betinol, Murphy and Regehr, 2023, p. 147) and, by extension, what is needed for clinical reasoning. As well as providing more meaningful, authentic learning experiences for students to develop their adaptivity, application, and acceptance of uncertainty, educators also need to configure authentic and sustainable assessment practices to encourage the development of lifelong learners (Boud, 2000, p. 151).

If educators ask real-world questions, they can assess much more than the students' knowledge of theoretical principles; they are able to assess their ability to contextualise problems and identify scientific principles to be applied (Meyer and Land, 2005, p. 382). For the identified thresholds to be achieved, learning strategies and evaluation methods will require a student-centred, case-focused, metacognitive approach that allows students to demonstrate discursiveness with concept knowledge (Mitchell and Pereira-Edwards, 2022, p. 35). Educators will need to think carefully about where and when in the curriculum different strategies are employed to facilitate the crossing of thresholds.

Building relationships with students should be at the forefront of identifying “troublesome” knowledge for individuals, to benefit the learner and the educator. The development of a rapport allows for the identification of threshold concepts together, empowering each party to see the threshold concept from the other's perspective (Gaunt and Loffman, 2018, p. 790). Co-creation can support the building of positive relationships, which can build more effective learning environments and a stronger sense of community and belonging (Bovill, 2020, p.

1034). The benefits of 'belonging' translate into tangible academic outcomes, such as increased student retention, enhanced self-efficacy, and active engagement (Hausmann, Schofield and Woods, 2007, p. 835; Hoffman *et al.*, 2002, p. 252), so it seems that this work could have both academic, personal and professional benefit.

If educators can view thresholds in the context of stages of conceptual change, crossing thresholds can lead to changes in 'ways of thinking and practising' which is intrinsically linked to the reshaping of a learner's identity (Davies and Mangan, 2007, p. 724; Jones and Hammond, 2023, p. 989). Applied as a framework as proposed by Barradell, Barrie and Peseta (2018, p. 267), 'ways of thinking and practising' could offer a holistic approach to designing curriculum that incorporates context specific understandings, discourse, values, or ways of acting regarded as central to graduate-level mastery of a subject area (McCune and Hounsell, 2005, p. 257). 'Ways of thinking and practising' can prompt educators to consider what it means to be educated in today's universities for tomorrow's world (Barradell, Barrie and Peseta, 2018, p. 272). Specifically, 'ways of thinking and practising' can encourage educators to design a curriculum that integrates knowledge, agency and real-world learning (Barradell, Barrie and Peseta, 2018, p. 273). The idea of 'ways of thinking and practising' has been a useful addition to threshold concepts, helping to adopt a more extensive view of curriculum (Barradell, Barrie, and Peseta, 2018, p. 267) and together with the newly proposed idea of "threshold mindsets" and "threshold skills", sports therapy educators can begin to untangle the learning journey for students training in this complex and dynamic discipline.

In summary, educators need to help students connect the dots by designing a curriculum that more readily allows for the integration of knowledge. Educators need to provide students with authentic learning experiences and focus on methods that will encourage acceptance of uncertainty, adaptive expertise, develop the skill of integration and promote lifelong learning and education for sustainable futures.

4.6 Researcher's insights

Making the assumption that all students will find the same ideas "troublesome" is misleading (Mac Suibhne, 2012, p. 134). However, my research demonstrates that students are finding many of the same things "troublesome" and "transformative," as observed by students themselves and other stakeholder groups. As a trained sports therapist myself with almost 20

years of experience as an educator, I have reflected on my own perceptions as a practitioner and educator, considering my findings. Themes that did not appear to feature that I thought might have emerged align with the idea of education for securing sustainable futures. Specifically, there was little mention of inclusive education, equity, or diversity, which is likely a reflection of where the discipline is. Where stakeholders did touch on this area, it was clear that this was a zone for potential transformation of identity and practice. For example, educator practitioner Kathryn (EP) highlighted being aware of own biases.

Kathryn (EP): *My biases being aware of those biases...When I graduated didn't know what my bias were, but now I'm very aware of them and therefore I try not to surround myself with an echo chamber of people who have a like mind.*

Patrick (Ed) also highlighted some valid and authentic opportunities that practitioners will face, relating to cultural awareness and diversity of experiences.

Patrick (Ed): *How do to deal with a patient wearing a hijab, who's wearing a burka... Students probably aren't confident because they're probably not spoken to about that or actually given exposure to that.*

Cultural competence or inclusive practice, and other terminology that might describe this skill set, is something we are grossly underpreparing students for in sports therapy education, and it is an essential part of education for securing sustainable futures (Zheng *et al.*, 2021, p. 308). In addition to 'future proofing' this discipline, it is an important feature in sufficiently preparing therapists for professional practice as outlined by educator Patrick (Ed).

Patrick (Ed): *...I think there's a body of work there to make people more comfortable with conversations, not necessarily difficult conversations but conversations with people who do not represent what they do, whether that be cultural or religious point of view, maybe a different sex, someone going through a gender change. Do we prepare our students for that? It's going to be difficult, it's going to be troublesome.*

Just as we could better prepare students for more inclusive practice, educators could be more accepting of other ways of doing things, considering approaches to practice beyond white, Westernised methods. Transformational learning using a threshold lens could be one way to achieve this, as it reflects individuals who are more inclusive in their perceptions of their world

view, able to differentiate, open to other viewpoints and able to integrate differing dimensions of their experiences (Dirkx, 1998, p. 4). This seems precisely what is needed to prepare practitioners for real-world experiences in industry. Educators also need to be critically aware of their learners' perspectives and experiences, culturally and socially, as indicated by professional body representative Mathew (Rp).

Mathew (Rp): *Students need early success, and they need to be able to identify with the knowledge that they are being exposed to, to the person that's exposed them to it and that they feel consciously or subconsciously that they are co-creating that knowledge. Students might have low academic capital and may not look like me, it becomes even more important for me to establish a connection and demonstrate empathy now.*

Professionalism and professional identity were a strong theme throughout the data, but the interrelated idea of 'entrepreneurship' or links with 'business' skills were exceedingly rare, demonstrating that this was likely not at the forefront of stakeholders' minds. In addition, there were very few mentions of research skills and evidence-based practice. When asked, stakeholders tended to think about specific sports therapy curriculum content. Content that connects to the practice of sports therapy rather than things that might underpin practice, for example. They focused more on the 'doing' rather than the 'being' in sports therapy. That is not to say that elements such as entrepreneurship or evidence-based practice could not be thresholds in sports therapy education, but there was insufficient mention of it in my data.

Though threshold concepts were new to almost all the stakeholders taking part in this research, it was insightful to see them all connect with the idea, despite the unfamiliarity. As the conversations went on, descriptions and experiences seemed to evolve. Perhaps the experience of the interview itself was catalytic, as Betinol, Murphy and Regehr (2023, p. 147) described when speaking of adaptive expertise. I got the sense that many of the educators and educator practitioners were thinking deeply about their own approaches to curriculum design and pedagogy, with many appreciating the time to discuss something they rarely get time for.

Chapter 5.0 Conclusion

5.1 Chapter overview

In this concluding chapter, I will summarise the key findings from my research, make recommendations for practice, evaluate the research process, and propose areas for further investigation. Along with the approach to this work, these findings are my original contribution to the sports therapy discipline.

5.2 Summary of key findings

This research investigated stakeholder perceptions of “troublesome” knowledge and thresholds for learning in sports therapy education. The characteristics of threshold concepts proposed by Meyer and Land (2003, pp. 5-6) were used as the conceptual and analytical lens to identify thresholds in this research. A qualitative research design was implemented to obtain data from five stakeholder groups: educators, educator practitioners, industry professionals, newly and newly graduated therapists, and professional body representatives for sports therapy in the UK. My research addressed the following objectives:

- To explore stakeholders’ perceptions of troublesome knowledge in sports therapy education.
- To identify troublesome knowledge and thresholds in sports therapy education.
- To explore the nature and categorisation of troublesome knowledge and thresholds.
- To provide recommendations for sports therapy educators.

The core themes from the data indicate that variability and uncertainty caused by the unique context of the musculoskeletal environment and the clinical encounter with the ‘athlete as patient’ (Wilson-Thain and Hammond, 2023, p. 195) contribute to feelings of uncertainty and fear of failure during clinical practice. A student’s ability to integrate their knowledge to address such variability and uncertainty is a “threshold skill” which, once acquired, contributes to their ways of practising and identifying as a professional, and developing a philosophy of care that is person-centred. The acquisition of the “threshold mindsets”: acceptance of uncertainty, and adaptivity, allows for transformation in a practitioner's ability to tolerate the “greyness” of the sports therapy discipline and undertake effective clinical reasoning.

RQ1 - What is troublesome in sports therapy education and why?

Analysis of data has led to the findings of three thematic areas of “troublesome” knowledge for students: variability and uncertainty; “connecting the dots”; and professionalism and professional identity.

The theme of variability and uncertainty reflects the unique context in which sports therapists practice, working with ‘athletes as patients’. This unique challenge requires therapists to contend with considerable variation in patient presentation, goals and response to treatment. This variability can lead to considerable uncertainty and requires therapists to be adaptive, reflective and critical practitioners to undertake effective clinical reasoning.

“Connecting the dots” represents the troublesome skill of integrating and applying knowledge from across the sports therapy discipline in response to variability and uncertainty. This encompasses specific clinical knowledge and skills, as well as the essential foundations of sport and exercise science.

Finally, professionalism can be “troublesome” for students and something that develops over a long period. Student therapists searching for their professional identity are challenged by the variability and uncertainty of this discipline and seek authentic clinical experiences to undertake transformations in this area.

Collectively, these three “troublesome” aspects of learning to be a sports therapist present the unique challenges for learners and highlight areas for potential transformation along the way.

RQ2 - What are considered transformational moments in sports therapy education?

Connected specifically to the recollection of transformations, ontological shifts and changes in practice, the findings of this research unearthed two key things. Firstly, practitioners experience transformations after graduating when faced with the realities of real-world practice. Secondly, practitioners cite the positive influence that observing and working with other practitioners has on their transformations.

Opportunities for transformations are impeded by limited prospects to undertake high-quality, authentic clinical experiences at critical moments in a curriculum. Curriculum volume, design, and mechanisms for delivery are likely hindering the learning process and delaying said

transformations. Learners require more time in authentic practice settings, with opportunities to engage with and learn from experienced practitioners.

RQ3 - What are the thresholds for learning in sports therapy?

Informed by the “troublesome” themes that arose from the analysis of the data (Figure 4.1), variability and uncertainty, “connecting the dots”, authenticity, and professionalism, I propose five thresholds for learning in sports therapy:

- 1) Acceptance of Uncertainty (Mindset)
- 2) Adaptivity (Mindset)
- 3) Integration (Skill)
- 4) Clinical reasoning (Concept)
- 5) Professional identity and philosophy (Concept)

These thresholds represent “troublesome” and “transformational” elements of learning to become a sports therapist, “bounded” in the unique context of this discipline. Collectively, they represent the thresholds practitioners must acquire on the journey to becoming effective clinical reasoners with established professional identities and philosophies.

RQ4 - Does categorisation of thresholds for learning exist in sports therapy?

From this research and its findings, I propose a new way of thinking about specific learning thresholds. This new idea categorises thresholds into “threshold mindsets”, “threshold skills”, and threshold concepts, alongside a hierarchy of acquisition (see Figure 4.2). “Threshold mindsets” is used where the passing of the threshold requires a cognitive shift in the practitioner’s approach and understanding, and represents more about ‘thinking’ like or ‘being’ a practitioner. “Threshold skills” represent more of the ‘doing’ aspects of undertaking clinical practice. I propose that it is these mindsets and skills that facilitate the acquisition of threshold concepts (clinical reasoning, professional identity and philosophy), presenting, for the first time, the nature and categorisation of thresholds in sports therapy (see Figure 4.2).

RQ5 - What are the implications for educators of sports therapy?

It is clear from the data that the way sports therapy is currently taught, prescriptively, in inauthentic environments and focused on outcomes, is exacerbating the struggles in learning

and contributing to delays in transformations. In addition, the current design of the curriculum, which includes a high volume of content, is siloed, modular and assessment-focused, inhibiting the necessary integration of knowledge and development of adaptive expertise.

It is essential that educators provide more opportunities for students to learn in authentic environments where they will encounter variability, uncertainty, and put skills such as adaptive expertise, critical thinking, and reflection into practice. Time spent in real-world clinical settings with other practitioners will be transformational for students learning to become sports therapists.

5.3 Recommendations

The following recommendations have been informed by the themes identified in the data and designed to best equip students to acquire the thresholds proposed. To assist students during the learning of “troublesome” knowledge and acquisition of thresholds in sports therapy, educators need to consider the following:

- Design a curriculum that is integrated. Move away from isolated, outcome-focused modules and assessments, making use of an integrated curriculum through capstone or synoptic modules and assessments that require students to connect the dots and demonstrate effective reasoning. For example, where possible, require students to draw content from different areas to effectively and creatively problem solve.
- Use a threshold concept lens to explain the different thresholds and layers of learning to students. Discuss the experience of liminality and the feelings students might experience along the way. For example, introducing the notion of uncertainty and particularly in the context of the “greyness” of the sports therapy discipline.
- Educators should be cautious not to overburden students with volume and may wish to avoid prescriptive ‘signs and symptoms’ modes of delivery, to avoid the production of performers or mimicry.
- Teach professional competencies in ways that will promote the development of adaptive expertise and will expose students to authentic clinical learning opportunities, allowing them to learn from other practitioners. For example, using more problem or case-based approaches to nurture students’ adaptive and creative problem-solving skills.

- Introduce students to the notion of “threshold mindsets” and “threshold skills” necessary for practice, distinguishing between the practical, theoretical, and cognitive competencies that learners will need to achieve.
- Adopt scaffolded, authentic, clinical experiences or high-fidelity simulations that offer opportunities for students to develop the skills necessary to clinically reason and promote an adaptive mindset. This could be done by exposing students to authentic clinical experiences, giving them opportunities to face uncertainty, variability, and, critically, failing in a safe environment. For example, scaffolding low to high-stakes experiences with real patients to ensure authenticity.
- Build connections with placement providers that offer students high-quality, “transformational” experiences. Invest time in quality assuring placement activity so that all students can benefit from authentic and worthwhile experiences.
- Work to set and share expectations of programmes and the profession as early as possible. Provide a window into the professional environment and the development of professional identity and philosophy sooner, so that the transitions post-graduation are smoother. This could include discussing and exploring the discipline more holistically with students, to include expectations, values and behaviours. Using ‘ways of thinking and practising’ is one such way that this could be achieved.
- Engage in conversations with other educators about thresholds in sports therapy education. This allows us to reflect and gain different insights into how we plan teaching and facilitate learning.
- Professional bodies must promote the use of more authentic learning environments that will facilitate the development of adaptive expertise. Frameworks and competency guidance should be updated to reflect this.
- Educators and professional bodies should consider using ‘ways of thinking and practising’ as a holistic tool for reviewing curriculum, identifying competencies and exploring thresholds for learning (Barradell, Barrie, and Peseta, 2018, p. 267).

5.4 Evaluation of the research process

The strength of this research process has been the engagement in a wide-reaching stakeholder inquiry to examine troublesome knowledge and thresholds for learning in sports

therapy education. I attribute the success to the strong professional connections of myself and other therapists who were central to the snowball/chain referral sampling methodology. The scale of the research is a positive step forward for this discipline and will be instrumental in moving the education of sports therapy forward, based on evidence.

Although this research is the first of its kind in the discipline of sports therapy and the first to gather the perspectives from five stakeholder groups, there were several limitations worthy of note that would require addressing in future research of this nature. The initial questionnaire design was successful in yielding many responses from the stakeholder groups. However, it became clear that the questions were open to interpretation and, on three occasions, were misinterpreted by stakeholders. Instead of focusing on what was “troublesome” for students from a curriculum point of view, respondents focused on the attendance and engagement of students. Participants were not provided with a summary of threshold concepts as part of the questionnaire, which, on reflection, may have been useful and may have prevented misinterpretation. It is essential that all participants understand what troublesome knowledge and threshold concepts are to be able to identify them (Barradell, 2013, p. 274). An additional downfall of the original questionnaire was that it did not appeal to the nearly and newly graduated stakeholder group. As discussed in the methods chapter, this was addressed with a bespoke communication and modified questionnaire design, which yielded more responses. If I were to undertake this research again, I would attempt to make the initial parts of the questionnaire more informative in terms of setting the groundwork and familiarising participants with troublesome knowledge and threshold concepts. I would also more carefully consider the different audiences among the stakeholder groupings and establish how best to reach the varied groups.

The strength of the 1:1 semi-structured interview was that stakeholders were able to clarify anything that they were uncertain about, and I was able to guide the discussion. The semi-structured interviews also incorporated an introduction to threshold concepts and specifically the characteristics proposed by Meyer and Land (2003, pp. 5-6). Though the semi-structured interviews were time-consuming, forty-five minutes each, the process was enjoyable. It felt like valuable time spent in discussion with other practitioners, which is a rare opportunity in current

times. In particular, I think the educators and educator practitioners who took part found the process and opportunity to reflect on practice, curriculum, and student learning cathartic.

To my knowledge, this is the broadest stakeholder inquiry undertaken in the allied health professions, in relation to identifying troublesome knowledge and thresholds of learning. The inclusion of five stakeholder groups in one piece of research is in itself a novel approach. This work is strengthened not only by the inclusion of professional body representation but also by the good spread of representation from both the Society of Sports Therapists and the British Association of Sport Rehabilitators, accredited programmes as a total percentage. One could argue that individual responses may not represent the view of the rest of an institutional team, and there could be more variation in views than presented in the data. There was varied engagement from the various stakeholder groups, resulting in unequal sample sizes, but this was taken into consideration when analysing the data, and, for example, where themes were not strongly represented in all groups, they were cautiously interpreted.

Given that threshold concepts were unfamiliar to the participants, if I were to undertake this research again, a further opportunity for participants to reflect may well have proven useful for the identification of more thresholds or added clarity where themes were unshared. This may have also increased the validity of the data by using a retest interview. The test-retest method would include a second interview to check for consistency in participant responses and explore things in further depth where necessary (Roos, 2022, p. 434). However, this would have required a significant increase in data collection time, given the number of participants interviewed. This would have been unachievable in this research, but should be a consideration for future work.

Though there are notable limitations of using thematic analysis software (St John and Johnson, 2000, pp. 395-396), the use of NVivo in addition to conducting this process by hand could have offered another source to inform data triangulation. This might have strengthened the validity and reliability of the data further, though notably would also increase the time taken to undertake this research considerably, specifically the analysis.

As outlined in the literature review, the task of identifying threshold concepts is plagued with challenges predominantly related to the reliable application of characteristics that determine a threshold concept (Barradell and Peseta, 2016, p. 271). A strength of this research is that I

adopted a mindful approach to all characteristics when trying to identify troublesome knowledge and thresholds, and though there were occasions where the mention of characteristics was not explicit, especially in relation to “boundedness” and “irreversibility”, educators have been encouraged to move through the discussion of what ‘concept’ means and focus attention on the transformative impact on the learner, and learning (Timmermans and Meyer, 2019, p. 357). Using a threshold concept lens facilitated this mindful approach.

5.5 Future research

Future research should aim to achieve consensus among stakeholders on the key thresholds in sports therapy education. This would enhance the rigour of the argument and provide evidence that extends beyond my interpretation of the data. I propose that this is done via Q-sort or similar consensus methodology, as this provides researchers with a tool for systematically exploring perceptions, to identify areas of overlap and difference (Akhtar-Danesh *et al.*, 2008, p. 760). This could be particularly useful for exploring areas that were less certain or unshared among the stakeholders. Similarly, the addition of a second stage analysis conducted by ‘experts’ as suggested by Correia *et al.* (2024, p. 40) could add rigour to this work.

Trialling the implementation of the recommendations related to curriculum and pedagogical approaches would support the evaluation of their effectiveness and impact. Although the full implementation of all recommendations may necessitate significant modifications to degree programmes, they have been presented in a manner that allows any institution to adopt one or two recommendations. These could substantially enhance a student’s journey through the liminal space and increase the likelihood of transformation.

This research did not attempt to capture or interrogate the diversity of stakeholders taking part. Such data could have provided valuable and useful insight for the discipline. To demonstrate inclusivity, avoid gender-based assumptions and protect anonymity, all stakeholders have been referred to using gender neutral language and/or they/them pronouns. Diversity, equity, and inclusivity (DEI) was mentioned two to three times across the data collection process, which is surprising given its importance and wider recognition across professional settings and the higher education sector. More understanding of DEI in the context of being a practitioner could assist students in becoming more adaptive to the settings they find themselves in and would

support working towards developing education for a more sustainable future. Future work should seek to include this as a priority.

The use of a threshold concepts lens offers the opportunity for rethinking student learning and curriculum design. Identifying threshold concepts can help educators consider what, why, how, and when they teach. Embedding threshold concepts successfully in a curriculum carries the potential to positively shape student learning (Barradell and Peseta, 2016, p. 263). This work presents a novel contribution to the field of sports therapy education, and though threshold concepts are not without criticism, the use of a threshold concept lens has allowed for the identification of “troublesome” knowledge and thresholds in sports therapy education, for the first time.

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Appendices

Appendix A. Student Communication

Dear Student/Recent Graduate

Thank you for taking the time to read this email. I know you receive lots of communication over the duration of your course.

I am writing to seek your involvement in a research project that I am undertaking as part of my Doctoral studies. I am seeking the views of 'nearly' and 'newly' graduated students of Sports Therapy and Sports Rehabilitation programmes in the UK.

What is in it for you? Honestly, nothing in the immediate term, but I am hoping that the findings of this investigation will help our profession and the future of Sports Therapy education. You might find yourself supervising or even teaching students of the future who have been impacted by this research and your valuable input. It should not take long!

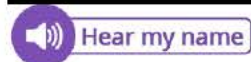
If you would be happy to contribute to this investigation by participating, please follow the link below to a short online survey.

<https://glos.onlinesurveys.ac.uk/sports-therapy-student-survey>

Thanks, in anticipation!

Best wishes
Sam

Samantha Wilson-Thain SFHEA (she/her/hers)



Appendix B. List of providers

Society of Sports Therapists	British Association of Sport Rehabilitators
London Metropolitan	Wrexham Glyndwr University
University of Hertfordshire	University of Sunderland
University of Chichester	Queen Margaret University
University of Central Lancashire	University of the West of England
University College Birmingham	Teesside University
Edge Hill University	St Mary's University College
Leeds Beckett University	Plymouth Marjon University
Coventry University	Salford University
University of Worcester	University of Nottingham
University of Gloucestershire	University of Northampton
Staffordshire University	Newcastle College
University of East London	Middlesex University
Hartpury University	Liverpool Hope University
University of Essex	University of Kent
University of Wales - Trinity St David	Hull University
Buckinghamshire New University	University of Cumbria
Solent University	University of Bolton
Bournemouth University	London Southbank University
Birmingham City University	University of Bedfordshire
University of Derby	Canterbury Christ Church University
Anglia Ruskin University	
Loughborough College	
Wolverhampton University	
University of South Wales	
University of Lincoln	
University of Winchester	
York St John University	
Moulton College	
University College Bishop Burton	

*As at the start of this project in May 2023

Appendix C. Questionnaire

1. Thinking specifically about the education of this discipline (what practitioners need to learn), use as many words as you can to describe what you feel is/was/has been the most "troublesome" component. This could be theoretical concept, a practical skill, a particular behaviour, or anything else you can think of.
2. What else do you perceive to be troublesome?
3. What do you think it is about these particular things that makes them troublesome to learn? Please be as descriptive as possible.

Appendix D. Recruitment Communications

Dear XXX

I hope this email finds you well.

I am writing to seek your support and involvement in a research project that I am undertaking as part of my Doctoral studies. I am attempting to get a rich picture of the views/perceptions of key stakeholders in musculoskeletal therapy education (specifically graduate level Sports Therapy and Rehabilitation).

I am hoping to speak with programme leads and educators working in the sector currently, as well as accessing small groups of level 6 students/recent graduates of those programmes. The attached information gives a little more detail regarding this investigation. I am also looking to gather the views of PSRB's and those working in the industry.

If you would be happy to contribute to this investigation by participating yourself, and/or helping to recruit student volunteers, please follow the below link to the initial stage (online survey) and forward as you see fit.

Best wishes

Sam

Dear xxx

I am writing to seek your support and involvement in a research project that I am undertaking as part of my Doctoral studies. I am attempting to get a rich picture of the views/perceptions of key stakeholders in musculoskeletal therapy education (specifically graduate level Sports Therapy and Rehabilitation).

I am hoping to speak with educators, professional bodies, practitioners working in industry, and small groups of level 6 students/recent graduates, with the ambition to get representation from all UK HEI's.

If you would be happy to contribute to this investigation by participating yourself and helping to recruit others in your network by passing it on, please follow the below link to the initial stage (online survey).

<https://glos.onlinesurveys.ac.uk/evaluation-of-musculoskeletal-therapy-education>

The initial survey will not take longer than 10 minutes and the follow up discussion/interview is only 45 minutes, online.

Look forward to hearing from you.

Best wishes

Sam

Appendix E. Draft Questionnaire

- 1.What is troublesome about sports therapy practice?
- 2.What is troublesome about sports therapy education (if different)?
- 3.What else do you perceive to be troublesome?
- 4.Why are these things troublesome?
- 5.What examples do you have (self or others) of struggling with these things

Appendix F. Revised Student Questionnaire

1. Of all the things you have needed to learn to become a Sports Therapist/Rehabilitator, what has been the most "troublesome", "challenging", "difficult" component? This could be theoretical concept, a practical skill, a particular behaviour, or anything else you can think of. Please be as descriptive as possible. How did it make you think, feel, behave?
2. What made it "troublesome", "challenging", "difficult" to learn?
3. Are there any bits of learning, experiences or interactions that have changed the way you do things or think as a therapist? If so, what were they? What was the impact on you?
4. What do you feel are the most important skills/attributes you need, to be a successful practitioner?
5. If you would like to add any additional information that you think is relevant but that does not sit naturally in the above questions, please feel free to do so here.

Appendix G. Interview Structure

Part two - Semi-structured interview

Opener

- Confirmation of participation and check receipt of informed consent
- Thank you for completing the initial Questionnaire – which we can discuss in a few minutes.
- Introduction and purpose (recorded/transcribed/confidentiality/anonymity)
- Participant details (confirm stakeholder group, own qualification, years' experience)
 - Tell me about your own training.
 - How many years have you been educating/practicing?

A brief introduction to threshold concepts

Are you familiar with threshold concepts before?

- If yes, what is your understanding?
- If no, back to key points
 - TCF/Lens – Meyer and Land
 - Key characteristics
(transformational/irreversible/Troublesome/bounded/integrated)
 - Troublesome but transformation – key focus of this investigation
 - Liminal space

Questions

- What do you perceive to be the most challenging parts of Sports therapy education SPTE and why?

Thinking now about TC's and the idea of troublesome knowledge – would your answer be different?

- What do you perceive to be the most troublesome parts of SPTE?
 - Are these the same things reflected in practice?

What would you consider to be true threshold concepts in SPTE?

- Do you think these are equally weighted?
 - How important do you view these? How might you order them?
- What do you feel would help students/clinicians to develop these concepts?

- What do you do as an educator/practitioner to help students get through troublesome knowledge?

Appendix H. Participant Debrief

Dear Participant,

Thank you very much for participating in the study investigating Threshold Concepts and Troublesome Knowledge in Sports Therapy and Rehabilitation.

My hope is that the information that you and other participants provide will help us to better understand the components of “troublesome knowledge” within curriculum and approaches used in the education of these concepts.

We would like to take this opportunity to reassure you that your data from this study will be anonymised and will be held confidentially for a maximum of 15 years before being destroyed. Data will be stored via the University cloud in password protected files, of which only the researchers have access to.

Owing to the anonymisation of data, you will not be identified in any publications resulting from this research. The University’s Privacy Notice can be found at this link: <https://www.glos.ac.uk/information/knowledgebase/Research-Participants-Privacy-Notice/>.

We would also like to remind you that you have the right to withdraw from this study at any point, while data is being collected. If you wish to withdraw your data after data collection has taken place, you have 30 days from your last engagement with the investigation, to do so. Beyond this point, it may be difficult to extract your data from the analysis. If you would like to withdraw your data, please contact any member of the research team (email addresses at the end of this email).

Again, thank you for your participation in this study. If you have any further questions or would like a summary of the finding of this research following completion of data collection, please don’t hesitate to contact a member of the research team and they will be happy to send it to you when it becomes available.

Kind regards

Samantha Wilson-Thain

University of Gloucestershire

Email addresses

[REDACTED]

This project has received ethical approval from the University’s Research Ethics Committee. Please contact REC Vice Chair, Dr Robin Bown, [REDACTED] if you wish to raise any ethical concerns

Appendix I. Informed Consent

Informed Consent Form

Please read the accompanying study information letter for full details and speak to the study investigator prior to signing this form.

I confirm that I –

1. Have read the research study information letter
2. Have had the opportunity to ask questions and discuss study requirements
3. Have received satisfactory answers to all of my questions from the researcher
4. Understand that I will not be identified in any publication arising from this study
5. Understand that I am free to withdraw from the study at any point, while data collection is taking place and my data can be withdrawn up to 30 days following my last engagement with the investigation, without giving a reason
6. Agree to take part in the study

Initial

Name:

Signed: Date:

I am satisfied that the above-named person has given informed consent.

Investigator name:

Signed: Date:

Appendix J. Codes and Themes

Themes	Subthemes	Codes
Acceptance of Uncertainty	• Grey area • Liminality • Fear of failure • Uncertainty	• Patient differences • Non-textbook • Variability • Troublesome • Stuck • Struggle • Confidence
Integration	• Connecting the dots	• Connecting modules • Understanding SPX • Seeing connections • Considerations for rehab
Authenticity	• Real world • Theory practice gap • Placement	• Uninjured patients/scenarios • Learning from others • Time in practice • Post-graduation realisations • Experience
Adaptivity	• Adaptive mindset	• Adaptable • Flexible • Mold to environment

		• Creativity • Critical thinking • Problem solving
Professionalism and Professional Identity	• Professional behaviours and interactions • Philosophy	• Building relationships • Rapport • Soft skills • Communication • Reflection • Person-centred care
Barriers/enablers	• Curriculum design • Curriculum delivery	• Time • Attendance • Engagement • Prescriptive curriculum • Structure and content • Load/volume • Expectations of PSRB's • Authenticity
Knowledge and Skills	• Pain science • Applied Anatomy • Practical skills	• Understanding pain • Biopsychosocial approach • Mobilisations • Rehab

Appendix K. Ethical Approval



Dr Hilary Weeks School of Education and
Research Ethics Lead Humanities
School of Education and Humanities

Email: h.weeks@gloucestershire.ac.uk

Ms Samantha Wilson-Thain
Via Email

5 May 2023

Dear Samantha,

Thank you for your application for ethical approval.

I am pleased to confirm ethical clearance for your research following ethical review by the Research Ethics Panel of the School of Education and Humanities.

Please keep a record of this letter as a confirmation of your ethical approval.

Project Title: *Identification and evaluation of threshold concepts and signature pedagogies in Athletic Therapy education and implications for curriculum*

Start Date: February 2023

Projected Completion Date: February 2025

SREP Approval Code: EDU202325

If you have any questions about ethical clearance please feel free to contact me. Please use your School Research Ethics Panel Approval Code in any future correspondence regarding this study.

Good luck with your research project.

Yours sincerely,



Dr Hilary Weeks

Appendix L. Privacy Statement

Research Participants Privacy Notice

Last updated: 9 February 2022

In order to undertake academic research and to train students in research methods, staff and students at the University of Gloucestershire collect and process various types of personal data. The University is committed to being transparent about how it collects and uses that data and to meeting its data protection obligations.

1. IDENTITY AND CONTACT DETAILS OF THE DATA CONTROLLER

The Data Controller (the organisation responsible for how your data is processed) is the University of Gloucestershire. The University is registered with the Information Commissioner's Office and it is committed to protecting the rights of individuals in line with Data Protection legislation.

A copy of this registration can be found [here](#).

2. CONTACT DETAILS OF THE DATA PROTECTION OFFICER

The Data Protection Officer is responsible for advising the University on compliance with Data Protection legislation and monitoring its performance against it. If you have any concerns regarding the way in which the University is processing your personal data, please contact the Data Protection Officer at:

Data Protection Officer
University of Gloucestershire
Registrar's Directorate
Fullwood House
The Park
Cheltenham, GL50 2RH

Email: dpo@glos.ac.uk

3. WHAT INFORMATION DOES THE UNIVERSITY COLLECT?

The University collects a range of information in order to carry out its research activities. This may include personal data such as name and address, date of birth, or information on your views on specific research topics. The University may also collect special category (sensitive) personal data as defined under Data Protection legislation such as information about racial or ethnic origin, political opinions, religious or similar beliefs, health, genetic or biometric data (where used for ID purposes).

The University collects this information in a variety of ways. For example, it might be collected via surveys or questionnaires, through interviews of focus groups, or by taking photographs, audio or video recordings.

For each individual research project you will be provided with a Participant Information Sheet, which explains in more detail the kind of information that will be collected, and how this will be done.

4. WHAT IS THE PURPOSE AND LAWFUL BASIS OF COLLECTING MY DATA?

Undertaking research, publishing research and training students to undertaking are tasks that are in the public interest. Universities undertake these activities so that they can fulfil their function as a Higher Education institution. Some types of research will require the collection of personal data including, where appropriate, special category personal data, in order that the aims of the research can be achieved. The University will only collect the information that is necessary to undertake each specific research project. If we are able to anonymise or pseudonymise the personal data you provide we will undertake this, and will endeavour to minimise the processing of personal data wherever possible.

Where we rely on a different lawful basis such as consent or legitimate interest we will inform you of this in the Participant Information Sheet provided to you.

There is no statutory or contractual requirement to provide your personal data to us through participating in a research project.

The University will not use your personal data for automated decision making or profiling about you as an individual.

5. HOW AND WHERE YOUR DATA ARE HELD

All research projects involving the collection of personal data are subject to an ethics review, to ensure that appropriate arrangements are made for the secure storage of your data. If you take part in a research project, you will be provided with a Participant Information Sheet that will outline in more detail how and where your data are stored.

6. WHO HAS ACCESS TO THE DATA?

Your data will be accessed by members of the research team (including Supervisors of student research projects), however, most personal information used in research will be de-identified where-ever possible before sharing more widely or publishing the research outcomes. If it is not possible to de-identify your information, we may ask for your consent to share or otherwise make your personal information available to others. Information shared will be on a need to know basis, not excessive and with all appropriate safeguards in place to ensure the security of your information. It may sometimes be necessary to share your personal information with other researchers for the purpose of achieving the research outcomes. Where researchers wish to use any information that would identify you, specific consent will be sought from you.

If it is necessary for anyone else to have access to the data, or for the data to be shared more widely (including any transfers outside the European Economic Area), this will be made clear in the Participant Information Sheet that will be provided to you before you agree to participate in the research.

7. HOW DOES THE UNIVERSITY PROTECT THE DATA?

In order to protect your rights and freedoms when using your personal information for research and to process special category (sensitive) information, the University must have safeguards in place to help protect that data. The University takes the security of your personal data very seriously and it has policies, procedures, training, technical and organisational measures in place to ensure that your information is protected. All research projects or studies involving personal data that has been identified/deemed higher risk are scrutinised and approved by a research ethics panel or committee.

8. HOW LONG IS MY DATA KEPT?

If you take part in a research project, you will be provided with a Participant Information Sheet that will outline in more detail how long the data will be held for and, where applicable, the re-use of the data.

9. DATA SUBJECT'S RIGHTS

Under Data Protection legislation you have the following rights:

to request access to, and copies of, the personal data that we hold about you;

to request that we cease processing your personal data;

to request that we do not send you any marketing communications;

to request us to correct the personal data we hold about you if it is incorrect;

to request that we erase your personal data;

to request that we restrict our data processing activities (and, where our processing is based on

your consent, you may withdraw that consent, without affecting the lawfulness of our processing based on consent before its withdrawal);

to receive from us the personal data you have provided to us, in a reasonable format specified by you, to another data controller;

to object, on grounds relating to your particular situation, to any of our particular processing activities where you feel this has a disproportionate impact on your rights and freedoms.

It is important to understand that the extent to which these rights apply to research will vary and that in some circumstances a right may be limited when the data is being used for research purposes. It should also be noted that we can only implement your rights during the period upon which we hold personal identifiable information about you. Once the information has been irreversibly de-identified or anonymised and becomes part of the research data set, it will not be possible to access your personal information.

If you would like to exercise any of these rights or have any questions regarding your rights, please contact the University's Data Protection Officer, using the contact details under Section 10 below.

10. HOW TO RAISE A QUERY, CONCERN OR COMPLAINT

If you have questions about the particular research study you are participating in, please use any contact details you have already been supplied with regarding the research study or project.

If you have general queries, concerns or wish to raise a complaint about how your personal data is used by the University, or if you wish to exercise any of your rights, you should contact the Data Protection Officer in the first instance, using the contact details under Section 2 above.

If you remain dissatisfied, then you have the right to refer the matter to the Information Commissioner's Office (ICO). The ICO can be contacted at:

Information Commissioner's Office,
Wycliffe House,
Water Lane,
Wilmslow,

Cheshire,
SK9 5AF

Telephone: 0303 123 1113

Website: www.ico.org.uk

Appendix M. Information Sheet

Dear Participant

Thank you for taking the time to read this information letter, for the study that you have been invited to participate in.

What is the purpose of the study?

The purpose is to evaluate the perceptions of sports therapy education by key stakeholders. Specifically it seeks to investigate what is troublesome about the learning of sports therapy.

Why do we want to investigate this area?

This is an area that is yet to be explored and may have implications for curriculum design and delivery.

What does the study involve?

If you agree to participate in the study you will be asked to take part in a short online questionnaire and a face to face (virtual) semi-structured interview.

Why have I been chosen?

You have been chosen as you are currently a member of one of the key stakeholder groups (Education, Industry, Professional body, Student/Graduate)

Do I have to take part?

Taking part is entirely voluntary. If you would like to take part, you can complete the attached consent form and make contact with the principal researcher. Participation in or withdrawal from this investigation as a student, will have no impact on your grades or module outcomes.

What if I wish to withdraw?

Whilst data is being collected, if you choose to, you can drop out of the study at any point, without reason. If you wish to withdraw after data collection has taken place, you can request that your data is removed from the study up to 30 days following your final engagement with the investigation. Beyond this time, it may be difficult to extract your data from the analysis.

How will be data be used?

All data collected would be anonymous so that you would not be able to be identified within the data at any point. All written information collected will be stored in a locked cabinet in a locked office, and any electronic data collected will be held on a password protected storage (cloud) facility on a computer. The data is kept for fifteen years, following which it is securely destroyed.

Who is funding the project?

The project is not funded and there are no collaborative partners involved.

How will the results be presented?

The data collected is very important and will be presented in a thesis as part of the requirements for a Doctorate of Education. Data may be publishable following completion of this project also. You will not be identified in any publications resulting from this research.

If you have any queries or would like to receive more detailed information about the project then please contact the lead researcher Samantha Wilson-Thain on sbarrywilson@glos.ac.uk or glos.ac.uk.

This project has received ethical approval from the University's Research Ethics Committee. Please contact REC Vice Chair, Dr Robin Bown, [REDACTED] if you wish to raise any ethical concerns.