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Irish Clinicians' Self-Efficacy in Concussion-Care within Sporting Environments:
From Education to Practice

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Student Declaration

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I hereby certify that this material, which I now submit for assessment on the programme of study leading to the award of Doctor of Elite Performance (Sport) is entirely my own work, and that I have exercised reasonable care to ensure that the work is original and does not to the best of my knowledge breach any law of copyright, and has not been taken from the work of others save and to the extent that such work has been cited and acknowledged within the text of my work.

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Abstract

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Introduction
Concussion-related clinical practices lack quality and consistency worldwide. The level of clinicians' self-efficacy, a belief in ability to succeed in the context of concussion-care, might be a contributing factor. This research aimed to explore Irish clinicians' concussion-related self-efficacy during professional education and clinical practice, through the lens of the triadic reciprocal determinism (TRD) model and the four general self-efficacy sources.

Methods
In total, 285 clinicians (certified athletic therapists, chartered physiotherapists, emergency medical services professionals) and 98 final-year athletic therapy (AT) students participated in a cross-sectional, quantitative evaluation of self-efficacy in concussion assessment and management skills, clinical practices and factors impacting self-efficacy. Following that, guided by an interpretative phenomenology approach, qualitative investigation of factors influencing development of self-efficacy during professional education and clinical practice took place. The perceptions of 12 clinicians and 20 AT students were investigated using a semi-structured interview/focus group format, and reflexive thematic analysis approach. Findings of the aforementioned investigations guided development of recommendations for educational practice.

Results
The overall levels of concussion-related self-efficacy among Irish clinicians and AT students were moderate. However, their skill-specific scores varied from very low to high and correlated with frequency of their use with concussed patients. All general sources of self-efficacy were found relevant in the context of concussion-care. Although practice in a relaxed, real-life environment and educators' feedback were the highest-rated influencing factors, broader environmental and personal factors modified the outcomes of those experiences, in line with the TRD model. Concussion-related self-efficacy is a dynamic attribute that fluctuates throughout clinicians' professional life. The period of enrolment on professional education programmes is critical for the development of a strong self-efficacy foundation.

Conclusion
Concussed patients in Ireland receive care from clinicians who feel only moderately efficacious about delivery of optimal concussion-care. Professional and personal development should be promoted throughout professional healthcare education and embraced by the students. Clinicians should strive for excellence utilising a variety of continuing professional development opportunities. However, achieving high-level concussion-related self-efficacy might not be possible without joint support of stakeholders and mentors within clinicians' professional education and work environments.

Table of Contents

List of figures

Glossary of abbreviations

AT – Athletic Training / Therapy

CAT - Certified Athletic Therapist

ChP - Chartered Physiotherapist

CISG - Concussion in Sport Group

CTE – Chronic Traumatic Encephalopathy

EMSP - Emergency Medical Services Practitioner

GAA – Gaelic Athletic Association

PCS – Post-Concussion Syndrome

PPCS – Persistent Post-Concussion Symptoms

REB – Rational Emotive Behavioural

RTA - Reflexive Thematic Analysis

SAC – Standardised Assessment of Concussion

SCAT – Sport Concussion Assessment Tool

SCOAT6 – Sport Concussion Office Assessment Tool

SCR – Sport-Related Concussion

SCT – Social Cognitive Theory

SOAP – Subjective, Objective, Assessment and Plan

TES – Traumatic Encephalopathy Syndrome

TRD – Triadic Reciprocal Determinism

<h1 style="text-align:center">Research outputs</h1>

Peer-Reviewed Journal Publications:

Postawa, A. P., Whyte, E. F. and O'Connor, S. (2024) *Are Irish Athletic Therapy Students Confident in Concussion Assessment and Management? A Cross-Sectional Study of Final Year Students' Self-Efficacy*, International Journal of Athletic Therapy and Training, 29(3), pp. 141–148. doi: 10.1123/ijatt.2023-0081.

Postawa, A. P., O'Connor, S. and Whyte, E. F. (2024) *Concussion assessment and management self-efficacy among Irish clinicians*, Sports Health, 13(X), pp. 1–36. doi: 10.1177/19417381241287209.

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Conference Presentations:

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Postawa, A. P., Whyte, E. F., O'Keeffe, S., Burke, A., O'Connor, S. *'Is it just me?' Work Environment and Clinician's Concussion-Related Self-Efficacy*, Isokinetic Conference 2025, Madrid (2-5/05/2025)

Conference Posters:

Postawa, A. P., Whyte, E. F. and O'Connor, S. *The levels of Irish athletic therapy students' self-efficacy in concussion assessment and management.* National Sport and Human Performance Conference, University of Limerick (29/09/2023)

Postawa, A. P., O'Connor, S. and Whyte, E. F. *The levels of self-efficacy in concussion assessment and management among allied healthcare professionals in Ireland.* British Association of Sport and Exercise Medicine Annual Congress, Manchester (5-6/10/2023)

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Dedication

To Łukasz,

Thank you for believing in me when I did not believe in myself. Without you, I would not be

who I am today…

Chapter 1: Introduction

1.1 Establishing context

In recent years, concussion has become a major public health issue (O'Connor *et al.*, 2022a) evident particularly across sporting environments (McCrory *et al.*, 2017). Millions of people worldwide play and watch sport, and are emotionally connected to the athletes and teams they support (Apostolou and Lambrianou, 2017; Guo, Yang and Zhang, 2024). Observation of the impact that injuries can have on the careers of the individual athletes, and the whole teams, is a part of this experience. Although every injury evokes emotions in the world of sport (Campo *et al.*, 2018; Oshimi, 2021), concussion is likely the most controversial of all. The phenomenon of concussion stems from its clinical presentation, where it may manifest with no visible signs (Kontos *et al.*, 2019), which contrasts with the recently highlighted possibility of its link with detrimental health consequences (Patricios, Schneider, *et al.*, 2023). Moreover, the pace at which concussion-relevant research has been growing (Malcolm, 2021) can lead to a situation where many of the sports environment stakeholders, including team managers, coaches and athletes themselves, experience first-hand the significant change in the way concussion is perceived and managed. Change often leads to resistance, especially when a rational outlook is blurred by emotions (Cheraghi *et al.*, 2023), hence the attitudes and beliefs regarding concussion observed within the sporting environments, are often not aligned with the scientific evidence (Malcolm, 2016). Amongst the stakeholders affected by the evolution of concussion-relevant research there are also the members of medical support teams. Their concussion-related professional knowledge and skills have been continuously challenged over the past years and are required to develop in line with the new evidence. Although clinicians first and foremost have a duty of care to their patients-athletes, they are also humans, susceptible to doubts and societal influences of an environment that still does not fully understand concussion (Malcolm, 2009). Past investigations have continuously indicated a problem of sub-optimal concussion-related athlete care, and its multifactorial nature, that involves a variety of individual- and organisational-level stakeholders (Malcolm, 2021; Rosenbloom *et al.*, 2022; McLoughlin, 2023). A similar breadth of challenges, including those related to clinicians themselves, professional education institutions, and sports governing bodies, have been reported in Ireland (McGrann and Keating, 2012; Scully and Falvey, 2021; Walshe,

Daly and Ryan, 2023, 2024), where approximately 30-50% of athletes had suffered at least one concussion in the past (Sullivan, Thomas and Molcho, 2016; O'Connor, Geaney and Beidler, 2020; O'Connor *et al.*, 2022b). Clinicians as the direct providers of medical care are one of the main elements of the athlete health management system. Therefore, I believe they require attention and support in order to strive to deliver optimal concussion-related patient care. As a clinician and a healthcare educator, I decided to explore this subject, and this thesis is a summary of the journey I have undertaken throughout the past four years. Across the chapters of this thesis, the word 'clinician' will be used to represent healthcare practitioners who commonly provide concussion-related patient care within sporting environments. Depending on the context and geographical location, this term may encompass practitioners holding various professional credentials.

1.2 Biographical positioning and personal philosophy

On commencing the professional doctorate studies, I had been an athletic therapy lecturer at the Technological University of the Shannon, Midlands for nine years. My professional background is healthcare, with both undergraduate and postgraduate degrees obtained in physiotherapy. I had practiced as a physiotherapist for seven years before taking up the position of an educator, and it took me some time to shape my personal identity in the new role. Reflecting on that process of career shift, I can clearly see the influences of my previous work as well as my personal interests and values on who I am today as an educator. The main aim that always underpinned my work was to make a difference in the lives of others. This idea motivated me in my role as a physiotherapist, and it keeps motivating me as an educator.

The overall goal of the third level education is to produce qualified professionals that can serve the community (Newton, Da Silva and Berry, 2020). However, in the process of educating future clinicians, my personal goal is to help them grow not only into competent practitioners, but also into confident and resilient professionals. A view emerging from the care theory by Nel Noddings, is that a relationship in which students feel respected and cared for, facilitates their confidence in achieving the learning goals, increases their engagement and promotes academic success (Yan, 2019; Flaherty and Mccormack, 2023). With this in mind, I care about the learning environment in my classroom, and I aim at creating a relaxed and harmonious space where every student feels they can succeed. Literature suggests that the educator-student relationship has a

potential to not only ease students' learning anxiety and emotional obstacles, but can also facilitate their motivation to learn and inspire their self-directed learning (Yan, 2019; Zhang and Zheng, 2021). This view deeply resonates with me, hence in my practice I strive to build meaningful professional relationships with my students and support them on their educational journey.

One of the greatest challenges that my students face during their clinical placements is the management of concussion within sporting environments. During informal conversations they have often admitted to lack confidence in concussion-related clinical decision making and athlete management. This is in line with literature, as concussion has been described as one of the most challenging injuries within sports medicine (McCrory *et al.*, 2017). Although I have been attempting to support and guide them through those challenges, establishing each students' individual learning and support needs is difficult. As a strong believer in the value of curiosity and continuous learning, I decided to engage in research, and search for sustainable ways to support healthcare students on their journey to becoming confident and competent clinicians. Considering the challenges met by my students, as well as the globally recognised importance of optimisation of concussion-related athlete care, my investigation has focused on this aspect of clinical practice. In line with literature, perception of confidence that is specific to a certain context should be referred to as self-efficacy (Bandura, 2006; Pagnotta *et al.*, 2013). Therefore, the word 'self-efficacy' will be used in this thesis to represent confidence in the context of concussion-related patient care. Moreover, the term 'professional education' will be used to refer to both undergraduate and postgraduate education in the field of healthcare.

1.3 Aims and objectives

Based on my personal goal of supporting healthcare students in the confident management of concussion within a sporting environment, as well as the global need for optimisation of concussed athlete care, the aims of this thesis were:

1. To explore the relevance of clinician's/healthcare student's concussion-related self-efficacy for delivery of the optimal concussion-care within a sporting environment.
2. To explore the factors that contribute to clinician's/ healthcare student's self-efficacy in concussion-related patient care within a sporting environment.

3. To explore the strategies that can facilitate development of clinician's/ healthcare student's self-efficacy in concussion-related patient care within a sporting environment.

The following objectives allowed the aims listed above to be achieved:

1. To establish the levels of concussion-related self-efficacy among clinicians/healthcare students in Ireland.
2. To investigate the relationship between clinician's/healthcare student's self-efficacy and concussion-related clinical practices.
3. To investigate the relevance of the general self-efficacy sources for development of concussion-related self-efficacy within educational and sporting environments.
4. To investigate clinician's/healthcare student's perceptions of factors influencing development of self-efficacy in concussion-related patient care.
5. To identify strategies that can facilitate development of clinician's/ healthcare student's concussion-related self-efficacy.
6. To provide practical recommendations for optimisation of concussion-related self-efficacy development during professional education.

1.4 Programme of work

Chapter 2 provides a critical overview of the literature pertaining to the topic of this thesis, across three sections. These sections refer specifically to (1) concussion as a healthcare problem, (2) the concept of self-efficacy and its theoretical underpinnings and (3) current research on self-efficacy in healthcare. Chapter 3 presents my research philosophy and the methodology that supported achieving the aims of this research. In line with the objectives 1-3, Chapters 4 and 5 present two separate quantitative investigations, each exploring a separate participant population (clinicians and healthcare students). In accordance with objective 4, Chapters 6 and 7 present two qualitative investigations of concussion-related self-efficacy perceptions across the two populations. Chapter 8 provides the recommendations for educational practice (objective 6), including the newly developed coaching model, suitable for personal and professional development within healthcare environments (objective 5). Chapter 9 consists of the general discussion of

research findings, the overview of strengths and limitations of this thesis, along with the recommendations for future research.

Chapter 2: Literature review

2.1 Introduction to literature review

The objective of this literature review is to critically analyse current literature pertaining to the challenge of provision of optimal concussion-related patient care and the value of clinician's self-efficacy in this context. In order to understand the challenges that are relevant to concussion-related clinical practices, this literature review will first focus on demonstrating the complexity of concussion as an injury, and the evolution of recommendations for its optimal assessment and management. Having next presented the shortcomings of concussion-related clinical practices globally, this literature review will then explore the breadth of challenges that clinicians face in the context of concussion-care. In order to gain a deep understanding of how these challenges contribute to clinicians' practices, the concept of self-efficacy will be introduced, and human behaviour will be discussed through the lens of social cognitive theory. This literature review will demonstrate the interconnectedness of the environment and individual, the impact of both on all human behaviours, and the specific importance of self-efficacy for successful performance. Finally, the extent of evidence on the link between clinician's self-efficacy and clinical practice will be explored, along with the factors indicated as influential for self-efficacy in clinical context.

2.2 Concussion as a healthcare problem

Concussion is considered a mild traumatic brain injury that involves a cascade of metabolic and neurotransmitter-related changes, possible damage to the neuron axons, blood flow changes and inflammation (Patricios, Schneider, *et al.*, 2023). The damage is a result of a forceful brain movement within the skull (Damji and Babul, 2018), which can be induced by an impact to the head, neck or body (Mang *et al.*, 2020). Although concussion is associated with only subtle neurologic impairments in comparison to the other types of traumatic brain injury, the multidimensional nature of these impairments contributes to concussion being a significant diagnostic challenge. Moreover, if concussion is undetected and/or not managed appropriately (Mang *et al.*, 2020), there is a risk of further injury and subsequent damage. Currently, concussion

is considered a major public health concern (O'Connor *et al.*, 2022a) and over the past years it has gained considerable media attention (Simpson-Jones and Hunt, 2018). One of the main reasons for this increased interest is a substantial increase in a number of reported sport-related concussions (SRC), concussions sustained during sport or exercise-related activities (Pierpoint and Collins, 2021). Globally, approximately 42 million concussions occur each year (Heslot *et al.*, 2022), which constitutes 70-80% of all traumatic brain injuries (Simpson-Jones and Hunt, 2018). In the United States, annually, a total of 1.6 - 3.8 million of SRCs affect children, adolescent and adult athletes (Kontos *et al.*, 2017, 2019). Although the information on the exact number of SRCs in Ireland is not available, sports involving high speed and physical contact, like rugby, Gaelic football or hurling/camogie are commonly played by male and female athletes across all age groups (O'Connor *et al.*, 2019; Leahy *et al.*, 2023). The burden of players' absence following concussive injury has been reported as high both in collegiate (Teahan, O'Connor and Whyte, 2021) and professional (Cosgrave and Williams, 2019) rugby. An investigation of the Gaelic Athletic Association (GAA) athletes indicated that 54% of them sustained SRC in the past, and 44% admitted to having been concussed more than once (Sullivan, Thomas and Molcho, 2016). With over 100,000 of athletes across 2500 GAA clubs, SRC is a discernible issue in Ireland (Sullivan and Molcho, 2018). A cross-sectional investigation of the adolescent GAA population indicated that 30.1% of the evaluated players had at least one medically confirmed concussion (O'Connor *et al.*, 2019). Concussion has also been acknowledged as the second most prevalent injury within collegiate Gaelic football (Teahan, O'Connor and Whyte, 2021). Among the collegiate athletes who represented 12 different sports, 31.3% reported to have suffered concussion in the past (O'Connor *et al.*, 2022a). In response to the rising incidence of SRC, the Concussion in Sport Group (CISG) was established over two decades ago (Patricios, Schneider, *et al.*, 2023). Their meetings (International Conferences for Concussion in Sport) have become the key platform for leading researchers, clinicians, and policymakers to collaboratively review new, concussion-related evidence. Following each of the CISG meetings, the consensus statements (Aubry *et al.*, 2002; McCrory *et al.*, 2005, 2009, 2013, 2017; Patricios, Schneider, *et al.*, 2023) have been released to inform the public on best practices for concussion assessment and management, guide clinical protocols and influence return-to-play policies worldwide. It is crucial that sporting bodies remain up to date with the latest consensus statement recommendations and regularly review their concussion-related policies to ensure optimal athlete care.

2.2.1 Clinical presentation of concussion

Concussion is a heterogenous injury and its clinical presentation is not consistent across individuals (Kontos *et al.*, 2017). It may involve a variety of somatic, cognitive, affective and sleep-related symptoms, as well as functional impairments of balance, gait, cognition, vestibular and ocular systems (Kontos *et al.*, 2019), and occur with or without loss of consciousness (Patricios, Schneider, *et al.*, 2023). The vast array of possible signs and symptoms are not exclusive to concussion, which contributes to the diagnostic challenge (Collins *et al.*, 2014). In order to facilitate concussion recognition, its appropriate management and patient's recovery, conceptual approaches have been proposed, aiming to group the signs and symptoms together into clinical subtypes, representing commonly observed clinical presentations (Langdon *et al.*, 2020). One of the proposed models was developed originally over 10 years ago (Collins *et al.*, 2014) and later refined, utilising a large, heterogenous and generalisable sample of adults and children (Lumba-Brown *et al.*, 2020). It includes vestibular, ocular motor, cognitive, post-traumatic migraine and anxiety/mood clinical trajectories (Table 2.1) with two concussion-associated conditions, sleep disturbance and cervical strain (Kontos *et al.*, 2020). Signs and symptoms of concussion may present immediately or develop gradually and evolve over several hours following injury (Patricios, Schneider, *et al.*, 2023). A large group of concussed patients recover within days (Patricios, Schneider, *et al.*, 2023), with approximately 80-90% experiencing full recovery within one month (Langdon *et al.*, 2020). Recovery denotes a complete resolution of symptoms and functional impairments (Martinez *et al.*, 2020).

Table 2.1 Concussion clinical trajectories and their associated symptoms (Collins *et al.*, 2014; Kontos *et al.*, 2020)

Clinical trajectory	Possible symptoms
Vestibular	Dizziness Unstable vision Difficulty focusing Motion discomfort Difficulty in busy visual environments Imbalance, especially in absence of visual input

Ocular motor	Blurred vision Diplopia Difficulty reading Eyestrain Headache Loss of place when reading Difficulty with visual scanning
Cognitive/fatigue	Fatigue Decreased energy levels Non-specific headache Sleep disturbance

Migraine	Post-traumatic migraine type headache
	     o Unilateral
	     o Moderate-severe intensity
	     o Pulsating quality
	     o Associated with nausea and/or photosensitivity
	 Headache exacerbated by stress, sleep disturbance, anxiety/emotional changes and dietary triggers

Anxiety/Mood	Anxiety-related issues (might manifest through headache, feeling "foggy", dizzy or fatigued)
	     o Ruminative thoughts
	     o Hypervigilance
	     o Feeling of being overwhelmed
	     o Sadness
	     o Hopelessness
	     o Sleep disturbance
	 Depression
	 Irritability

2.2.2. Persistent symptoms

It is estimated that in 10-30% of cases, concussive symptoms persist beyond three months, which is the period generally considered sufficient for full resolution of symptoms and functional impairments. The variation is likely due to differences in the post-injury evaluation times, forms

of symptom-reporting, and diagnostic criteria followed (Rytter *et al.*, 2019). In line with the World Health Organisation International Statistical Classification of Diseases and Related Health Problems 10th Revision, these patients are commonly diagnosed with a post-concussion syndrome (PCS) (Rytter *et al.*, 2019). However, due to the lack of clarity regarding diagnostic criteria, nature of the pathology and heterogeneity of its presentation, this diagnosis has been debated at the 5th International Conference for Concussion in Sport in Berlin (McCrory *et al.*, 2017), and an alternative one, persistent post-concussion symptoms (PPCS) has been introduced (Rytter *et al.*, 2019; Fordal *et al.*, 2022). Although it is difficult to predict the adverse patient outcomes at an individual level, several factors have been linked with the persistent presence of symptoms (Heslot *et al.*, 2022). The pre-injury factors include female biological sex, mental health issues (Mollayeva, El-Khechen-Richandi and Colantonio, 2018), presence of a learning disability, neurodevelopmental disorders and history of previous concussion (Mollayeva, El-Khechen-Richandi and Colantonio, 2018; Martinez *et al.*, 2020). The time from concussion to the initial clinical intervention was also found to be a significant injury-related predictor of recovery time (Eagle *et al.*, 2020). Moreover, the presence of severe initial symptoms, prolonged headache, concentration deficits, dizziness and vestibular-ocular dysfunction (Martinez *et al.*, 2020), as well as emotional distress and maladaptive coping (Heslot *et al.*, 2022) have been considered among other risk factors. PPCS has been shown to substantially affect cognitive functioning, and subsequently work- and/or education-related activities and social participation (Rytter *et al.*, 2019). Despite this, the literature on strategies that can alleviate the PPCS-related deficiencies is limited (Rytter *et al.*, 2019). In line with the recent evidence, prescribed sub-symptom threshold aerobic exercise can be effective in facilitating PPCS recovery (Leddy *et al.*, 2023). Nevertheless, prevention, through appropriate concussion management immediately after the injury, is crucial (Rytter *et al.*, 2019). Early return to physical activity and graded prescribed decrease the incidence of PPCS (Leddy *et al.*, 2023).

2.2.3. Other adverse outcomes

A rare and sometimes disputed phenomenon linked with concussion is second impact syndrome; a result of sustaining a second head injury prior to complete recovery from the initial concussion (Donaworth *et al.*, 2016). Second impact syndrome is associated with a substantial swelling of the brain, leading to devastating neurological deficits or death (Donaworth *et al.*, 2016),

and it is observed primarily among children and adolescents (Leddy *et al.*, 2012). The controversy around second impact syndrome stems from whether its occurrence is, in fact, a result of a second trauma, or whether it is a complication of a traumatic brain injury, well-recognised within the paediatric population (Leddy *et al.*, 2012). Another potential consequence of repetitive concussions or sub-concussive head impacts is chronic traumatic encephalopathy (CTE) defined as neuropathologic changes within the brain tissue (Donaworth *et al.*, 2016). It is theorised that CTE might be associated with repetitive head trauma observed in some sports (Patricios, Schneider, *et al.*, 2023) and may manifest with permanent changes in mood, behaviour and cognition, as well as somatic symptoms (Donaworth *et al.*, 2016). Although the currently available evidence on CTE is limited and of low level (Patricios, Schneider, *et al.*, 2023), the clinical condition associated with a possible presence of neuropathic brain changes (CTE) has recently gained a name of traumatic encephalopathy syndrome (TES) (Katz *et al.*, 2021; Patricios, Schneider, *et al.*, 2023). The newly developed TES diagnostic criteria include (1) substantial exposure to repetitive head impacts, (2) cognitive impairment and/or neurobehavioural dysregulation, (3) a progressive nature and (4) inability to fully account for the clinical features by any other medical condition (Katz *et al.*, 2021). Nevertheless, it is still unclear whether the CTE neuropathic changes are the direct cause of neurological and psychiatric conditions (Patricios, Schneider, *et al.*, 2023). Further investigation of this topic is essential for a clear understanding of the concussion-CTE relationship.

2.2.4 Concussion assessment and management

The approach to assessment and management of concussion has evolved significantly over the past two decades (Wallace, Covassin and Lafevor, 2018). The increased understanding of concussion implications led to a worldwide increase in concussion-related research (Notebaert and Guskiewicz, 2005) and international-level discussion about the evidence-based clinical practice (McCrory *et al.*, 2005, 2009, 2013, 2017; Patricios, Schneider, *et al.*, 2023). The cornerstone of concussion management has become removal from play on the day of the injury, followed by relative physical and cognitive rest and a stepwise return to play, synchronised with the patient's recovery (McCrory *et al.*, 2005). Multiple concussion-related tools have been developed over the years to aid the process of concussed patient care (Gardner, Quarrie and Iverson, 2019), including the Standardised Assessment of Concussion (SAC) tool (McCrea *et al.*, 1998) and Sport Concussion Assessment Tool (SCAT). The SCAT, developed at the 2nd International Conference

on Concussion in Sport in 2004 (McCrory *et al.*, 2005) transformed several times over the following years, in line with the new research findings. Recently, the newest version was introduced (SCAT6), and supplemented with the Sport Concussion Office Assessment Tool 6 (SCOAT6), intended for evaluations conducted after the initial 72 hours post-injury (Patricios, Davis, *et al.*, 2023). The frequency of these changes could have contributed to the challenge of dealing with concussed patients. The recommendations for management of concussed athlete also evolved, from the universal guidelines based on concussion grade (McCrory *et al.*, 2005), through more and more individualised approach (McCrory *et al.*, 2013) and considerations of comprehensive rehabilitation and referral (Patricios, Schneider, *et al.*, 2023). Currently, the high-standard care includes serial, multimodal clinical assessments to identify deficits, target them with appropriate treatments and rehabilitation techniques and to monitor the recovery (Patricios, Schneider, *et al.*, 2023). Concussion assessment should incorporate medical history, with consideration of the risk factors, subjective and objective clinical examinations, symptom reports and screening for the functional impairments (Kontos *et al.*, 2019). Utilisation of baseline testing is a recommended strategy for accurate interpretation of the post-injury assessment findings (McCrory *et al.*, 2017). However, in the absence of the baseline scores, normative data have been indicated as a recommended alternative (Caccese *et al.*, 2021). Identification of symptoms and functional deficits is crucial to ensure appropriate treatment and rehabilitation, as no single strategy can be effective for an injury so heterogeneous as concussion (Broglio *et al.*, 2015). The presence of vestibular and ocular motor symptoms has been associated with poor clinical outcomes in the past, hence accurate assessment and identification of these deficits, followed by targeted interventions are particularly important (Broglio *et al.*, 2015). Several concussion-care models have been developed in recent years to support comprehensive patient management (Ellis, Leddy and Willer, 2016). One of them, the sign- and symptom-guided framework, recommends assessing six clinical domains: (1) somatic, cognitive, and/or emotional symptoms; (2) physical signs; (3) balance impairment; (4) behavioural changes; (5) cognitive impairment; and (6) sleep–wake disturbances (McCrory *et al.*, 2017). Treatment and rehabilitation are then tailored according to the domains affected (McCrory *et al.*, 2017). A concise three-domain minimum approach has also been proposed, which prioritises the assessment of (1) cognitive function, (2) vestibular-oculomotor function, and (3) psychosocial function. This model offers a practical solution for providing thorough care in resource-limited settings (Ellis, Leddy and Willer, 2016). To better predict

concussion recovery outcomes in paediatric populations and guide the allocation of clinical resources, the Predicting and Preventing Postconcussive Problems in Pediatrics (5P) risk score was developed (Zemek, Osmond and Barrowman, 2013; Teel *et al.*, 2025). This model uses patient demographics and acute presentation to estimate the likelihood of prolonged recovery. Its clinical utility has been reaffirmed in more recent research (Teel *et al.*, 2025). Another approach, developed based on classification of concussion into the clinical trajectories (Lumba-Brown *et al.*, 2020), highlights the need for a multidimensional assessment of symptoms and impairments across affective, balance, neurocognitive, ocular, and vestibular domains (Kontos *et al.*, 2019). Research shows that athletes rarely exhibit a single, clearly defined trajectory, making careful identification and prioritisation essential for effective, individualised treatment (Kontos *et al.*, 2019). Management strategies within this model typically follow an expose-recover framework, in which specific symptoms and impairments are stressed in a controlled way to promote recovery (Kontos *et al.*, 2017). Examples of these treatment and rehabilitation strategies are presented in Table 2.2.

Table 2.2 Key concepts of treatment and rehabilitation strategies targeting specific concussion trajectories (Collins *et al.*, 2014; Broglio *et al.*, 2015; Kontos *et al.*, 2017)

Clinical trajectory	Problems and their targeted treatment and rehabilitation strategies
Vestibular	Comprehensive vestibular therapy targeting • Benign paroxysmal positional vertigo (e.g. canalith repositioning manoeuvres) • Vestibular-ocular reflex impairment (e.g. gaze stability training) • Visual motion sensitivity (e.g. graded exposure to visually-stimulating environments, virtual reality, optokinetic stimulation • Balance dysfunction (e.g. balance regulation strategies, sensory organisation training, divided attention training, dynamic balance training) • Cervicogenic dizziness (e.g. manual therapy for cervical spine, balance training, oculomotor training) • Exercise-induced dizziness (e.g. progressive dynamic exertion exercise programme) Secondary emotional symptoms – pharmacological treatment Secondary migraine – pharmacological treatment
Ocular motor	Reduced strain on visual system (frequent breaks from reading/computer work are required) Vision therapy with a use of eye-patches, penlights, mirrors, lenses and prisms. Improvement of ocular muscle function through exercises, e.g. • Speeded saccadic eye movement • Visual pursuit and tracking tasks • Alternating monocular and binocular tasks • Reading tasks • Visual attention tasks Surgical/medical interventions might be needed for complex cases of diplopia/strabismus.

Cognitive/fatigue	Reduction of both cognitive and physical demands Sleep schedule (consistent bedtime and waking time) Regulated diet and hydration Regulated psychological stress and physical exercise (at least one walk/day) Pharmacological treatment with neurostimulants Sleep aids, if required, e.g. melatonine Cognitive/speech therapy, if required
Migraine	Pharmacological treatment (antidepressants, anticonvulsants or beta-blockers) Increased cardiovascular activity Supervised physical exertion protocol Sleep schedule (consistent bedtime and waking time) Regulated diet and hydration Regulated psychological stress
Anxiety/Mood	Once any identified vestibular symptoms resolved : Daily exercise plan (supervised physical exertion protocol) Regulated sleep schedule Regulated diet and hydration Productive stress management strategies are crucial, hence psychotherapy/pharmacotherapy (e.g. tricyclic antidepressants) might be required

While each of the clinical frameworks offers distinct pathway to structured concussion-care, none has been conclusively demonstrated to be superior to the others. A recent systematic review found limited comparative data across these frameworks and emphasised ongoing uncertainty about which is most effective or efficient in varying clinical settings (Purtzki et al., 2022). Therefore, rather than endorsing one framework, an integrative approach combining the strengths of these models may offer more flexibility and clinical relevance. Further comparative research is needed to clarify relative performance across contexts and populations, guiding optimal framework selection.

Literature suggests that up to 80% of concussed athletes experience an increase in symptoms during physical exertion (Graham *et al.*, 2021). Therefore, effective recovery and a safe return to sport require a progressive increase in physical load (Leddy *et al.*, 2023). Based on the most recent recommendations, absolute rest should be avoided (Patricios, Schneider, *et al.*, 2023). Instead, a return to daily activities and light physical activity, like walking, is recommended with the first 24-48 hours, as long as it only mildly exacerbates the symptoms. Following that period, graded physical exertion should be incorporated into the recovery process (Patricios, Schneider, *et al.*, 2023). Several methods of assessing exercise tolerance have been developed, including the Buffalo Concussion Treadmill Test (Leddy *et al.*, 2017), the Calgary Concussion Cycle Test (Miutz *et al.*, 2023) and the Stationary Cycling Test (Graham *et al.*, 2021). Their use can guide exercise prescription following concussion (Graham *et al.*, 2021) and facilitate athletes' transition back to sport (McLoughlin, 2023; Patricios, Schneider, *et al.*, 2023). A gradual and individualised increase in cognitive load is also crucial for a safe return to work- and school-related activities (McLoughlin, 2023; Patricios, Schneider, *et al.*, 2023). Although this process can be particularly challenging for athletes who displayed high acute symptom severity or those with a history of learning disabilities, complete rest is not recommended (Dawson *et al.*, 2023; Patricios, Schneider, *et al.*, 2023; Vaughan *et al.*, 2023). Early return to daily and school activities, followed by individualised adjustments within the educational setting (Patricios, Schneider, *et al.*, 2023), has been linked with a lower burden of symptoms and faster recovery (Vaughan *et al.*, 2023). Environmental, curricular, and testing adjustments within schools should be supplemented with physical modifications to minimise the risk of falls or collisions. Overall, the transition to sport-, work-, and education-related activities should be coordinated with the rehabilitation protocol and the pace of symptom and functional impairment resolution (Patricios, Schneider, *et al.*, 2023).

2.2.5 Worldwide concussion-related clinical practices

The clinical practices evolved alongside the best practice concussion-care recommendations. Although return to play on the day of concussion was common in '80s and '90s, the 21st century's developments in concussion understanding and knowledge led to increased vigilance towards this injury and avoidance of same-day return to play (Gardner, Quarrie and Iverson, 2019). Despite progressive improvements in the practice patterns among clinician working in sports environments, it has not been common for any clinician group to fully align with the available recommendations regarding concussion assessment and management (Ferrara *et al.*, 2001; Notebaert and Guskiewicz, 2005; Covassin, Elbin and Stiller-Ostrowski, 2009; McGrann and Keating, 2012; Maxtone *et al.*, 2020; Scully and Falvey, 2021; Rosenbloom *et al.*, 2022). The repeated investigations of American athletic trainers' (ATs) consequently demonstrated low level of utilisation of the available concussion assessment and management tools (Ferrara *et al.*, 2001; Notebaert and Guskiewicz, 2005; Covassin, Elbin and Stiller-Ostrowski, 2009; Lynall *et al.*, 2013; Lempke, Schmidt and Lynall, 2020). Almost 10 years after the introduction of SAC (McCrea *et al.*, 1998), only 48% of ATs reported using it with concussed patients (Notebaert and Guskiewicz, 2005). A delay in utilisation of SCAT2 (Lynall *et al.*, 2013), SCAT5 (Lempke, Schmidt and Lynall, 2020), computerised neurocognitive testing (Notebaert and Guskiewicz, 2005; Covassin, Elbin and Stiller-Ostrowski, 2009; Lynall *et al.*, 2013; Lempke, Schmidt and Lynall, 2020), oculomotor and reaction-time assessments were also identified among American ATs (Lempke, Schmidt and Lynall, 2020). In Ireland, over 10 years after the introduction of SAC (McCrea *et al.*, 1998) and over five year after the introduction of SCAT (McCrory *et al.*, 2005), the majority (82.1%) of chartered physiotherapists assessed concussion using the standard orientation questions, and only 15.8% utilised SAC (McGrann and Keating, 2012). The recent investigations of concussion-related clinical practices continuously indicate the presence of inaccuracies globally, and among various clinician groups (Maxtone *et al.*, 2020; Scully and Falvey, 2021; Rosenbloom *et al.*, 2022; Lempke *et al.*, 2023). This suggests that a substantial group of concussed patients are inadequately managed. Considering the link of inappropriate concussion management with delayed recovery, persistent symptoms and functional impairment, suboptimal concussion-care may have long-term, negative consequences for personal and professional lives of those patients. The understanding of barriers to provision of best practice and challenges faced by clinicians is crucial in order to enhance the standard of concussion-related patient care.

2.2.6 Challenges in provision of high-standard concussion-care

Despite the substantial growth of the general concussion-related knowledge and attention (Gardner, Quarrie and Iverson, 2019), a multitude of barriers to the provision of high-standard concussion-care have been identified, including time and resources constraints, concussion-related diagnostic uncertainty, perception of pressure and lack of authority to implement best practice and limited clinicians' knowledge (Covassin, Elbin and Stiller-Ostrowski, 2009; McGrann and Keating, 2012; Buckley, Burdette and Kelly, 2015; Bacon *et al.*, 2018). The understanding of challenges faced by clinicians might facilitate implementation of optimal concussion-related patient care.

2.2.6.1 Time and resources constraints

Lack of time and resources, including staff, equipment and finances, have been identified as barriers to the implementation of optimal concussion-care (Williams *et al.*, 2014; Buckley, Burdette and Kelly, 2015; Bacon *et al.*, 2018; Galbraith *et al.*, 2020; Hattrup, Root and Valovich Mcleod, 2022). Although the assessment of symptoms and balance can be completed with resources available at no cost (Lempke *et al.*, 2023), personnel-related constraints have been affecting their implementation in some settings (Buckley, Burdette and Kelly, 2015). In Ireland, clinicians are rarely present during training/practice and matches at a grassroot level, hence the personnel-related limitations are a valid barrier to utilisation of the freely available resources (Sullivan and Molcho, 2018). The time constraints are one of the most common barriers to gathering of the baseline scores (Buckley, Burdette and Kelly, 2015), along with the personnel (Paddack *et al.*, 2016) and financial (Buckley, Burdette and Kelly, 2015) constraints. The neurocognitive testing can take the form of either a computerised or paper and pencil assessment. However, none of these methods are free from limitations. The cost of carrying out the computerised neurocognitive testing was indicated as a possible barrier (Lempke *et al.*, 2023). Resource constraints, like limited access to electronic devices were also acknowledged in relation to the use of computerised neurocognitive testing (Notebaert and Guskiewicz, 2005). Conversely, the pen and paper assessments are easily available, yet they require a trained individual to administer it and interpret the results. Considering the limited number of athletes who can be tested at the same time, the personnel-related barriers are also relevant in case of paper and pencil neurocognitive tests (Notebaert and Guskiewicz, 2005). Limited time might be a barrier to

provision of guidance regarding the gradual return to play and education in some settings (Galbraith *et al.*, 2020). Time-related constraints are also relevant to the comprehensive rehabilitation targeting cervical, vestibular, ocular, emotional and migraine-related, along with the financial, equipment and personnel-related limitations (Hattrup, Root and Valovich Mcleod, 2022).

2.2.6.2 Diagnostic uncertainty

Concussion is considered one of the most clinically, symptomologically, biomechanically and neurologically complex injuries (AlHashmi and Matthews, 2022). Although the body of literature dedicated to concussion recognition and management is continuously growing, merging the findings together remains challenging (McLoughlin, 2023). This epistemological uncertainty is evident among clinicians and contributes to their concussion-related clinical practices (Malcolm, 2009). One of the significant challenges in the process of concussion diagnosis is the reliance on athlete's honest disclosure of symptoms (Baugh *et al.*, 2016; Rosenbloom *et al.*, 2022). Considering the globally high-level of concussion under-reporting in sport (Kroshus *et al.*, 2015; Baugh *et al.*, 2016; O'Connor *et al.*, 2020; Rosenbloom *et al.*, 2022) and the expectation of diagnostic precision within sporting environment (McNamee, Partridge and Anderson, 2015) clinicians are placed in a difficult position. The poor sensitivity and specificity of the individual components of concussion assessment batteries (Buckley, Burdette and Kelly, 2015) and the lack of a single benchmark diagnostic test (Robertson and McLoughlin, 2024) further increases the diagnostic ambiguity, emphasising the importance of multifaceted approach to examination (Buckley, Burdette and Kelly, 2015) and the importance of clinician's skills for the accurate diagnosis (Robertson and McLoughlin, 2024). Literature suggests that lack of clarity surrounding concussion might lead to a situation where some clinicians allow their clinical reasoning to be influenced by the social norms of their work environment (AlHashmi and Matthews, 2022). Social influence, a process in which individuals adapt their behaviours, opinions and attitudes as a result of interactions with others, is especially evident in strongly interconnected environments (Moussaïd *et al.*, 2013). Interestingly, self-confidence and perception of being well-informed supports individuals in challenging the views of the uninformed majority (Moussaïd *et al.*, 2013). This might explain how concussion-related uncertainty influences clinicians' decision to conform with the rules of their work environment. Consequently, improvements in clinicians' understanding and confidence in

concussion assessment and management might facilitate their compliance with best practice guidelines, regardless of social influences.

2.2.6.3 Perception of pressure and lack of authority over clinical management

Perception of pressure from the management and athletes has been recognised as a problem by clinicians working across various sports and levels of competition, worldwide (McNamee, Partridge and Anderson, 2015; Baugh *et al.*, 2016; Rosenbloom *et al.*, 2022). The main ethical duty of a clinician is to act in the best interest of their patients, however, they might also perceive to be legally obligated to prioritise the expectations of their employer (McNamee, Partridge and Anderson, 2015). Within the sports environment the two are often contrary, which leads to a conflict of interest (McNamee, Partridge and Anderson, 2015). In the context of concussion-care, an investigation of Irish clinicians working in rugby demonstrated that they most commonly felt pressured to not diagnose concussion, to clear the athlete back to play or to accelerate their post-concussion return to play protocol (Liston *et al.*, 2018). Even clinicians working at the professional level admitted to had rejected the recommendations of the International Rugby Board and avoided making the diagnosis of concussion, following the pressure within the team (Liston *et al.*, 2018). Although no coaches admitted to exerting this kind of pressure on their medical team, many clinicians reported feeling pressured (Rosenbloom *et al.*, 2022). Some athletes also oppose being removed from the field and being forced to undertake an extended stand-down period. This is especially prevalent in the case of important games and in situations where players fear losing their place on the team (McNamee, Partridge and Anderson, 2015). Down-playing of symptoms is a common strategy utilised by the athletes in Ireland (Liston *et al.*, 2018; Walshe, Daly and Ryan, 2023), along with not seeking clinician's attention, asking them to minimise the effects of their injury or not informing the coach about the concussion diagnosis, as indicated in other countries (McNamee, Partridge and Anderson, 2015). Another challenge reported in literature is linked with clinician's lack of authority to implement the recommended level of patient care (Rigby, Vela and Housman, 2013). Internationally, many sporting organisations and governing bodies have been slow in integrating consensus recommendations into their medical regulations and protocols regarding concussion (Malcolm, 2016; Walshe, Daly and Ryan, 2024). Hence, clinicians might be forced to follow the rules of their sporting environment, regardless of their professional opinion (Liston *et al.*, 2018). A delayed implementation of consensus statement recommendations by some

of the sporting organisations and governing bodies may also impact the level of concussion-related knowledge among certain clinicians (Covassin, Elbin and Stiller-Ostrowski, 2009; McGrann and Keating, 2012; Malcolm, 2016). Thus, accelerating the implementation of consensus recommendations by the sporting organisations and governing bodies may facilitate delivery of more optimal concussion-care.

2.2.6.4 Concussion-relevant knowledge

Gaps in concussion-related knowledge and limited awareness of the relevant concussion-recommendations have been suggested as significant barriers to implementation of best practice in concussion-care (Donaworth *et al.*, 2016; Yorke, Littleton and Alsalaheen, 2016). Inadequate clinical decision making, alongside limited concussion-understanding had been demonstrated among a variety of clinician groups in the past (McGrann and Keating, 2012; Donaworth *et al.*, 2016; Yorke, Littleton and Alsalaheen, 2016; Haider *et al.*, 2017; Tomkinson, Weston and Batt, 2017; Adams *et al.*, 2020; Al Attar and Husain, 2021). The investigations of clinicians' perceptions on the subject indicate that they are aware of their knowledge and understanding deficits (Yorke, Littleton and Alsalaheen, 2016; Galbraith *et al.*, 2020; Scully and Falvey, 2021; Hattrup, Root and Valovich Mcleod, 2022) and that they believe these deficits impact their ability to implement high-quality patient care (Hattrup, Root and Valovich Mcleod, 2022). Limited formal education and training have been indicated as the main reasons for inadequate concussion-related knowledge (Galbraith *et al.*, 2020; Al Attar and Husain, 2021; Scully and Falvey, 2021). The level of qualification (undergraduate/postgraduate) within the same profession was demonstrated as a significant factor influencing clinicians' knowledge and understanding of concussion. Those with undergraduate education only displayed significantly lower scores that those with a postgraduate degree (Al Attar and Husain, 2021).

Limited knowledge and understanding of concussion appear to not only be barriers to implementation of the optimal concussion-related patient care, but may also contribute to clinicians' susceptibility to the social pressures within the sports environment. Although the current level of research does not allow to fully eliminate concussion-related diagnostic uncertainty, gaining awareness of the up-to-date best practice recommendations might facilitate high-standard clinical practice.

2.2.7 Concussion in professional healthcare education

The foundation of clinicians' knowledge and skills are developed during undergraduate/postgraduate professional education (Mrazik *et al.*, 2015). Given the importance of appropriate concussion assessment and management, concussion-related awareness and understanding should be included in the educational programmes of all healthcare professionals likely to encounter concussion. However, significant gaps have been identified across a variety of professional education programmes globally (Mrazik *et al.*, 2015; Wallace, Beidler and Covassin, 2018; Scully and Falvey, 2021; Husain, 2024), including Ireland (Scully and Falvey, 2021). The limitations relate to the didactic curriculum, practical education of concussion examination and management, and limited exposure to real-life patients (Donaworth *et al.*, 2016; Wallace, Beidler and Covassin, 2018). Despite the recent increase in the public and scientific attention to concussion, the professional education standards for some healthcare professions in Ireland (Carney, 2023b, 2023c) and other countries (Hunt, Harris and Way, 2017; Mathieu, Ellis and Tator, 2018; Carney, 2023b, 2023c) do not include concussion-specific learning objectives. Although literature suggests that nearly every medical doctor is required to provide concussion-related care at some point in their career, regardless of the field of work (Gardner and Heron, 2022), medical education institutions tend to defer concussion education until specialist training (Hunt, Harris and Way, 2017; Mathieu, Ellis and Tator, 2018). Similarly, physiotherapists are often required to provide medical care in high concussion-incidence sporting environments (Sullivan *et al.*, 2012), yet concussion education appears to be limited in the undergraduate physiotherapy programmes (Al Attar and Husain, 2021). In the case of other healthcare professions, including athletic therapy/training, professional governing bodies require inclusion of concussion within the curriculum. However, the general nature of this requirement gives the educational institutions freedom to decide on what guidelines and recommendations are included (Covassin, Elbin and Stiller-Ostrowski, 2009; Wallace, Beidler and Covassin, 2018; King and Hynes, 2021). Although this approach is understandable given the constantly evolving understanding of concussion, it might lead to delays in the introduction of new evidence into the curriculum in some institutions, and consequently to inconsistencies in concussion-related knowledge and awareness among their students. The teaching and learning strategies utilised during the education may also differ and

further impact the degree of concussion-related knowledge transfer (Al Attar and Husain, 2021). Considering the dynamic nature of concussion-related research and its complexity, up-to-date education might not be provided in all educational institutions (Covassin, Elbin and Stiller-Ostrowski, 2009; Wallace, Beidler and Covassin, 2018; King and Hynes, 2021). Moreover, since significant strides have been made in concussion assessment and management (McCrory *et al.*, 2005; Patricios, Schneider, *et al.*, 2023), clinicians who graduated several years ago had been educated according to different guidelines. Therefore, they may require upskilling in order to provide an optimal-level patient-care and student education. This, however, is not mandated in Ireland.

2.2.7.1 Concussion-related knowledge among healthcare students

A consequence of gaps in professional healthcare education is insufficient level of concussion-related knowledge among students. Deficits in awareness of concussion signs and symptoms (Donaworth *et al.*, 2016), its multifaceted assessment and management, clinical decision-making (Sullivan *et al.*, 2012; Donaworth *et al.*, 2016; Al Attar and Husain, 2021), possible long-term concussion consequences (Boggild and Tator, 2012), patient care across the continuum of recovery and practical application of theoretical knowledge (King and Hynes, 2021) were identified across variety of professional healthcare education programmes. It is therefore not surprising that a high number of healthcare students felt inadequately prepared to provide concussion-related patient care upon graduation (Cheung *et al.*, 2024). Development of the readiness to practice requires well designed curriculum with opportunities to practice the clinical skills (Ingram, Forbes and Jones, 2019), instructional strategies that facilitate self-reflection and metacognition (Burton, Winkelmann and Eberman, 2019), and gradual change in the ratio of supervision and independent practice (Mazerolle and Bowman, 2017). Although increased exposure to concussion evaluations during professional education lead to increased self-perceived expertise (Hunt, Harris and Way, 2017)**,** the readiness to practice and confidence in own skills may still differ among the students with the same level of clinical experience (Lai, Sivalingam and Ramesh, 2007). Hence, the understanding of what else influences students' belief in their own skills is crucial to producing clinicians who are not only competent, but also confident in provision of optimal concussion-related patient care. Confidence is the term commonly used to describe a belief in one's own abilities, however it is rather a global personality trait, while its task-specific

equivalent is self-efficacy (Bandura, 2006; Pagnotta *et al.*, 2013). Therefore, the exploration of clinicians' and students' belief in their ability to provide optimal-level patient care, specifically in the context of concussion, should be focused around their perception of self-efficacy, rather than confidence.

2.3. Self-efficacy

Self-efficacy is defined as personal belief in one's own capability to "organise and execute courses of action required to attain designated types of performances" (Bandura and National Inst of Mental Health, 1986). According to the theory of self-efficacy, no other belief influences human action as substantially as self-efficacy, particularly in challenging situations, as it determines behaviour and impacts thought patterns and emotional responses (Bandura, 1989). High level self-efficacy motivates a person to invest significant effort into tasks and persevere in the face of difficulties or failures. It decreases the level of stress experienced in anticipation of, and throughout, the task, and promotes self-motivating thought patterns. Low level self-efficacy discourages action, contributes to a high level of perceived stress and self-hindering thoughts (Bandura, 1989). A related concept, perceived behavioural control, is a central component of the theory of planned behaviour (Ajzen, 1991). However, its predictive power is more limited in complex and dynamic settings (Ajzen and Fishbein, 2000), like sporting environments. Over the past decades, the concept of self-efficacy has been utilised to explain and predict human behaviours across a variety of fields, including health and medicine, and it has been considered an essential theoretical contribution to the understanding of learning, achievement and motivation (Artino, 2012). In self-determination theory, Ryan and Deci (2000) acknowledged the importance of self-efficacy for intrinsic motivation one's natural inclination towards learning, exploration and seeking challenges. However, SDT focuses primarily on motivational processes, and self-efficacy is only indirectly integrated (Sweet et al., 2012), unlike in Bandura's framework, where it is central. According to Bandura (1997), the belief in one's own ability to successfully perform a task under certain circumstances is crucial, alongside their knowledge and skills, to engage in that specific task. Throughout the process of learning, skills and efficacy beliefs develop and influence each other in a reciprocal way (Bandura, 1997). This concept of interdependence called by Bandura 'reciprocal causation' or 'reciprocal determinism' is broadly embedded into the social cognitive theory that self-efficacy is only an element of (Artino, 2012).

2.3.1 Social cognitive theory (SCT)

SCT is a psychological theory of human behaviour that presents each individual's actions as outcomes of bilateral interactions between the environment (social context), and their personal attributes, including self-efficacy (cognitive context). Historically, the foundations of SCT were developed in the 1970s, at a time of the paradigm shift from the focus on human behaviour to the focus on human cognition (Conner and Norman, 2005). Through the exploration of human functioning and learning as social phenomena, Bandura (1997) concluded the work on SCT, and postulated that humans have agency over the course of their lives. This argued with the generally accepted view at the time that human life is unidirectionally determined by their internal dispositions and the environment (Bandura, 1989; Bembenutty, White and DiBenedetto, 2016). Bandura (1997) suggested that although human actions are responses to environmental demands, those actions are influenced by their personal beliefs, values and past experiences. Moreover, humans have the ability to actively regulate those beliefs, values and actions, as well as influence the environment through their actions. An explanation of the reciprocal interactions in the SCT is provided by the triadic reciprocal determinism model (Bandura, 1997).

2.3.1.1 Triadic reciprocal determinism (TRD) model

The TRD model consists of three groups of factors, namely personal, behavioural and environmental, that form subsystems of reciprocal influence within each individual's life (Bandura, 1989) (Figure 2.1). The reciprocal interactions do not occur simultaneously, it takes time for a causal factor to activate a response. Moreover, the strength of influence of each individual factor is not equal (Bandura, 1989), and can change depending on environmental conditions, behavioural effectiveness and self-regulatory processes (Lo Schiavo *et al.*, 2019).

Behaviour
Actions and Decisions

Person
Internal Competencies
Cognitive, Emotional
and Physical

Environment
External
Spaces, Laws, Objects
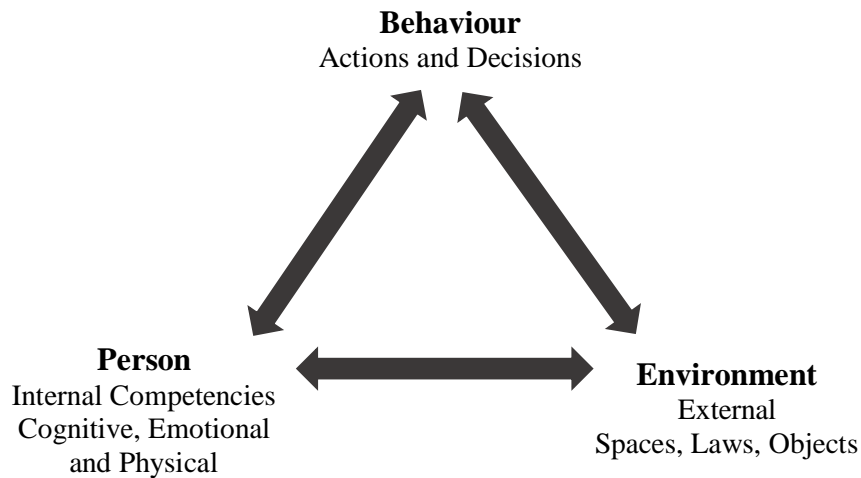
Figure 2.1 The triadic reciprocal determinism model (Woodcock and Tournaki, 2023)

The subsystem of personal and behavioural factors represents the link between human thought and action (Bandura, 1989). The shape and direction of behaviour are influenced by the beliefs, self-perceptions, expectations or intentions of an individual. The effects of those behaviours, in turn, contribute to development of new thought patterns and emotional reactions (Bandura, 1989). The personal factors also encompass the individual's biological characteristics and physical structure, including the nervous system. Hence, the brain's developmental stage imposes limitations on human behaviour, while behavioural experiences can modify the structure of brain and other elements of the nervous system (Greenough, Black and Wallace, 1987). The subsystem of personal and environmental factors represents the link between human characteristics and the environment (Bandura, 1989). Human perceptions, beliefs, expectations and cognitive ability are developed and modified through environmental influences, including social persuasion, modelling and instruction (Bandura, 1997). On the other hand, the reactions of social environment stakeholders are influenced by one's observable characteristics, as well as their status or socially conferred roles. Those social reactions, in turn, further influence one's perceptions regarding themselves and the environment (Bandura, 1989). The subsystem of behavioural and environmental factors represents the link between human action and environment (Bandura, 1989). Human behaviour is a response to the conditions of their environment, however human actions can also modify the environment, which in turn influences the subsequent environmental impacts (Bandura, 1997). Hence, humans are the product of their environment but also its producers, as

they can not only impact, but also select their environment (Bandura, 1989). Interestingly, Bandura (1989) suggested that the environment commonly does not produce the influences until activated by one's behaviour, implying the power of human agency.

2.3.2 Self-efficacy development

Self-efficacy is one of many beliefs forming the group of personal factors within the TRD model. It develops as a result of processing of the information coming from four principal sources: (1) mastery experience, (2) vicarious experience, (3) verbal persuasion and (4) physiological and affective states (Bandura, 1989).

2.3.2.1 Mastery experience

Mastery experience is defined as a direct and authentic personal experience of success associated with a specific task (Bhati and Sethy, 2022). It is considered to be the strongest source of self-efficacy as it is linked with evidence of capability (Bandura, 1997). Following completion of a task, an individual engages in a reflective self-evaluation process (Bandura, 1989). Generally, success builds self-efficacy, while failure undermines it, and every performance associated with the same tasks contributes to further self-evaluations and adjustments of the efficacy belief (Bandura, 1989). During reflection linked with the evaluation process, the new information is weighted against past experiences and a variety of beliefs, including preconceptions regarding one's own capabilities, difficulty of the task, effort exerted, external circumstances and support, and past patterns of successes and failures (Bandura, 1989, 1997). Hence an experience of failure not preceded by firmly developed self-efficacy, has a notably negative effect, while self-efficacy developed from easily achieved successes does not translate into persistence in face of challenges (Bandura, 1997). An experience of overcoming adversities through sustained effort is required for development of a resilient sense of efficacy, that facilitates perseverance and rebound from setbacks (Bandura, 1997). Interestingly, development of self-efficacy in relation to complex performances, does not occur simply through repetition of the desired behaviour. It occurs by "acquiring cognitive, behavioural and self-regulatory tools for creating and executing effective courses of action to manage the ever-changing life circumstances" (Bandura, 1997, p.80).

2.3.2.2 Vicarious experience

Vicarious experience refers to the judgement of one's own capability following observation of others' performance (Bandura, 1993). This source of self-efficacy information is considered particularly useful in relation to tasks with no objective measure of adequacy, where self-evaluation is based on social comparison (Bandura, 1997). In those cases, efficacy beliefs generally increase when an individual performs better than others in their environment, and decrease when performing below the normative standard. However, the outcome of self-evaluation can be modified depending on characteristics of those chosen for social comparison (Bandura, 1997). The efficacy beliefs can also be formed through a modelling process, described as an observation of others' performance without comparative evaluation (Bandura, 1993). In those cases, success of a model increases an individual's self-efficacy, while their failures decrease it, and the greater the similarity between the model and individual, the greater the impact on efficacy beliefs (Bandura, 1997). However, in the case of significant differences between the two, aspirational modelling can take place. In this process, observation of the model guides and motivates professional development, and the subsequent acquisition of the desired skills raises an individual's self-efficacy. Interestingly, models' behaviour in face of challenges (confidence and determination vs uncertainty and concern) can instil similar reactions in the individuals who observe them (Bandura, 1997). Overall, the importance of the vicarious experience as a source of efficacy beliefs is particularly significant in the case of an individual having little preconceptions regarding their own capability. However, most commonly personal experiences and vicarious experiences coincide, influence each other and the efficacy information they convey (Bandura, 1989).

2.3.2.3 Verbal persuasion

Verbal persuasion refers to the strengthening of an individual's belief in their capability through social persuasion (Bandura, 1989). Although verbal persuasion is suggested to have a limited power to produce long-term self-efficacy changes, it can motivate sustained effort and persistence when facing difficulties. This is especially the case when provided by a "significant other" person viewed as credible and knowledgeable in the specific context (Bandura, 1997). The greatest positive impact of verbal persuasion is observed among individuals who already believe in their capability and the outcome of their effort reaffirms their existing efficacy belief. In cases where persuasion raises unrealistic belief of one's own capability, and is followed by a failure, it

discredits the persuader and decreases individual's self-efficacy (Bandura, 1993, 1997). The efficacy information is often delivered in a form of evaluative feedback, which can either increase or decrease self-efficacy. A feedback emphasising personal abilities and suitability for the task has the most significant positive impact on self-efficacy, particularly in the early stages of skill development (Bandura, 1997). Similarly, feedback that highlights the progress and improvement of performance positively influences an individual's efficacy belief (Schunk, 1984). On the other hand, a decrease in self-efficacy takes place when feedback directly emphasises the deficiencies of performance or discredits an individual's capability, as well as when it indirectly devalues the individual. This can take the form of assigning them unchallenging tasks, repetitive unsolicited assistance, excessive recognition for poor performance or lower praise in comparison to others performing at the same level (Bandura, 1997). Interestingly, constructive criticism of a deficient performance, that provides guidance for improvement, does not have a negative impact, but leads to sustained or increased motivation and self-efficacy (Schunk, 1984; Bandura, 1997). Overall, although verbal persuasion has a potential to both increase and decrease self-efficacy, its negative impact is more powerful in the long-term. The disbelief in personal capabilities discourages the individual from engaging in the activity, which limits the opportunities to practice and achieve success (Bandura, 1997).

2.3.2.4 Physiological and affective states

Human judgement of capabilities is partially based on the information conveyed by their physiological and emotional bodily reactions, originally referred to as physiological and affective states (Bandura, 1989). This source of self-efficacy is believed to be most influential in the context of physical performance and activities that require coping with stressors (Bandura, 1997). High arousal has a potential to inhibit performance, hence the presence of physiological and affective body reactions before and during engagement in a task can be interpreted as a sign of vulnerability and incapability. In these situations, it has a negative impact on self-efficacy (Bandura, 1997; Bhati and Sethy, 2022). However, the influence of physiological and affective states on self-efficacy can be moderated by the intensity of these bodily reactions, situational circumstances, their interpretation by the individual as well as their current mood and broader personal beliefs (Bandura, 1997). A positive effect on efficacy beliefs can be achieved through self-regulation of the physiological and affective body responses, as well as thorough adjustment of their interpretation

(Bandura, 1989). An example of interpretation that can promote self-efficacy is viewing the arousal as an energizing facilitator of the performance. This kind of interpretation can be linked with a past experience of success associated with presence of physiological or affective states. On the other hand, past failure can contribute to perception of body responses as performance inhibitors (Bandura, 1997). A previously established level of self-efficacy in relation to a specific task influences personal sensitivity to information carried by the arousal. A low sense of belief in personal capability makes one prone to further self-efficacy decrease following a physiological or emotional arousal (Bandura, 1997; Bryant, 2017). Overall, the body's responses generally occur alongside or in the context of other self-efficacy sources (mastery experience, vicarious experience and verbal persuasion), and serve as an accessory source of efficacy information (Bandura, 1997).

To summarise, self-efficacy is a product of cognitive processing of information provided by diverse sources, such as mastery experience, vicarious experience, verbal persuasion and physiological and affective states. Integration of the efficacy information is complex, and varies across individuals and contexts. The level of an individual's cognitive development influences their ability to identify the relevant self-efficacy sources and utilise the information they convey. Furthermore, utilisation of self-reflective, metacognitive skills facilitates later accurate evaluation of personal efficacy beliefs against the outcomes of an individual's performance (Bandura, 1989, 1997).

2.3.3 Self-efficacy and performance

The relationship between self-efficacy and performance is self-perpetuating in nature (Figure 2.2). Each of the two continuously influences the other, and an increase in one facilitates improvement of the other (Potts, Potts and White, 2024). The quality of performance in a specific domain is the strongest source of efficacy information that influences human efficacy belief. This belief, in turn, impacts the consecutive performances, through modification of human cognitive, motivational, affective and decisional processes (Bandura, 1997).
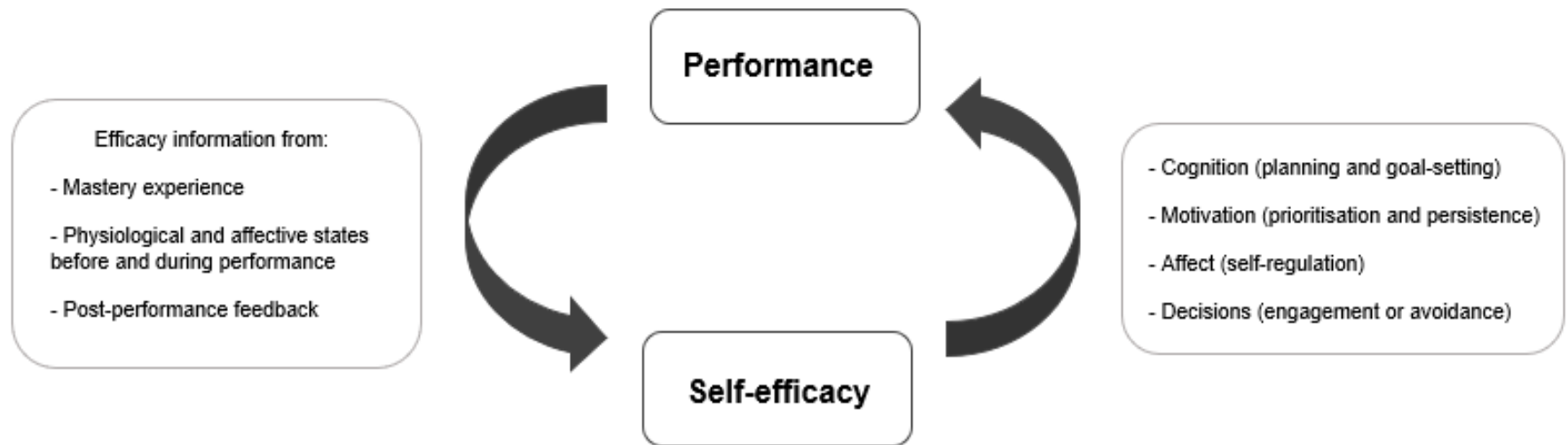
Figure 2.2 The self-perpetuating relationship between self-efficacy and performance (adapted from Potts, Potts and White, 2024).

2.3.3.1 Modification of cognitive processes

Self-efficacy modifies human thought patterns, and facilitates planning and goal setting. These cognitive constructs (thoughts and plans) guide action and promote proficiency of performance in situations that can be pre-planned (Bandura and National Inst of Mental Health, 1986). Performance outcomes, in turn, influence the level of self-efficacy; success increases it and failure decreases. Overall, the stronger the efficacy belief, the more ambitious the goals, the higher the commitment to achieve them. Moreover, high self-efficacy facilitates visualisation of success and construction of situations that provide opportunities for success. Low self-efficacy, on the other hand, leads to uncertainty and "cognitive negativity", where individuals dwell on their deficiencies and visualise failure, which in turn inhibits motivation and performance (Bandura, 1997). However, not all performances can be pre-planned. A large proportion of human environments are complex and dynamic in nature, which creates a level of uncertainty regarding the outcomes of performance, and consequently makes action planning difficult (Bandura, 1993, 1997). In those situations, the outcomes of performance are often more dependent on the motivational and affective processes (Fuente *et al.*, 2022).

2.3.3.2 Modification of motivational processes

Self-efficacy is a crucial contributor to cognitive regulation of motivation (Bandura, 1989). The belief in one's own capability to successfully complete an action is generally a precursor to the process of visualising its completion and planning the execution of that task in a way that will most likely produce a satisfactory outcome (Bandura, 1997). Moreover, the sense of self-efficacy contributes to prioritisation of the given task and persistence in its completion (Bandura, 1989). Motivation can also be gained from reflection on past experiences and reasoning regarding the causes of successful or unsuccessful outcomes. High level of self-efficacy contributes to a belief in one's power to adjust one's own behaviour and influence the environment in order to either repeat the past success or introduce changes to improve the unsuccessful performance. This in turn motivates action (Bandura, 1997).

2.3.3.3 Modification of affective processes

Self-efficacy plays an important role in self-regulation of affective states (Bandura, 1989). Their nature and intensity can be modified through the control of (1) thoughts, (2) actions and (3)

the affect itself. High self-efficacy promotes (1) control over the personal interpretation of reality, so that it facilitates self-regulation and control over the incoming negative thoughts; (2) ability to influence the environment to decrease its negative potential on one's emotional state; (3) control over the emotional states that arise (Bandura, 1997). In the context of performance, the efficacy beliefs influence one's affective state before and throughout the activity, which in turn influences the quality of their performance (Bandura, 1997; Schunk, 2011).

2.3.3.4 Modification of decisional processes

The decisions made by an individual are highly dependent on their efficacy beliefs (Bandura, 1997). Humans tend to engage in activities and environments that they perceive to be within their capability, while they avoid those that they perceive as too difficult. The higher the self-efficacy level, the more challenging the activities one engages in, and the more ambitious the goals one sets for themselves (Schunk, 2011). In the context of performance, decision regarding engagement in an activity influences a broad spectrum of aspects, including performance outcomes, proficiency in that given task and subsequently the re-evaluated efficacy beliefs (Bandura, 1997).

Considering the fact that humans are a part of the environment, and that every individual's action influences or modifies their environment, the impact of personal efficacy beliefs reaches beyond the individual (Bandura, 1989). Consequently, clinician's concussion-related self-efficacy influences their clinical practice, the outcomes of their patients and their broader environment.

2.4 Current research on self-efficacy in healthcare

The concept of self-efficacy and its relevance for learning and performance has been extensively researched over the past decades. In the context of healthcare and healthcare education, the focus on self-efficacy coincided with a paradigm shift, from a disease-centred approach to a health-centred one, which emphasises the value of both health and personal well-being (Shorey *et al.*, 2022). Clinician's and patient's self-efficacy have been shown crucial for effective self-management, as well as initiation and maintenance of positive behaviour changes (Baldwin *et al.*, 2006), including those aiming for high quality patient-care (Shorey *et al.*, 2022). In the educational setting, healthcare students' efficacy beliefs have been shown to positively influence course completion, clinical performance and motivation, hence establishing the sense of self-efficacy

during professional education is essential for producing competent and independent clinicians (Shorey *et al.*, 2022).

2.4.1 The mediating role of self-efficacy on clinical practice

Literature indicates that clinician's efficacy beliefs influence the quality of their clinical practice through mediating a variety of their behaviours (Karagkounis *et al.*, 2020). These include proactivity in optimisation of work performance (Karagkounis *et al.*, 2020), acquisition of evidence and implementation of evidence-based practice (Abrahamson and Gillette, 2013), engagement in knowledge exchange with peers (Farhan *et al.*, 2020), effective stress management and productive coping with work-related challenges (Salanova, Grau and Martínez, 2014; Sánchez-Anguita Muñoz, Pulido López and Conde Vieitez, 2018), as well as resilience and physical and mental quality of life during extraordinary work-related circumstances (COVID-19 pandemic) (Baluszek, Brønnick and Wiig, 2023). Since skill-specific efficacy beliefs can influence performance in specific contexts (Bandura, 1997), numerous investigations have been carried out to explore clinicians' self-efficacy across a range of demanding professional skills. Those included for example work with autistic patients (Corden, Brewer and Cage, 2022), management of mental illness (Loeb *et al.*, 2018), disclosing a poor prognosis or transition to palliative care (Messerotti *et al.*, 2020), utilising online medical databased to guide clinical decision making (Naeem and Bhatti, 2020) or engagement in research (Bougmiza *et al.*, 2022). Across the healthcare education sector, similar investigations explored students' self-efficacy linked with delivery of a family centred care (Young *et al.*, 2012), communication with patients (Ghofranipour *et al.*, 2018), general health promotion education (Tresolini *et al.*, 1994; Wilesmith, Lao and Forbes, 2020), nutrition education for special populations (Carson *et al.*, 2002), responses to clinical uncertainties (Lee *et al.*, 2023), engagement in interprofessional collaboration (Jones *et al.*, 2021) as well as clinical practice and coping with stress among international students (Altıntas *et al.*, 2024). Each of the above tasks had been previously established as challenging, due to for example, knowledge gaps (Naeem and Bhatti, 2020), difficulties in translation of theoretical knowledge into practice (Tresolini *et al.*, 1994) insufficient and inconsistent training (Loeb *et al.*, 2018; Jones *et al.*, 2021), as well as limited real-life task exposure (Loeb *et al.*, 2018; Paloncy, Georges and Liggett, 2019). Since the optimal-level delivery of those tasks has been considered crucial for both patient safety and clinician's mental well-being (Messerotti *et al.*, 2020; Lee, Chan and Ng, 2023), past

investigations focused on establishing the levels of clinicians'/students' self-efficacy in those tasks, exploration of factors contributing to the limited efficacy beliefs and implementation of interventions aiming at increasing the levels of self-efficacy in those contexts. Although concussion-related clinical practice has also been considered as highly challenging (McCrory *et al.*, 2017), the investigations of self-efficacy in this context have been very limited to date.

2.4.2 Concussion-related self-efficacy

Only one previous study explored clinicians' self-efficacy in concussion-related clinical practice. Savage and Covassin (2018) investigated efficacy beliefs of 94 American athletic trainers' regarding performance of eleven concussion assessment techniques and eleven concussion management techniques. All the evaluated techniques had been endorsed by the most recent consensus statement at the time of data collection (4th International Conference on Concussion in Sport). The questionnaire designed for this purpose demonstrated good face validity, as established by a panel of 10 concussion experts, excellent test-retest reliability (Cronbach's alpha = 0.92) and acceptable internal consistency between the subscales (Cronbach's alpha = 0.76) and intra-rater reliability. In line with the recommendations for constructing self-efficacy scales (Bandura, 2006), self-efficacy was rated on a 0-100 scale, where 0 represented 'no self-efficacy', 50 represented 'moderate self-efficacy', and 100 represented 'complete self-efficacy' (Savage and Covassin, 2018). The evaluated clinicians were required to rate their efficacy beliefs separately for each of the 22 techniques. Although the overall level of self-efficacy across all assessment and management techniques was moderate, the scores representing self-efficacy in specific concussion-relevant techniques varied from very low to high (Savage and Covassin, 2018) (Table 2.3).

Table 2.3 The levels of self-efficacy in concussion assessment and management among American athletic trainers (Savage and Covassin, 2018)

Concussion-relevant technique	Self-efficacy score
Assessment	
Baseline examination	84.18 ± 30.50
History and clinical evaluation	92.17 ± 12.50
Symptom checklist	94.95 ± 7.50
Cranial nerves assessment	66.98 ± 36.20
Standardised assessment of concussion (SAC)	50.14 ± 46.30
Sport Concussion Assessment Tool-3 (SCAT3)*	69.20 ± 41.40
Balance measure	70.78 ± 38.70
Vestibular-ocular motor screening	39.31 ± 41.70
King-Devick test	12.71 ± 32.50
Paper/pencil neuropsychological assessment	5.79 ± 21.10
Computerised neuropsychological assessment	77.55 ± 36.20
Management	
Home care instructions	90.93 ± 14.50
Symptom checklist	94.37 ± 13.10
Standardised assessment of concussion (SAC)	45.05 ± 47.00
Sport Concussion Assessment Tool-3 (SCAT3)*	65.23 ± 44.40
Balance measure	68.85 ± 40.90
Vestibular-ocular motor screening	38.18 ± 42.80
Vestibular-ocular motor therapy	17.61 ± 31.70
King-Devick test	10.80 ± 30.50
Paper/pencil neuropsychological assessment	6.30 ± 21.40
Computerised neuropsychological assessment	78.60 ± 35.20
Stepwise progression	92.61 ± 15.90

* Replaced by SCAT6 (Patricios, Schneider, *et al.*, 2023)

Considering the link between self-efficacy and performance (Potts, Potts and White, 2024), it is possible that the repertoire of clinical skills utilised by these clinicians had mainly consisted of the techniques they have had a strong sense of efficacy in. Although this investigation did not explore the factors perceived to influence participants' self-efficacy levels, it evaluated the differences between clinicians working in two different environments. Athletic trainers who worked in the collegiate settings displayed significantly higher overall assessment and management self-efficacy, and significantly higher self-efficacy for certain individual techniques (balance measure, King-Devick test and vestibular ocular motor screening) than those working in the high school settings (Savage and Covassin, 2018). This suggests the influence of the work environment on clinicians' efficacy beliefs, in line with the TRD model (Bandura, 1989). The authors hypothesised that in the context of concussion-related techniques, work-setting can dictate the availability of tools and other resources, influencing the ability to practice the specific techniques, and in turn influencing clinicians' self-efficacy (Savage and Covassin, 2018). Regrettably, no other evidence exists in relation to clinicians' concussion-related efficacy beliefs, hence it remains unclear what had led to such disparity in self-efficacy levels across the investigated techniques, whether it influenced clinicians' clinical practices and what strategies could be implemented to alleviate this situation. With no evidence that is specific to concussion, potential hypotheses on this topic can be guided by the findings of research conducted in other clinically-relevant contexts.

2.4.3 Factors influencing self-efficacy in clinically-relevant contexts

Exposure, practice and peer observation have been consistently indicated as the crucial factors influencing self-efficacy in contexts other than concussion, among both qualified clinicians and students (Tresolini *et al.*, 1994; Young *et al.*, 2012; Atun-Einy and Ben-Sasson, 2018; Loeb *et al.*, 2018; Crane *et al.*, 2019; Zamani-Alavijeh *et al.*, 2019; Bougmiza *et al.*, 2022). This is in line with Bandura's original work that emphasised the value of mastery experience and vicarious experience for development of self-efficacy (Bandura, 1997). Nevertheless, several studies considered the relevance of factors beyond the general self-efficacy sources, and explored how modifiers of the aforementioned experiences influence self-efficacy. One group of factors were those moderating the quality of exposure during education, for example, the breadth of education, presence of direct practice, real-life world experiences (Tresolini *et al.*, 1994; Wilesmith, Lao and

Forbes, 2020), clinical environments, relationships with peers (Shorey *et al.*, 2022) and educators/role-models, whose demonstrations and feedback further facilitated self-efficacy development (Tresolini *et al.*, 1994; Young *et al.*, 2012). Perception of preparedness was also indicated as crucial by the qualified clinicians, according to whom unexpected encounters during clinical practice (Zamani-Alavijeh *et al.*, 2019; Wilesmith, Lao and Forbes, 2020) as well as lack of continuous access to supporting resources (Naeem and Bhatti, 2020) were factors negatively impacting self-efficacy. The value of peer-observation was emphasised particularly by those who did not have extensive previous experience in the specific context or those who compared their own performance with that of the others (Zamani-Alavijeh *et al.*, 2019). The other group of factors that were indicated as moderators of clinician's efficacy beliefs were their personal attributes, including knowledge and attitudes towards clinical practice, attitudes to learning in the specific context (Tresolini *et al.*, 1994; Loeb *et al.*, 2018), clinician's self-concept (Zamani-Alavijeh *et al.*, 2019), as well as their perceptions regarding patients, peers and the work environment (Loeb *et al.*, 2018; Zamani-Alavijeh *et al.*, 2019; Wilesmith, Lao and Forbes, 2020). Moreover, engagement in reflective practice was indicated as beneficial for self-efficacy, particularly when it (1) led to identification of personal weaknesses and generation of action plan for improvement, (2) facilitated understanding and familiarisation with the task, (3) promoted open mindset, awareness of one's own progress and capabilities, and (4) led to connection with emotions linked with performance of the task (Yong, 2025). The summary of the aforementioned investigations is presented in Table 2.4.

The above evidence demonstrates the complexity of the process of self-efficacy development, and the multitude of factors contributing to clinician's efficacy beliefs. Literature has demonstrated that the general sources of self-efficacy (mastery experience, vicarious experience, verbal persuasion and physiological and affective states) are relevant for development of these beliefs, which in turn influences clinical practices. However, in line with the SCT, a multitude of environment- and clinician-related factors can modify those efficacy beliefs, and subsequently clinical practice. In the light of the globally evident challenges in provision of the optimal concussion-related patient care, particularly within the sporting environments, this thesis will explore the development of clinician's concussion-related self-efficacy, from education through clinical practice.

Table 2.4 Past investigations of self-efficacy in clinically relevant contexts

Study	Design	Context	Clinician group (n)	Factors affecting self-efficacy
Tresolini *et al.*, 1994	Qualitative	Delivery of patient education for health promotion	Fourth year medical students (n=28)	Experience (breadth of education, direct and real-world practice), role-models' observation and feedback, personal knowledge and attitudes
Young *et al.*, 2012	Quantitative	Family-centred care during bedside rounds	Medical students (n=172)	Role model observation, mastery experience
Atun-Einy and Ben-Sasson, 2018	Quantitative	Autism spectrum disorder diagnosis and care	Allied healthcare professionals (n=234)	Experience in task delivery
Loeb *et al.*, 2018;	Quantitative	Mental illness management Team-based care	Primary care doctors (n=448)	Communications skills, knowledge regarding mental illness, preparedness in management of mental illness Communications skills, team dynamics and climate, attitudes towards team-based care
Crane *et al.*, 2019;	Quantitative	Autism spectrum disorder screening, diagnosis and care	Psychiatrists (n=172)	Knowledge and experience (past training and number of autistic patients)

Zamani-Alavijeh *et al.*, 2019	Qualitative	Delivery of health education	Public health educators (n=23)	Quality and quantity of experience, encountering unexpected events, perception of client's trust, self-concept, professional knowledge and skills, vicarious experiences
Bougmiza *et al.*, 2022	Quantitative	Research-related skills	Primary care doctors (n=122)	Experience in development of clinical practice guidelines
Wilesmith, Lao and Forbes, 2020	Mixed-methods	Delivery of patient education	New-graduate physiotherapists (n=149; n=15)	Experience in patient education
Naeem and Bhatti, 2020	Quantitative	Use of the online medical databases for clinical reasoning	Primary and secondary care doctors (n=517)	Experience (access to resources facilitating online database access)
Yong, 2025	Mixed-methods	Clinical skills	Medical students (n=273; n=13)	Engagement in reflection for evaluation past experiences, skill familiarisation and understanding, mindset transformation and connection with emotions

Chapter 3: Research philosophy and methodology

This chapter presents the overview of the research philosophy that guided my doctoral research, and the methodological strategies that were utilised to achieve its aims and objectives, detailed in Chapter 1.

3.1 My research philosophy

A research philosophy that I identify with is pragmatism. Pragmatism has been described as 'the most sensible and practical method available in order to answer a given research question' (Clarke and Visser, 2019), and its main focus is on practical understanding of real-world issues (Kelly and Cordeiro, 2020). I decided to pursue this research in the hope of generating evidence that can improve concussion-related clinical practices by enhancing healthcare education. My passion to find solutions to real-life problems resonates with the underpinnings of pragmatism, and its focus on the future (Kaushik and Walsh, 2019). Clarke and Visser (2019) suggest that pragmatism is concentrated on practicality and adaptation, and aims to find solutions that work, as opposed to searching for the truth. This corresponds with my expectations towards research. My practice has taught me that there is no single approach, whether in education or clinical practice, that obtains the best results. Context is crucial, inclusive of stakeholder-related factors, so a holistic understanding of the issue is essential for finding solutions. This holistic approach is in line with the pragmatic research philosophy (Clarke and Visser, 2019). Newton, Da Silva and Berry (2020) add that pragmatist researchers value knowledge for its usefulness and undertake practically relevant topics. Although I agree with Flexner (1939) that there is no useless knowledge, my focus and interest lie in gaining knowledge that is practically applicable.

The same philosophy has underpinned my practice. If I were to describe myself as an educator, I would use words like 'open minded' and 'sensible.' As previously mentioned, I fully appreciate the diversity amongst students, and I believe that flexibility is necessary when working in a constantly changing educational environment. According to Adeleye (2017, p.2) pragmatists believe that 'whatever was true yesterday need not to be the same today'. I also adapt my teaching methods depending on circumstances, I stay open to students' feedback and adjust my approach,

as long as it supports them in reaching their learning goals. This appreciation of the utility of methods is homogenous with pragmatists' view, that actions should be evaluated based on their results, and that no truth is absolute and permanent (Adeleye, 2017) (Adeleye, 2017). With this in mind I draw from multiple learning theories in my educational practice, and I implement the behaviourists' positive reinforcement (Ertmer and Newby, 2013), the cognitivists' desirable difficulties (Bjork and Bjork, 2020), and the active student engagement in real-world scenarios, suggested by the constructivists (Ertmer and Newby, 2013). I strive to create a supportive learning environment, in line with the humanists' student-centred approach (Tangney, 2014) and I emphasise to students the importance of seeking connection between concepts and searching for answers, suggested by the connectivists (Garcia, Brown and Elbeltagi, 2013). Hence, when undertaking this research, I have decided to remain equally open-minded, and search for strategies that will not only be practically useful, but also versatile and flexible.

3.2 Selection of research strategies

Action research has been described as a strategy of systematic enquiry aimed at improvement of practice (Oranga and Gisore, 2023), informed by a belief that 'there is no substitute for learning by doing' (Stark, 2014). This approach has resonated with my goal, especially when literature suggests it has been widely used in education, and it often results in implementation of meaningful changes within the researcher's immediate environment (Oranga and Gisore, 2023). Although its philosophical roots lay in the democratic approach (Stark, 2014), action research had been successfully combined with the pragmatic philosophy in the past (Davydd and Verlag, 2007). Generally, action research entails several steps, including conceptualization of the ideas regarding specific problems, its investigation through data collection and analysis, identification of strategies for practice improvement, their implementation, reflection on the outcomes (Oranga and Gisore, 2023). This can start a repetitive cycle, with reflection stimulating action, and new knowledge creation (Davydd and Verlag, 2007). The utility of action research and its potential to produce practically relevant knowledge inspired this research. Although throughout my professional doctorate journey I did not manage to complete the whole cycle of action research, the recommendations for practice presented in Chapter 8 are the foundation for my future research.

The pragmatist research philosophy proposes that researchers should use methodological approaches that are the most suitable for the problems they investigate (Kaushik and Walsh, 2019). Therefore, utilisation of multiple data sources and mixed research methods is common among the pragmatic researchers (Allemang, Sitter and Dimitropoulos, 2022). As my personal philosophical beliefs have been evolving over the initial months of my professional doctorate journey, it became clear to me that applying a single methodological approach, either quantitative or qualitative, will not allow me to obtain the evidence I am searching for. Through gaining the understanding of the advantages of both these approaches, I became appreciative of the value of mixed methods in research and the holistic view that it can offer. Considering the multifactorial nature of concussion-related problems within the healthcare environment (Chapter 2), this holistic approach was the most appropriate. I decided to begin with utilising the well-established social cognitive theory, specifically its elements pertaining to self-efficacy, and its standing within the triadic reciprocal determinism model, and test its applicability in the context of concussion-related patient care. Confirmatory research allows testing hypotheses and theories, and generalises the findings beyond the previously considered contexts (Foster, 2024). Therefore, I chose to adapt a quantitative survey utilised in past research (Savage and Covassin, 2018), and re-confirm its findings regarding self-efficacy levels in an Irish context, using a larger sample of clinicians, across a variety of professions, and within an educational setting. In line with the pragmatic passion for actionable research (Allemang, Sitter and Dimitropoulos, 2022), this investigation was expanded beyond the original self-efficacy level testing, and evaluated self-efficacy's relationship with clinical practice and past education, as well as the relevance of the general self-efficacy sources in the context of concussion assessment and management (Appendices A and B). Pragmatic research emphasizes the value of building knowledge and understanding of the world, based on human experience, and the pragmatic view is that 'social problems are best defined by the individuals experiencing them' (Allemang, Sitter and Dimitropoulos, 2022, p.39). Therefore, the natural next step in my investigation was to explore the lived experiences of clinicians and healthcare students involved in concussion-related patient care within a sporting environment. The main aim of this part of my investigation was to gain their perspective on the factors influencing self-efficacy in the context of concussion-care. Explanatory research is an open-minded investigation that can facilitate preconception-free exploration of ideas and understanding of the relationships between them

(Foster, 2024). Considering the overall goal of generating evidence on what support is required by the clinicians, this approach was the most appropriate. The next paragraphs provide detail on the methodological choices made for the investigations presented in Chapters 4,5, 6 and 7.

3.2.1 Quantitative investigations

3.2.1.1 Survey validity

Savage and Covassin (2018) reported good face validity for their survey, which was adapted for use in the quantitative investigations presented in Chapters 4 and 5. Content validity of the adapted survey was further evaluated by five multinational concussion experts, using a modified Delphi technique (Nasa et al., 2021). The protocol involved rating (1-5) each of the survey questions separately regarding its clarity, comprehensiveness and appropriateness, and modification or removal of questions with an average score below 4 (Devereux *et al.*, 2022). Construct validity was assured through alignment with Bandura (2006) recommendations for construction of self-efficacy scales.

3.2.1.2 Survey reliability

The intra-rater reliability of the original survey was previously established as acceptable (Savage and Covassin, 2018). The adapted survey was evaluated using Cronbach's alpha and demonstrated good to excellent internal consistency for self-efficacy [0.95/0.94 (clinicians/students)], frequency of use [0.95/0.96 (clinicians/students)], and positive [0.91/0.86 (clinicians/students)] and negative [0.92/0.93 (clinicians/students)] factor scales.

3.2.2 Qualitative investigations

3.2.2.1 Semi-structured interviews and focus groups

Semi-structured interviews are the most frequent qualitative data source in healthcare research (Dejonckheere and Vaughn, 2019). Utilisation of a semi-structured format facilitates an in-depth exploration of participants' opinions, beliefs and attitudes regarding a specific topic (Babe, 2017; Dejonckheere and Vaughn, 2019). The aim of this investigation was to gain the clinicians' perspective on the factors influencing self-efficacy, while at the same time focusing the conversation within the theoretical underpinnings of self-efficacy, therefore the semi-structured format was deemed appropriate. Adams (2020) adds that the use of a semi-structured interviewing

method is particularly suitable when a follow-up enquiry might be required. Considering the pragmatic focus on generating practically relevant knowledge, follow-up questioning was deemed essential for gathering actionable and meaningful data. The nature of this investigation was sensitive and participants were likely to expose their vulnerability, and discuss their professional insecurity. Therefore, to ensure the perception of safety and connection with the interviewer (Gill and Baillie, 2018), the individual interview format was chosen for exploration of the clinicians' views. On the other hand, the investigation of the students' perspectives took the form of focus group discussions. The social interaction between participants of a focus group can facilitate exploration of collective perspectives, as well as highlighting agreement and inconsistencies (Gill and Baillie, 2018). Considering that the student-participants commonly perform among their peers, including the placement scenarios they were prompted to discuss, the focus group format was deemed the most appropriate. However, due to the topic sensitivity, participants were encouraged to choose their discussion group members, which facilitated a relaxed group environment.

3.2.2.2 Interpretative phenomenology

The purpose of a phenomenological enquiry is to gain an understanding of an individual's experiences and their perceptions of those experiences (Ramanadhan *et al.*, 2021). Since self-efficacy is a personal belief based on past experience (Bandura, 1997), the understanding of each participant's lived experiences and their accompanying thought patterns was crucial to get a deep understanding of how the efficacy beliefs are developed and what interpersonal differences may occur throughout this process. Interpretative phenomenological approach is especially useful to explore perceptions of individuals considered to be a part of a broader system (Ramanadhan *et al.*, 2021), and in the case of topics that are complex and emotionally laden (Smith and Osborn, 2015). This description perfectly represents the topic of our study. The TRD model clearly demonstrates the interconnectedness of human and the environment (Bandura, 1989), and this investigation aimed at exploring the process of self-efficacy development in relation to a challenging task, that involves multiple stakeholders and is delivered within a complex environment. However, considering that this investigation was grounded in the SCT, data analysis could not be considered completely inductive. Therefore, reflexive thematic analysis (RTA) (Braun and Clarke, 2021) was deemed more appropriate than interpretative phenomenological analysis (Ramanadhan *et al.*, 2021). Moreover, the RTA is an interpretative reflexive process, where "researcher's subjectivity

is conceptualised as a resource for knowledge production" (Braun and Clarke, 2021, pp.334-335). The overall goal of this research was to produce recommendations for educational practice that can facilitate development of students' self-efficacy. Hence, the interpretation of participants' perspectives by an experienced educator was deliberate, and aimed at formulating practically applicable solutions.

3.2.2.3 Rigour and trustworthiness

The main strategy implemented to enhance the rigour of this research was the 'critical friend' approach, commonly utilised within the educational action research (Mat Noor and Shafee, 2021). Although the conceptualisation of the critical friend is quite ambiguous across literature, and the exact set of tasks, competencies and behaviours that are expected of them are not clear, in the context of research, critical friend is proposed to critique the work, ask provocative questions, provide a view through a different lens (MacPhail, Tannehill and Ataman, 2021) and stimulate reflection (Kiewkor, Wongwanich and Piromsombat, 2014). Several 'critical friends' were engaged throughout the different stages of this research, including fellow healthcare educators who contributed to the research design, a researcher experienced in qualitative research who contributed to formulation of the interview guides and qualitative data analysis, as well as educators experienced in (I) concussion education, (II) applied psychology and (III) teaching and learning, who contributed to the process of development of the educational recommendations.

Literature suggests that a relationship with a critical friend based on mutual respect and trust can facilitate reflexivity (Earl and Ussher, 2016; Korstjens and Moser, 2018), which was incorporated into this research. Reflexivity, defined as 'a set of continuous, collaborative and multifaceted practices through which researchers self-consciously critique, appraise and evaluate how their subjectivity and context influence the research processes', contributes to research trustworthiness (Olmos-Vega *et al.*, 2023). To facilitate my reflexivity throughout the qualitative stages of this research, I engaged in several hours of personal development through peer-coaching. During these sessions I actively worked on improving my metacognitive skills, which have been deemed crucial for reflexivity (Merkebu *et al.*, 2023). Development of these metacognitive skills also facilitated implementation of the persistent observation strategy into the process of data analysis. Persistent observation described as an immersive and open-minded engagement with data contributes to research credibility (Korstjens and Moser, 2018; Sirwan, 2024).

Trustworthiness of this research was also enhanced by the use of thick description (Korstjens and Moser, 2018). Qualitative data was gathered from participants who differed in the length of concussion-related professional experience (final-year athletic therapy students and qualified clinicians with a range of professional experience from 0.5 to 15 years), type of sporting populations they engage with, frequency of concussion exposure and workplace setting. This study presented context-specific information in addition to participants' perceptions, which has been suggested to facilitate transferability judgement regarding the research findings (Korstjens and Moser, 2018).

3.3 Summary

This chapter presented the compatibility of the pragmatic research philosophy with my personal philosophy as an educator, and with my goal of producing practically meaningful and actionable evidence. Moreover, this chapter outlined the rationale for the major methodological choices that supported the achievement of the aims and objectives of this research, in line with the pragmatic approach. The methodological details, relevant for each of the four investigations presented in Chapters 4-7, can be found in the Methods sections across the next four chapters.

Chapter 4: Concussion assessment and management self-efficacy among Irish clinicians

Author Contribution Statement

The research presented in this chapter was conceptualised and conducted by the author as part of their doctoral research. The author was responsible for developing the research objectives, designing the methodology, obtaining ethical approval, and conducting all aspects of data collection, analysis, and interpretation. They also prepared all written and visual content presented in this chapter. Supervisory support was provided in an advisory capacity throughout the research process, with particularly significant input and extensive feedback during the survey adaptation phase to ensure content relevance and clarity. This chapter is presented as it appears in the published work, with some minor deviations on terminology to conform with the methodological cohesion of the thesis.

Abstract

Background: Low self-efficacy might lead to clinicians' non-compliance with gold-standard concussion-care recommendations. This study aimed to explore concussion assessment and management self-efficacy and practices of allied healthcare professionals in Ireland and identify factors influencing self-efficacy.

Hypotheses: (1) Self-efficacy levels and practices will vary across different concussion assessment and management skills, (2) the ability to practice skills will impact self-efficacy the most.

Study Design: Cross-sectional.

Level of Evidence: 3.

Methods: A cross-sectional survey investigating (1) demographics, (2) concussion assessment (immediate and office) and management (post-concussion advice and management/rehabilitation) self-efficacy levels and practices (0-100 scale), and (3) factors affecting self-efficacy (5-point Likert scale). In total, 285 Irish clinicians [chartered physiotherapists (n=96), emergency medical services practitioners (n=95), certified athletic therapists (n=78), dually qualified-chartered physiotherapists + certified athletic therapists (n=16)] participated. There were 68.4% (195) males, 31.2% (89) females, and 0.4% (1) non-binary participant, with mean age of 35.1±10.3 years and mean length of professional practice 5.93±5.86 years.

Results: Levels of self-efficacy among clinicians were 64.5±26.6 (immediate concussion assessment) and 56.6±25.4 (post-concussion advice). The highest scores were for concussion symptom checklist (80±28.4) and advice on physical rest (80.1±27.8), the lowest for Child Sport Concussion Assessment Tool (SCAT5) (44.6±41.2) and advice on nutrition (34.1±33.7). The overall levels of self-efficacy considering all assessment/management skills among Certified Athletic Therapists and Chartered Physiotherapists were 51.5±20.1 (assessment) and 62.1±20.9 (management). The highest scores were for history/clinical evaluation non-specific to concussion (86.6±16.2) and advice on physical rest (86.3±20), the lowest were for paper/pencil neuropsychological test (16.7±28.6) and advice on a use of medication (39.2±35). A strong positive correlation was observed between clinicians' self-efficacy and frequency of use of overall (r=.795, $P<0.001$) and immediate (r=.728, $P<0.001$) assessment, advice (r=.805, $P<0.001$) and management (r=.812, $P<0.001$) skills. Factors having the greatest positive impact on clinicians' self-efficacy were ability to practice skills during clinical placement (3.3±.9) and remaining emotionally (3.3±.8) and physically (3.3±.8) calm while practising.

Conclusions: Clinicians in Ireland had moderate self-efficacy in concussion care. Those who used concussion-relevant skills frequently in practice, displayed higher self-efficacy for those skills.

Clinical relevance: Concussion-related self-efficacy can be enhanced through practice in a clinical environment and through experiencing composure while practising.

4.1 Introduction

Concussion is a global public health concern and a major issue in sport (O'Connor *et al.*, 2022a). Timely recognition and appropriate management may mitigate its negative outcomes (Boland *et al.*, 2022). Sport related concussion (SRC) is considered one of the most complex injuries in sport, with its diagnosis, assessment and management posing a challenge to healthcare practitioners (McCrory *et al.*, 2017). Best practice recommends adherence to the latest SRC assessment and management recommendations, e.g., comprehensive baseline testing, multimodal concussion assessment and staged return-to-play (Paddack *et al.*, 2016). However, lack of full compliance with these guidelines has been established in multiple countries and among various clinician groups (Yorke, Littleton and Alsalaheen, 2016; Lempke, Schmidt and Lynall, 2020; Maxtone *et al.*, 2020; Lempke *et al.*, 2023). Absence or limited baseline testing (Paddack *et al.*, 2016), limited use of 3-domain minimum concussion assessment and reassessment (Williams *et al.*, 2016; Lempke, Schmidt and Lynall, 2020; Maxtone *et al.*, 2020; Lempke *et al.*, 2023) and poor implementation rate of vestibular, balance and graded exertional training in concussion management (Yorke, Littleton and Alsalaheen, 2016) were the main issues reported. In Ireland, limited use of 3-domain minimum concussion assessment/reassessment was also identified among athletic therapists (Lempke *et al.*, 2023), with general lack of awareness of current concussion-related recommendations and poor practices established among chartered physiotherapists (McGrann and Keating, 2012). So far, shortage of funding (Lempke, Schmidt and Lynall, 2020), time and delay in dissemination of the latest consensus statement recommendations by the local sporting organisations and governing bodies (McGrann and Keating, 2012) have been reported as the main reasons for poor compliance with gold standard practice in Ireland. However, a qualitative investigation of barriers to its implementation is worth exploring. Limited curriculum, lack of staff (Lempke, Schmidt and Lynall, 2020) and their inadequate training, shortage of equipment and cultural barriers were reported in other countries (Quatman-Yates *et al.*, 2020). Gaps in concussion-relevant theoretical (Mathieu, Ellis and Tator, 2018; DiCerchio *et al.*, 2021; Rashid, Mishra and Dobbin, 2021; Jervis *et al.*, 2022) and practical (Wallace, Beidler and Covassin, 2018; Gardner and Heron, 2022) education are well documented in literature across different healthcare professional and student groups, with a poor level of concussion-related knowledge evident worldwide (Haider *et al.*, 2017; Tomkinson, Weston and Batt, 2017; Black *et al.*, 2020; DiCerchio *et al.*, 2021; Jervis *et al.*, 2022).

Knowledge acquired through education is not the only factor that impacts healthcare professionals' practice (Yorke, Littleton and Alsalaheen, 2016). Attitudes and personality traits have been shown to strongly influence behaviour. However human actions in specific contexts are impacted through them only indirectly (Ajzen, 1991). Context specific behaviour, as explained by the theory of planned behaviour, is impacted primarily by the intention to demonstrate the behaviour, which in turn is influenced by perceived behavioural control, also known as self-efficacy (Ajzen, 1991; Yorke, Littleton and Alsalaheen, 2016). Self-efficacy, established as a part of social cognitive theory, is defined as a personal belief in one's own capability to successfully perform a specific task. Its level is suggested to influence an individual's choices, persistence and performance in skill it relates to (Schunk and Gunn, 1986), by either motivating to engage or inclining to avoid and give up quickly in face of difficulty (Schunk, 1985). Thus, the level of self-efficacy regarding concussion care may impact healthcare professionals' practices (Yorke, Littleton and Alsalaheen, 2016; Savage and Covassin, 2018). The overall level of American ATs self-efficacy in assessment and management of concussion is moderate, with ratings for specific assessment/management techniques ranging from very low to high. This might explain, at least partially, the reason for their non-compliance with concussion gold standard recommendations (Savage and Covassin, 2018). Investigation of American physical therapists' self-efficacy indicated high and moderate levels of general confidence in concussion recognition, management and ability to provide clearance for return to sport (Yorke, Littleton and Alsalaheen, 2016). Critically, no specific concussion assessment or management skills were included in the study, so the findings only reflect on clinicians' overall confidence beliefs, and not self-efficacy, which is task-specific (Pagnotta *et al.*, 2013) and is a strong predictor of human behaviour (Pajares, 1996).

The general sources of self-efficacy are well known, and include mastery experience, vicarious experience, verbal persuasion and physical and emotional arousal (Bandura, 1997). However, research on the factors that impact development of self-efficacy in practical skills among healthcare professionals is scarce (Van Dinther, Dochy and Segers, 2011). The existing evidence suggests that mastery experience and observation of role models impact medical students' self-efficacy (Tresolini *et al.*, 1994; Carson *et al.*, 2002; Yorke, Littleton and Alsalaheen, 2016). Role models were suggested to stimulate self-efficacy not only through demonstration of skill, but also through provision of feedback and encouragement to further practice (Tresolini *et al.*, 1994). The quality of practical experience appears to be crucial, with practice in a clinical environment shown

64

to impact undergraduate nursing students' self-efficacy in family nursing skills (Ford-Gilboe *et al.*, 1997) and high-fidelity simulation improved athletic training students' self-efficacy in emergency cardiovascular care skills (Paloncy, Georges and Liggett, 2019). Considering the importance of self-efficacy for clinical practice it seems crucial to establish how to facilitate its development during professional education.

To date, no research has examined the sources of concussion assessment/management self-efficacy, its relationship with clinical and field-based patient care, and no comparison exists for self-efficacy or practices across healthcare professional groups. In addition, concussion assessment and management self-efficacy has never been explored in an Irish context. Thus, this study aimed to (1) identify the levels of self-efficacy in concussion assessment and management (2) explore the relationship between self-efficacy and clinical/field-based practices, (3) investigate the factors that impact the development of self-efficacy among clinicians most commonly involved in a team sports' athlete care in Ireland [certified athletic therapists (CATs), chartered physiotherapists (ChPs), emergency medical services practitioners (EMSPs)].

4.2 Methods

4.2.1 Participants

A cross-sectional study design was implemented. Eligible participants were allied healthcare professionals (CATs, ChPs and EMSPs), currently working in Ireland. Participants were excluded if not currently practicing in Ireland or did not assess or manage concussion as part of their clinical practice. Raosoft sample-size calculator (Crilly *et al.*, 2017) indicated a minimum sample size of 267 (5% margin of error, 90% CI). Only participants who completed at least one section of the survey apart from the demographics were included in data analysis.

4.2.2 Instrumentation

An anonymous online survey (Appendix A), adapted from a previously published survey, investigating ATs' self-efficacy in concussion assessment and management in the USA (Savage and Covassin, 2018) was utilised. Questions were adapted for the Irish context and to reflect the changes in concussion assessment and management recommendations introduced since the original survey was implemented (Mani *et al.*, 2015; Cheever *et al.*, 2016; Weber *et al.*, 2018; Clugston *et al.*, 2019; Caccese *et al.*, 2021; Graham *et al.*, 2021; Ishii *et al.*, 2021). The survey

consisted of 71-79 questions depending on whether a participant held postgraduate qualifications, was working with sporting populations and completed concussion-focused continuing professional development courses in the past. It consisted of four sections including participant demographics (Section 1), factors positively affecting self-efficacy (Section 2), factors negatively affecting self-efficacy (Section 3) and concussion assessment and management skills' self-efficacy (Section 4). Sections 2 and 3 were added to investigate the impact that self-efficacy influencing factors, suggested by social cognitive theory (Bandura, 1989), have on development of self-efficacy in concussion assessment and management.

Section 1 of the survey included questions on participant's age, gender, past undergraduate and postgraduate education, inclusion of concussion assessment and/or management in professional education curriculum, time since graduation, professional qualifications, experience in work with sporting populations, experience in assessment and management of concussion, and participation in concussion focused continuing professional development course.

Sections 2 and 3 utilised a 5-point Likert scale to investigate participants' views on 13 factors that may have no/little/mild/significant/very significant positive or negative impact on their self-efficacy in concussion assessment and management. The assessed factors included practice in both classroom and clinical environments, observation of an educator and peer, verbal encouragement from an educator and peer, physical and emotional relaxation, as well as positive and negative feedback coming from an educator and peer.

In Section 4 of the survey participants rated their self-efficacy beliefs separately for 19 concussion assessment (8 initial assessment and 11 office assessment) skills, and 13 concussion management (6 post-concussion advice and 7 direct management/rehabilitation) skills, on a 0-100 scale, with 0, 50 and 100 respectively representing beliefs of 'cannot do at all', 'moderately can do' and 'highly certain can do' (Bandura, 2006). Skills considered relevant for all the clinician groups were the initial assessment and post-concussion advice, to reflect Irish EMSPs' scope of practice in relation to head injuries. Office assessment and direct management/rehabilitation skills were considered relevant for CATs and ChPs. Participants' current practices in assessment and management of concussion were rated alongside self-efficacy beliefs, using 0-100 scale. The ratings 0, 50, 100 represented statements of 'never use the technique with concussed patients', 'use the technique with half of concussed patients' and 'use the technique with every concussed patient'. Participants were also asked to report whether each of the skills was included in the curriculum of

their professional education or a continuing professional development course. Cronbach alpha analysis demonstrated good/excellent internal consistency for self-efficacy (0.95), frequency of use (0.95) and positive (0.91) and negative (0.92) factor scales.

4.2.3 Procedures

Ethical approval was granted by Dublin City University Research Ethics committee (DCUREC/2022/099) and participants completed informed consent prior to completing the survey. Face validity of the survey was established by five multinational concussion experts (two Irish, two American and one Canadian). Each question was rated between 1-5 for clarity, comprehensiveness and appropriateness. All questions with an average score below 4 were modified or removed completely, based on the experts' recommendations (Devereux *et al.*, 2022). The survey was then piloted on 10 healthcare professionals. After review of pilot participants' feedback, parts of the survey were removed to avoid repetitive questioning and to decrease time required to complete the survey. The final survey was distributed online on SurveyMonkey (SurveyMonkey, CA, USA) and shared with the representatives of Irish governing bodies of allied healthcare professions for distribution among their members. Social media platforms as well as word of mouth were also used to recruit participants. The survey was open from November 2022 to March 2023, and the final survey took a mean of 9±5 minutes to fully complete.

4.2.4 Statistical analysis

Data was analysed in SPSS (Version 27, IBM Corp, USA). Descriptive statistics were calculated for demographic information. Means and standard deviations were also calculated for self-efficacy scores, frequency of skills use and for the factors impacting self-efficacy. All data, apart from general concussion assessment self-efficacy scores, was not-normally distributed. Spearman's Rank Order correlation was used to explore the relationship between skills' self-efficacy and frequency of their use. Effect sizes were classified as small ($r=0.10$), medium ($r=0.30$), and large ($r=0.50$) (Cohen, 1988). Kruskal-Wallis tests and pairwise comparisons were also used to examine differences in immediate assessment and post-concussion advice self-efficacy and frequency of use among CATs, ChPs, EMSPs and clinicians holding both CAT and ChP qualifications (CAT/ChPs). Statistical significance was set at $P<0.05$, however Bonferroni adjustment was applied to post-hoc tests ($P<0.008$). Effect sizes were classified as small ($\eta^2=0.01$),

medium ($\eta^2 =0.06$) or large ($\eta^2 =0.14$) (Cohen, 1988). One-way ANOVA with Bonferroni post hoc tests were used to analyse differences in overall concussion assessment self-efficacy scores among CATs, ChPs and CAT/ChPs. Kruskal-Wallis tests and pairwise comparisons were used to establish differences in concussion assessment frequency of use, concussion management self-efficacy and frequency of use among CATs, ChPs and CAT/ChPs. Friedman's test examined differences in ratings of factors positively and negatively impacting self-efficacy. Effect sizes were classified as small (w=0.1), medium (w=0.30) or large (w=0.50) (Cohen, 1988). Multiple Wilcoxon Signed-Rank Order tests were utilised to explore the impact of location of practice, type of feedback and source of encouragement, vicarious experience and feedback on self-efficacy. Bonferroni adjusted alpha level for these tests was $P<0.003$, and the effect sizes were classified as small (r=0.10), medium (r=0.30), and large (r=0.50) (Cohen, 1988).

4.3 Results

4.3.1 Participant demographics

In total, 285 allied healthcare professionals' responses were included in the analysis. There were 68.4% (195) males, 31.2% (89) females, and 0.4% (1) non-binary participant, with the mean age of 35.1±10.3 (range, 25-47) years. Postgraduate qualifications were held by 58.2% (166) of practitioners. The majority of participants worked with sporting populations (84.2%, 240), had an average professional experience of 9.3±8.2 years in sport, and 45.6±31.2 percent of their patients presented with sporting injuries. Participating professionals assessed or managed 10.7±16.2 concussions annually on average. Table 4.1 displays participant demographics. Table 4.2 displays differences in professional engagement across clinician groups.

Table 4.1 Participants' demographic information

		Mean ± SD	Frequency % (n)
Primary professional qualifications	Chartered physiotherapist Emergency medical services practitioner Certified athletic therapist Certified athletic therapist + chartered physiotherapist		33.7 (96) 33.3 (95) 27.4 (78) 5.6 (16)
Time from most recent graduation (in years)		5.93±5.86	
Sporting populations working with	Community athletes (non-professional/ developmental level) Elite athletes (professional/ inter-county/ national level) Children (0-10 years old) Adolescent (11-18 years old) Adults		66 (188) 51.6 (147) 43.9 (125) 65.3 (186) 76.1 (217)
Participation in concussion-related continuous professional development courses (CPD)	No Yes Number of CPDs attended	2.38±1.46	54.7 (156) 45.3 (129)

Table 4.2 Differences in professional engagement across clinician groups

	Chartered Physiotherapist (n=96)	Emergency medical services practitioner (n=95)	Certified Athletic Therapist (n=78)	Certified Athletic Therapist + Chartered Physiotherapist (n=16)
Working with sporting populations	91.7% (88)	66.3% (63)	93.6% (73)	100% (16)
Community athletes	75.0% (72)	58.5% (55)	64.1% (50)	68.8% (11)
Elite athletes	60.4% (58)	36.8% (35)	57.7% (45)	56.3% (9)
Children	46.9% (45)	48.4% (46)	37.2% (29)	31.3% (5)
Adolescent	67.7% (65)	51.6% (49)	79.5% (62)	62.5% (10)
Adults	79.2% (76)	62.1% (59)	85.9% (67)	93.8% (15)
Engagement in concussion related CPD	67.7% (65)	36.8% (35)	26.9% (21)	50.0% (8)

4.3.2 Concussion assessment and management skills

The overall levels of self-efficacy among CATs, ChPs, EMSPs and CAT/ChPs were 64.5±26.6 for immediate concussion assessment and 56.6±25.4 for post-concussion advice. The highest scores were for concussion symptom checklist (80±28.4) and advice on physical rest (80.1±27.8), while the lowest for a Child Sport Concussion Assessment Tool (SCAT5) (44.6±41.2) and advice on nutrition (34.1±33.7) (Table 4.3). Considering all concussion assessment and management skills among CATs, ChPs and CAT/ChPs, the self-efficacy levels were 51.5±20.1 and 62.1±20.9 respectively. The highest scores were for history/clinical evaluation non-specific to concussion (86.6±16.2) and advice on physical rest (86.3±20). The lowest were for paper/pencil neuropsychological test (16.7±28.6) and advice on a use of medication (39.2±35) (Table 4.4). A strong positive correlation was observed between clinicians' self-efficacy and frequency of use of

overall concussion assessment (r=.795, *P*<0.001) and management (r=.812, *P*<0.001), immediate concussion assessment (r=.728, *P*<0.001) and advice (r=.805, *P*<0.001) skills, as well as each specific skill individually (Tables 4.3 and 4.4). Professionals holding both CAT and ChP qualifications had the highest self-efficacy scores for concussion assessment (60.4±18) and management (64.2±17.9) when compared to CATs and ChPs, as well as demonstrated the highest frequency of use of assessment (39.8±17.7) and management (48.4±22.7) skills (Table 4.5). No significant differences were observed between these clinician groups when considering concussion assessment and management self-efficacy and frequency of use scores. Regarding the immediate concussion assessment, professionals holding both CAT and ChP qualifications had the highest self-efficacy (77±15.9) and frequency of use (65.1±24.3) scores when compared to CATs, ChPs and EMSPs. They also displayed the highest frequency of post-concussion advice (58.9±22.2), while CATs displayed the highest self-efficacy score for advice (65.7±20.7) (Table 4.6). Kruskal-Wallis tests revealed significant differences in immediate concussion assessment self-efficacy [H(3) = 40.16, *P*<0.001, η^2 =.25] and frequency [H(3) = 25.15, *P*<0.001, η^2 =.16] and post-concussion advice self-efficacy [H(3) =18.62, *P*<0.001, η^2 =.13] and frequency [H(3) =12.63, *P*=0.006, η^2 =.09] among clinician groups. Pairwise post hoc comparisons indicated significantly lower immediate concussion assessment self-efficacy and frequency and post-concussion advice self-efficacy and frequency scores of EMSPs when compared with CATs (*P*<0.001), ChPs (*P*<0.001) and CATs/ChPs (*P*<0.001).

Table 4.3 Clinicians' self-efficacy levels and frequency of use for immediate concussion assessment and post-concussion advice skills among Irish CATs, ChPs, EMSPs and CAT/ChPs, with correlation coefficients for the relationship between self-efficacy and frequency of use

Immediate concussion assessment/advice skill	Self-efficacy (0-100)** (Mean ± SD)	Frequency of use with concussed patients (0-100)*** (Mean ± SD)	Correlation coefficient	*P* value
Assessment of concussion relevant health history (e.g., previous concussions, ADHD, learning difficulties, migraines)	70 ± 28.5	53.4 ± 41.1	r=.646	<0.001*
History and clinical evaluation non-specific to concussion (e.g., cervical ROM, neck strength, myotomes/dermatomes)	76.7±29.5	63.5 ± 38	r=.793	<0.001*
Any concussion symptom checklist	80 ±28.4	60.2 ± 41.4	r=.694	<0.001*
Standard Assessment of Concussion (SAC)	54.4 ± 41.1	35.6 ± 39.5	r=.821	<0.001*
Sport Concussion Assessment Tool (SCAT 5)	70.9 ± 36.7	49.1 ± 42.9	r=.791	<0.001*
Child version of Sport Concussion Assessment Tool (Child SCAT5)	44.6 ± 41.2	21.8 ± 36.2	r=.674	<0.001*
Balance measure (e.g., BESS)	61.2 ± 39.9	44.3 ± 42.7	r=.811	<0.001*
Gait measure (e.g., timed tandem gait)	58.3 ± 40.3	37.9 ± 40.9	r=.796	<0.001*
Providing advice on cognitive rest	71 ± 33	59.3 ± 41.8	r=.738	<0.001*

Providing advice on physical rest	80.1 ± 27.8	67.3 ± 40.2	r=.727	<0.001*
Providing advice on use of medications	41.1 ± 36.8	31.9 ± 37.3	r=.857	<0.001*
Providing advice on nutrition	34.1 ± 33.7	22.3 ± 30.2	r=.819	<0.001*
Providing advice on driving	56.1 ± 38.5	42 ± 40	r=.813	<0.001*
Providing advice on return to school/learning activities	56.6 ± 36.9	46.6 ± 40	r=.837	<0.001*

* Statistical significance at the 0.01 level.

** 0 – cannot do at all; 50 – moderately certain can do; 100 – highly certain can do

*** 0 – never use the technique; 50 – use the technique with half of concussed athletes; 100 – use the technique with every concussed athlete

Table 4.4 Clinicians' self-efficacy levels and frequency of use for concussion assessment and management relevant skills among Irish CATs, ChPs and CAT/ChPs, with correlation coefficients for the relationship between self-efficacy and frequency of use

Concussion assessment/management skill	Self-efficacy (0-100)** (Mean ± SD)	Frequency of use with concussed patients (0-100)*** (Mean ± SD)	Correlation coefficient	*P* value
Assessment of concussion relevant health history (e.g., previous concussions, ADHD, learning difficulties, migraines)	72.4 ± 26.5	55.8 ± 41	r=.646	<0.001*
History and clinical evaluation non-specific to concussion (e.g., cervical ROM, neck strength, myotomes/dermatomes)	86.6 ± 16.2	74.1 ± 31.9	r=.793	<0.001*
Cervical spine tests (e.g., cervical joint-reposition error test, smooth-pursuit neck torsion test)	55 ± 33.3	37.6 ± 34.5	r=.831	<0.001*
Cranial nerve examination	49.4 ± 32.6	31.6 ± 36.6	r=.819	<0.001*
Any concussion symptom checklist	86.4 ± 22.4	69.6 ± 39.1	r=.694	<0.001*
Standard Assessment of Concussion (SAC)	58.1 ± 40.6	37.8 ± 40.2	r=.821	<0.001*
Sport Concussion Assessment Tool (SCAT 5)	82.3 ± 28.1	59.4 ± 41.1	r=.791	<0.001*
Child version of Sport Concussion Assessment Tool (Child SCAT5)	52.7 ± 40.9	25.5 ± 39.1	r=.674	<0.001*
Balance measure (e.g., BESS)	76.9 ± 29.8	56.8 ± 40.9	r=.811	<0.001*
Gait measure (e.g., timed tandem gait)	71.3 ± 34.8	47 ± 41.6	r=.796	<0.001*

Vestibular/Ocular Motor test (e.g., VOMS)	57.8 ± 39.7	44.4 ± 42.9	r=.875	<0.001*
King-Devick Test	20.8 ± 33.5	5.4 ± 16.3	r=.602	<0.001*
Paper/pencil neuropsychological test (e.g., The Symbol Digit Modalities Test)	16.7 ± 28.6	7.1 ± 19.6	r=.708	<0.001*
Computerized neuropsychological test (e.g., ImPACT)	23.3 ± 34.6	10.1 ± 25.4	r=.704	<0.001*
Reaction time testing not included in computerised neuropsychological testing (e.g., ruler drop test)	26.8 ± 35.9	9.4 ± 21.7	r=.687	<0.001*
Aerobic exercise tolerance test (e.g., Buffalo Concussion Treadmill Test)	42.1 ± 40.6	18.7 ± 30.7	r=.723	<0.001*
Mood, anxiety or depression assessment (e.g., Brief Symptom Inventory-18)	41.1 ± 39.9	23.4 ± 34.6	r=.746	<0.001*
Sleep quality and quantity measure (e.g., Pittsburgh Sleep Quality Index)	39.3 ± 39.8	14.8 ± 27.7	r=.715	<0.001*
Migraine assessment (e.g., The Migraine Disability Assessment)	26.1 ± 3	10.9 ± 24.3	r=.724	<0.001*
Providing advice on cognitive rest	79.3 ± 25.7	66.3 ± 39.7	r=.738	<0.001*
Providing advice on physical rest	86.3 ± 20	74.7 ± 36.7	r=.727	<0.001*
Providing advice on use of medications	39.2 ± 35	28.9 ± 34.8	r=.857	<0.001*

Providing advice on nutrition	39.2 ± 32.4	24.8 ± 30.1	r=.819	<0.001*
Providing advice on driving	60.6 ± 36.1	45.8 ± 39.6	r=.813	<0.001*
Providing advice on return to school/learning activities	66.5 ± 30.5	55.1 ± 38.2	r=.837	<0.001*
Prescription of aerobic exercise	78.2 ± 26.4	69.9 ± 37.3	r=.838	<0.001*
Return to play progression (as per consensus statements e.g., graduated stepwise progression)	77.5 ± 28.3	65.7 ± 39.1	r=.823	<0.001*
Balance training	75.4 ± 28.6	58 ± 37.8	r=.852	<0.001*
Cervical spine rehabilitation	69.8 ± 31.8	50.7 ± 37.6	r=.835	<0.001*
Treatment of chronic headache	39.6 ± 32.4	24.5 ± 30.9	r=.793	<0.001*
Vestibular/Ocular Motor rehabilitation	40.7 ± 37.8	29.4 ± 36.1	r=.889	<0.001*
Referral to a specialist (e.g., optometrist, vestibular specialist, psychologist)	60.1 ± 37.4	25.8 ± 31.8	r=.808	<0.001*

* Statistical significance at the 0.01 level.

** 0 – cannot do at all; 50 – moderately certain can do; 100 – highly certain can do

*** 0 – never use the technique; 50 – use the technique with half of concussed athletes; 100 – use the technique with every concussed athlete

Table 4.5 Overall concussion assessment and management skills' self-efficacy levels and frequency of use across professional groups

	Concussion assessment skills		Concussion management skills	
	Self-efficacy (0-100)* (Mean ± SD)	**Frequency of use (0-100)** (Mean ± SD)**	**Self-efficacy (0-100)* (Mean ± SD)**	**Frequency of use (0-100)** (Mean ± SD)**
Certified athletic therapist (n=78)	52.1 ± 19.8	34.3 ± 22.1	61.5 ± 22.1	47.3 ± 25
Chartered physiotherapist (n=96)	49.7 ± 20.7	30.9 ± 19.3	62.3 ± 20.7	45.8 ± 25.4
Certified athletic therapist + chartered physiotherapist (n=16)	60.4 ± 18	39.8 ± 17.7	64.2 ± 17.9	48.4 ± 22.7

* 0 – cannot do at all; 50 – moderately certain can do; 100 – highly certain can do

** 0 – never use the technique; 50 – use the technique with half of concussed athletes; 100 – use the technique with every concussed athlete

Table 4.6 Immediate concussion assessment and post-concussion advice skills' self-efficacy levels and frequency of use across professional groups

	Immediate concussion assessment skills		Post-concussion advice skills	
	Self-efficacy (0-100)* (Mean ± SD)	Frequency of use (0-100)** (Mean ± SD)	Self-efficacy (0-100)* (Mean ± SD)	Frequency of use (0-100)** (Mean ± SD)
Certified athletic therapist (n=78)	73.3 ± 20.1	54.7 ± 28.3	65.7 ± 20.7	52.7 ± 28.3
Chartered physiotherapist (n=96)	72.4 ± 22.6	50 ± 29.9	58.6 ± 22	45 ± 28.4
Certified athletic therapist + chartered physiotherapist (n=16)	77 ± 15.9	39.8 ± 17.7	61.4 ± 22.5	58.9 ± 22.2
Emergency medical services practitioner (n=95)	40.8 ± 26	26.2 ± 23.7	40.4 ± 29.3	31.9 ± 30.7

* 0 – cannot do at all; 50 – moderately certain can do; 100 – highly certain can do

** 0 – never use the technique; 50 – use the technique with half of concussed athletes; 100 – use the technique with every concussed athlete

4.3.3 Factors impacting self-efficacy

Ability to practice skills during clinical placement (3.3±.9) and remaining emotionally (3.3±.8) and physically (3.3±.8) calm while practising the skills (Figure 4.1) had the greatest positive impact on clinicians' self-efficacy. The greatest negative impact had inability to practice skills in clinical placement (3.3±1), independently after graduation (3.2±1) or to observe a lecturer demonstrating the skills (3±1.1) (Figure 4.2). All these factors were rated 3 or higher (0-4 scale), which was referred to as significant impact within the survey. Significant differences between factors positively [$\chi2(12)=514.77$, $P<0.001$, W=.21] and negatively [$\chi2(12)=445.51$, $P<0.001$, W=.19] impacting self-efficacy. Ability to practice skills in clinical placement (Z=-6.48, $P<0.001$, r=.42) and independently after graduation (Z=-4.44, $P<0.001$, r=.28) had significantly higher positive impact on professionals' self-efficacy when compared to practice in a practical class. Ability to observe the lecturer demonstrating a skill (Z=-6.26, $P<0.001$, r=.39) as well as receiving their verbal encouragement (Z= -6.96, $P<0.001$, r=.44) had significantly greater positive impact on self-efficacy than observation of a peer or peer encouragement. Lecturer (Z=-3.80, $P<0.001$, r=.24) and peer (Z= -4.75, $P<0.001$, r=.30) positive feedback impacted self-efficacy significantly more when compared to negative feedback. Both positive (Z=-8.10, $P<0.001$, r=.51) and negative (Z=-8.31, $P<0.001$, r=.52) feedback from a lecturer were rated significantly higher than either type of feedback from a peer. Inability to practice skills in clinical placement had a significantly higher negative impact on practitioner's self-efficacy than inability to practice them in a practical class (Z=-4.87, $P<0.001$, r=.32). Inability to observe the lecturer demonstrating a skill (Z=-8.65 $P<0.001$, r=.55) and not receiving verbal encouragement (Z=-7.29, $P<0.001$, r=.47) had significantly greater negative impact on self-efficacy than inability to observe a peer or not receiving their encouragement. Lack of both positive (Z=-8.12, $P<0.001$, r=.52) and negative (Z=-7.02, $P<0.001$, r=.45) feedback from a lecturer had a significantly higher negative impact on self-efficacy than lack of peer feedback.
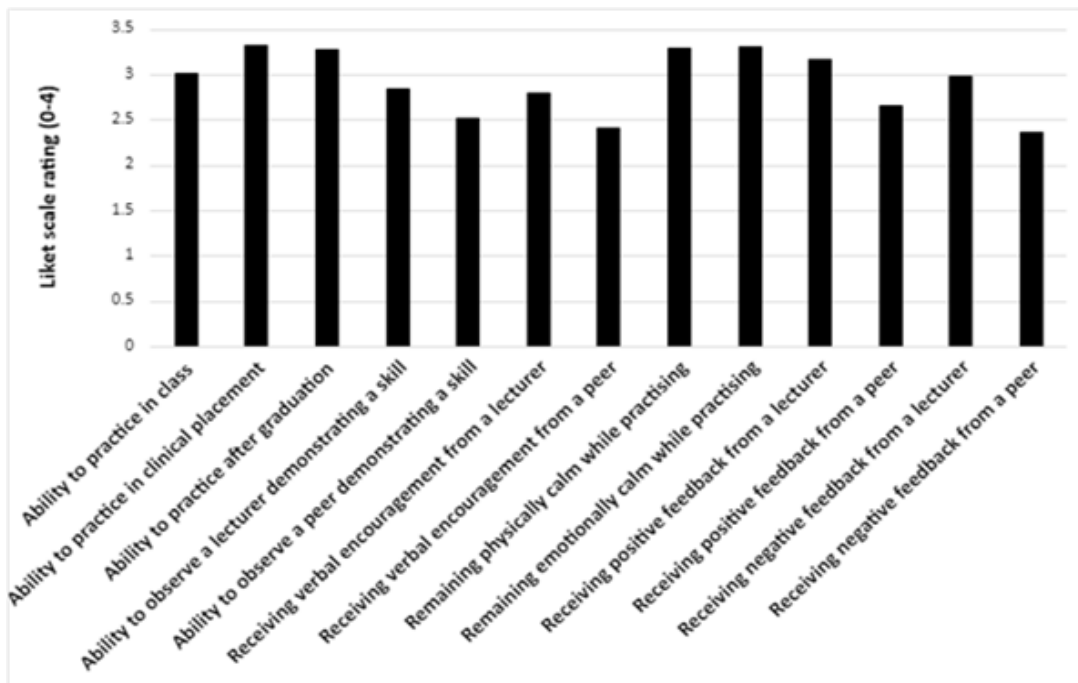
Figure 4.1 Distribution of scores for factors having positive impact on clinicians' self-efficacy in concussion assessment and management
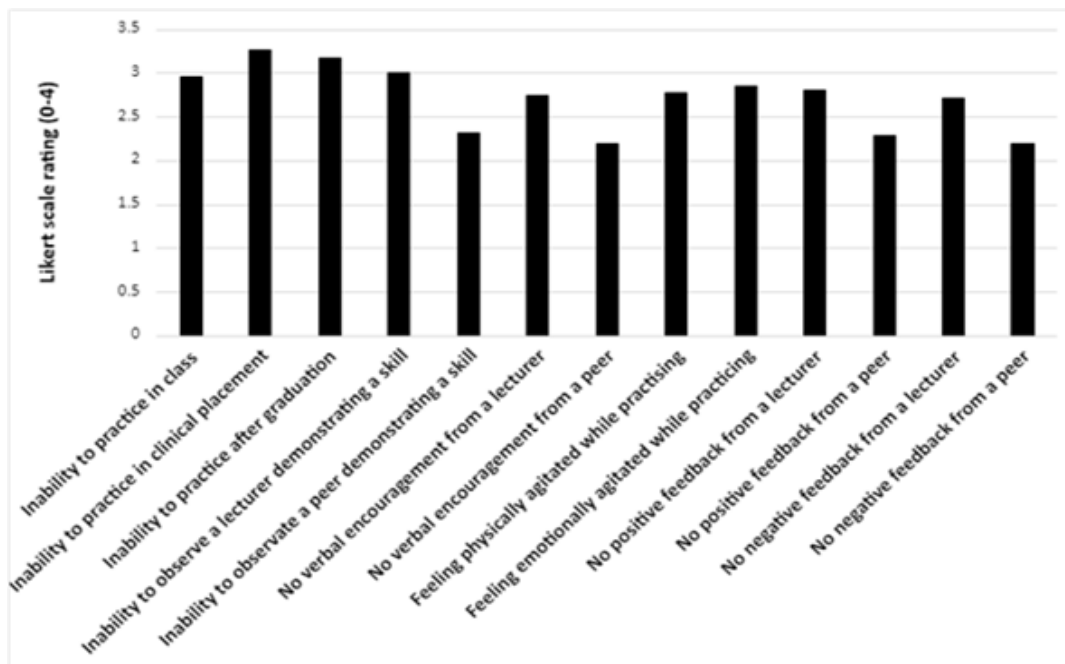
Figure 4.2 Distribution of scores for factors having negative impact on clinicians' self-efficacy in concussion assessment and management

4.4 Discussion

This study aimed to explore the concept of self-efficacy in concussion assessment and management among Irish allied healthcare professionals, to investigate the relationship between their self-efficacy and clinical practices and to establish the factors that impact development of their self-efficacy. The general levels of self-efficacy were moderate for immediate concussion assessment, post-concussion advice, overall concussion assessment and management. American ATs' self-efficacy was higher than Irish clinicians for concussion assessment (60.3±14.5 vs 51.5±20.1), however lower for management (55.3±14.1 vs 62.1±20.9) (Savage and Covassin, 2018). A possible explanation of these results is that American ATs may get more exposure to concussions and their assessment (14 vs 10 annually), compared to Irish clinicians that may engage with greater treatment/rehabilitation of concussed patients. The differences in concussion management self-efficacy may also result from recent advances in concussion treatment/rehabilitation (Rytter *et al.*, 2019; Esterov, Thomas and Weiss, 2021), allowing our participants to broaden their concussion management skill set and become more confident at it. No other research has examined clinicians' self-efficacy in balance training, cervical spine rehabilitation or treatment of chronic headache.

Considering specific skills, the highest scores were for concussion symptom checklist and history/clinical evaluation non-specific to concussion, both in the analysis of all Irish clinicians' immediate assessment skill, and among CATs, ChPs and CAT/ChPs, considering all the assessment skills. This is in line with the past research on American ATs, however their scores were higher (95±7.5 vs 80±28.4/86.4±22.4 and 92.2±12.5 vs 76.7±29.5/86.6±16.2) (Savage and Covassin, 2018). Concussion symptom checklists have been utilised in concussion assessment for many years (Aubry *et al.*, 2002), and the majority of American ATs are examined on this skill during professional education (Wallace, Covassin and Lafevor, 2018). Moreover, a high number of American sports medicine clinicians (85.3%) (Baugh *et al.*, 2016), ATs (86.7%) (Lempke, Schmidt and Lynall, 2020) and Irish CATs (93.1%) (Lempke *et al.*, 2023) had indicated its use in clinical practice. Practice is suggested to be the strongest self-efficacy impacting factor (Richardson, 2019), so the high scores for this skill are understandable. Similarly, the high scores for the history assessment may be linked to its non-specific nature, whereby clinicians utilise this skill with patients regularly, developing self-efficacy through its frequent use. The lowest score, considering the immediate assessment skills of all Irish clinicians, was for a Child Sport

Concussion Assessment Tool (SCAT5) (44.6±41.2). Less than half of our participants (31.3%-46.9%, depending on professional group) worked with children, thus opportunity to practice may be scarce. Moreover, lack of education on child concussion has been reported among emergency medical personnel globally (Speirs, Lyons and Johansson, 2017). Considering the overall assessment, Irish CATs, ChPs and CAT/ChPs scored the lowest for paper/pencil neuropsychological test (16.7±28.6) and King-Devick Test (20.8±33.5), similar to American ATs (5.8±21.1 and 12.7±32.5) (Savage and Covassin, 2018). A practical application of paper/pencil neuropsychological testing might not be included in the curriculum of AT education, as only 10.33% of ATs reported using it in practice and 78.8% believed they should be trained in its administration (Lempke, Schmidt and Lynall, 2020). Conversely, computerised neuropsychological assessment is taught in 89.4% of athletic training programmes (Wallace, Beidler and Covassin, 2018) which corresponds with the high scores (77.6±36.2) of self-efficacy for this skill among American ATs (Savage and Covassin, 2018). Low self-efficacy scores of paper/pencil neuropsychological testing among our participants are in line with its very low (5.3%) use among Irish CATs (Lempke *et al.*, 2023). This however cannot be justified by a higher use of computerised neuropsychological assessment as the levels of both were identical (5.3%) (Lempke *et al.*, 2023). Interestingly, computerised neuropsychological assessment was the third lowest scoring (23.3 ± 34.6) skill among our participants, possibly due to the costs associated with it. The King-Devick test is a relatively new diagnostic tool, so clinicians might not be experienced in its use (Savage and Covassin, 2018). This is in line with recent evidence suggesting that only 26.6% of American educational institutions provide athletic therapy students with hands-on experience in the use of King-Devick test (Wallace, Beidler and Covassin, 2018) and only 3.2% of American sports medicine clinicians administer it on concussed collegiate athletes (Baugh *et al.*, 2016). Importantly, the King-Devick test requires a baseline assessment (Howitt *et al.*, 2016), particularly for athletes with learning and attentional disabilities (Mrazik *et al.*, 2019) and there is a cost associated with its use (Savage and Covassin, 2018). Moreover, some concern has been raised in literature over its high false-positive rates (Donaworth *et al.*, 2016; Eddy *et al.*, 2020). It is possible that clinicians use different tools to assess ocular function.

Considering concussion management, advice on physical and cognitive rest were rated the highest in the analysis of all clinicians' advice skills and CATs', ChPs' and CAT/ChPs' overall management skills. The latter scored also high for prescription of aerobic exercise and RTP

progression, in line with American ATs, who reported very high self-efficacy for stepwise progression and homecare instructions (Savage and Covassin, 2018). The importance of relative physical and cognitive rest in concussion recovery has been emphasised for many years now, with clear guidelines for safe RTP available for clinicians (McCrory *et al.*, 2017). In Ireland, 86.8% of CATs reported using these guidelines in their clinical practice (Lempke *et al.*, 2023), which corresponds with self-efficacy scores of our participants and all major sporting bodies in Ireland have adopted RTP protocols following a concussion. The lowest scores were for advice on nutrition and the use of medication, among all Irish clinicians (34.1 ± 33.7 and 41.1 ± 36.8) and among CATs, ChPs and CAT/ChPs (39.2 ± 32.4 and 39.2 ± 35). The evidence on the potential influence of nutrition on recovery from concussion has only started to emerge in literature recently (Walrand *et al.*, 2021; Finnegan *et al.*, 2022), so clinicians might not be up to date with these recent publications. They also may not be embedded into clinicians' education curriculum. Deficits in nutrition-related knowledge and confidence were previously reported among Irish doctors (Boggild and Tator, 2012). Recommendations on the use of pharmacological treatment in concussion have been available for over a decade now (Meehan III, 2011), however Irish clinicians might not be educated on this topic. Although EMSPs and CATs are authorised to legally administer certain medication (Carney, 2021, 2023b, 2023c, 2023a), they may not be applicable for concussion. American ATs scored the lowest (17.6 ± 31.7) on vestibular/ocular motor therapy, apart from tests repeatedly included as assessment and management tools (paper/pencil neuropsychological test and King-Devick test) (Savage and Covassin, 2018). Our participants also presented low self-efficacy for this skill (40.7 ± 37.8). Assessment of vestibular/oculomotor function in concussed athletes has been introduced quite recently, hence rehabilitation of these disorders is a relatively new skill (Savage and Covassin, 2018). Less than half (48.6%) of American physical therapists reported using it in clinical practice (Yorke, Littleton and Alsalaheen, 2016), which may explain the low self-efficacy scores.

Our comparison of Irish clinician groups indicated significantly lower self-efficacy and frequency of use of the immediate concussion assessment (40.8 ± 26 and 26.2 ± 23.7) and post-concussion advice (40.4 ± 29.3 and 85 ± 30.7) skills among EMSPs, when compared to other professional groups. Until recently, paramedics and advanced paramedics in Ireland have been responsible solely for emergency patient care (Xi *et al.*, 2021; Barry *et al.*, 2022) and life-support services (PHECC, 2015), however all EMSPs in our study reported assessing/managing concussion

as a part of their practice. The education and training standards approved by Pre-hospital Emergency Care Council (PHECC) in 2014 include head injuries at all three levels of National Qualification in Emergency Technology (Pre-Hospital Emergency Care Council, 2014a, 2014c, 2014b). However, assessment/management of concussion specifically is solely included at the Paramedic level, with the only specific skill listed being Maddocks questions (Pre-Hospital Emergency Care Council, 2014c). This corresponds with past literature indicating that although assessment and management of traumatic brain injury is within the Canadian paramedics' scope of practice, concussion is not included in sufficient detail in the curriculum of their education, and they may not be up to date with the recent evidence regarding concussion care (Tomkinson, Weston and Batt, 2017). Considering that 66.3% of EMSPs in this study reported working with sporting populations and 36.8% participated in concussion-related CPD, it appears crucial to revise the PHECC approved education and training standards.

The highest level of self-efficacy in both concussion assessment (60.4±18) and management (64.2±17.9) demonstrated clinicians holding both CAT and ChP qualifications. No comparative data exists in literature, however there is some evidence that clinicians holding postgraduate qualifications are more likely to comply with gold standard concussion care recommendations (Lempke, Schmidt and Lynall, 2020; Lempke *et al.*, 2023). Through a longer education pathway, professionals holding dual qualifications may have had a greater exposure to concussion assessment and management education and more opportunities to practice concussion-related skills under supervision. Past research emphasises the impact of practice and role models on development of self-efficacy (Tresolini *et al.*, 1994). Additionally, all the professionals holding dual qualifications reported working with sporting populations, as opposed to the other professional groups (66.3%-93.6% working with sporting populations). This clinical experience could potentially allow them to assess/manage more concussions and consequently develop higher self-efficacy levels. Importantly, however, the number of clinicians holding dual qualifications in our study was quite low (n=16) when compared to ChPs (n=96) and CATs (n=78) which may have impacted our findings.

We observed strong positive correlation between self-efficacy levels and frequency of use of each concussion-related skill. It has been advocated that practice impacts development of self-efficacy, while level of self-efficacy in a particular skill impacts the likelihood of performing that skill (Schunk, 1985). Although no research investigated the relationship of self-efficacy and

practice in relation to concussion assessment and management, literature independently exploring concussion-related self-efficacy and clinical practices seem to support this trend (Savage and Covassin, 2018; Lempke, Schmidt and Lynall, 2020). Our study confirmed that concussion related self-efficacy scores correlate with frequency of skill use. Thus, ensuring sufficient time and opportunities to practice during education might be crucial to development of self-efficacy which in turn may allow clinicians to use the learnt skills efficaciously after graduation, and further reinforce their self-efficacy belief. The views of our participants support this. We found that ability to practice skills during clinical placement influences clinician's self-efficacy perceptions the most. Past literature suggests mastery experience as the strongest self-efficacy impacting factor (Richardson, 2019), and healthcare-related research confirms this, proposing practice in clinical environment (Ford-Gilboe *et al.*, 1997) and observation of role models as other crucial factors (Tresolini *et al.*, 1994; Carson *et al.*, 2002; Yorke, Littleton and Alsalaheen, 2016). Considering the nature of practice during clinical placement, where mastery experience takes place in a clinical environment and alongside role modelling, a high rating of this experience in comparison to practice in a practical class or independently after graduation seems understandable. Noteworthily, our participants rated independent practice after graduation significantly higher than practice in a classroom. Thus, mastery experience in a clinical environment may impact self-efficacy much stronger than a mastery experience with role modelling in a classroom setting. Literature suggests that the impact of role models on self-efficacy might be three-fold, through skill demonstration, provision of feedback and encouragement to further practice (Tresolini *et al.*, 1994). Importantly, however, all the above should come from a 'significant other', a person viewed as knowledgeable and credible (Bong and Skaalvik, 2003). Our results demonstrated similar beliefs among clinicians. Interaction with a lecturer was rated significantly higher than that with a peer, with educator's positive feedback having particularly strong impact on development of self-efficacy. Lack of physical and emotional arousal while practicing the skills was reported to have a great impact on our participants' self-efficacy. Although literature suggests this is the least influencing factor among those listed in Bandura's self-efficacy model (Richardson, 2019), it is particularly important in relation to physically or emotionally demanding activities (Lewis, Weight and Hendricks, 2021). Hence bodily reactions may be an important source of personal efficacy information in relation to concussion-care, that is challenging for clinicians (McCrory *et al.*, 2017).

4.5 Limitations

Convenience sampling was utilised, which likely led to selection bias. It is likely that clinicians with more interest in concussion or higher concussion-related self-efficacy levels decided to participate in the study. We were unable to calculate the response rate for our survey, as the total number of clinicians involved in team sports' athlete care in Ireland is unknown. The number of CATs was approximately 200 at the time of data collection, as indicated by their governing body (Athletic Rehabilitation Therapy Ireland), and majority was likely to be involved in concussion care. However, the Irish Society of Chartered Physiotherapists and the Pre-Hospital Emergency Care Council, which are the governing bodies for the other two clinician groups, we unable to provide the estimated numbers. We have used a self-report survey which may have led to inaccuracy of some responses. Although all participants reported to be professionally involved in concussion assessment and/or management, we cannot be sure that all engage equally in both aspects of concussion care and get a chance to utilise all the skills in clinical practice. The potential differences in head injury related protocols implemented at each participant's specific work-setting were also not considered. Hence the differences in their self-efficacy level might be linked to scope of their professional practice. An investigation of practice-specific skills' self-efficacy and exploration of its impact on clinical practice would be warranted, as well as investigation of any variations in those, depending on sport level, type and requirements put upon clinicians regarding their continuous professional development. Our study was limited to clinicians who most commonly work in a team sports setting in Ireland. Thus, examining concussion-related self-efficacy among sports medicine physicians, neurologists and other healthcare professionals involved in concussion-care would be beneficial.

4.6 Conclusion

Concussed patients in Ireland receive care from clinicians who feel only moderately efficacious about delivery of gold-standard concussion-related skills. Irish clinicians reported high self-efficacy in skills that are well established in clinical practice, and for which instructive and accessible tools exist. However, they did not feel efficacious in neuropsychological assessment and skills recently introduced to clinical practice. The newly developed SCAT6/SCOAT6 (Patricios, Davis, *et al.*, 2023; Patricios, Schneider, *et al.*, 2023) tools might facilitate growth of concussion-related self-efficacy among the Irish clinicians. EMSPs were significantly less efficacious in the

immediate concussion assessment and post-concussion advice than any other professional group. Clinicians who used concussion-relevant skills more frequently in practice, displayed higher levels of self-efficacy for these skills. Self-efficacy in concussion assessment and management can be enhanced through practice in a clinical environment and through experiencing composure while practising.

Summary of Chapter 4 and its link with Chapter 5

With reference to the Aim 1 of this research (Chapter 1), Chapter 4 presented the levels of concussion-related self-efficacy among clinicians in Ireland (Objective 1) and the relationship between their self-efficacy and concussion-related clinical practices (Objective 2). Although the overall concussion-related self-efficacy among the clinicians was moderate, several techniques that are crucial for the optimal assessment and management of concussion received very low scores. Since our findings demonstrated a strong positive relationship of concussion-related self-efficacy and clinical practice, low level of self-efficacy in some of concussion assessment and management techniques suggests that clinicians may have not been utilising these techniques in practice and will likely not use them in the future. These findings support past research that indicated a limited use of certain concussion-related techniques among Irish athletic therapists (Lempke *et al.*, 2023), and may contribute to the explanation of the problem of suboptimal concussion-related patient care in Ireland, and beyond. Therefore, exploration of the factors influencing clinician's concussion-related self-efficacy (Aim 2) is warranted. Considering that the engagement of the emergency medical services practitioners in concussion-related patient care is limited to its immediate assessment, the investigations presented across the next chapters do not include this group of clinicians.

Chapter 4 demonstrated the relevance of the general self-efficacy sources for development of concussion-related self-efficacy within educational and sporting environments, from the clinicians' perspective (Objective 3). The findings correspond with past research, and indicate the value of real-world practice and composure for the development of self-efficacy. They also highlight the link between the limited concussion-related education and low level of clinician's self-efficacy. In order to ensure that new graduates confidently engage in the care of concussed patients and continue to refine their concussion-related self-efficacy and skills, the foundation of self-efficacy must be developed during professional education. Chapter 5 presents a similar evaluation conducted with a group of Irish final-year athletic therapy students, aimed at gaining a deeper understanding of concussion-related self-efficacy development throughout professional education.

Chapter 5: Are Irish athletic therapy students confident in concussion assessment and management? A cross-sectional study of final year students' self-efficacy

Author Contribution Statement

The research presented in this chapter was conceptualised and conducted by the author as part of their doctoral research. The author was responsible for developing the research objectives, designing the methodology, obtaining ethical approval, and conducting all aspects of data collection, analysis, and interpretation. They also prepared all written and visual content presented in this chapter. Supervisory support was provided in an advisory capacity throughout the research process, with particularly significant input and extensive feedback during the survey adaptation phase to ensure content relevance and clarity. This chapter is presented as it appears in the published work, with some minor deviations on terminology to conform with the methodological cohesion of the thesis.

Abstract

Concussion is one of the most challenging injuries for sports medicine clinicians. It is crucial that students develop high self-efficacy for concussion-relevant skills during professional education, as it impacts the quality of their patient care. This study aimed to explore Irish final-year athletic therapy students' self-efficacy in concussion assessment and management and the factors that impact its development. Participants' level of self-efficacy varied, from low to high, depending on the skill assessed. Lack of practice and lecturer's positive feedback impacted student self-efficacy the most. Educators should provide students with an opportunity to practice their skills in an environment that facilitates feedback.

5.1 Introduction

Concussion is a major public health concern (Beidler *et al.*, 2021), and an injury common across all age groups (Gardner, Quarrie and Iverson, 2019). Concussion affects athlete's health, wellbeing (Baugh *et al.*, 2016), sporting performance and activities of daily living (O'Connor *et al.*, 2019). Recognition and appropriate management are required to mitigate negative outcomes from this injury (Black *et al.*, 2020), however, the assessment and management of concussion is one of the most challenging for sports medicine clinicians (McCrory *et al.*, 2017). This is particularly due to variations in its clinical presentation, considering both type and severity of symptoms, as well as the subjective nature of majority of concussion pitch-side assessment tools (Stuart *et al.*, 2017). Past research demonstrated lack of full compliance with concussion-care guidelines among athletic trainers/therapists in the USA (Buckley, Burdette and Kelly, 2015; Paddack *et al.*, 2016; Lempke, Schmidt and Lynall, 2020), Canada and Ireland (Lempke *et al.*, 2023), particularly regarding conducting baseline testing (Paddack *et al.*, 2016), and the use of 3-domain minimum concussion assessment/reassessment (Buckley, Burdette and Kelly, 2015; Lempke, Schmidt and Lynall, 2020; Lempke *et al.*, 2023). Although the Mutual Recognition Arrangement ascertains many commonalities in education of the American, Canadian and Irish athletic trainers/therapists, presence of certain jurisdictional differences among the partner countries makes it impossible to introduce a standardized curriculum (Frank *et al.*, 2019). To date, concussion-related teaching trends (Covassin, Elbin and Stiller-Ostrowski, 2009; Wallace, Beidler and Covassin, 2018) and student knowledge (King and Hynes, 2021) were investigated in the US (Covassin, Elbin and Stiller-Ostrowski, 2009; Wallace, Beidler and Covassin, 2018) and Canada (King and Hynes, 2021), however no research explored this in the Irish athletic therapy programmes. Knowledge gaps may affect clinicians' ability to appropriately assess and manage concussion (Yorke, Littleton and Alsalaheen, 2016), however self-efficacy is another factor crucial for provision of optimal patient care (Schunk, 1985).

Self-efficacy is defined as a personal belief in one's own ability to successfully complete a specific task and it is suggested to influence an individual's choices, persistence and performance in skill it relates to (Bandura, 1997). Poor athletic trainers/therapists' self-efficacy in relation to certain concussion-relevant skills might be a reason for their non-compliance with concussion gold-standard recommendations (Savage and Covassin, 2018). An investigation of concussion assessment and management self-efficacy among American athletic therapists (active members of

National Athletic Trainers' Association, employed in a high school/college setting) indicated that the levels of their skill-specific self-efficacy varied from very low to high (Savage and Covassin, 2018). The general sources of self-efficacy include mastery experience/practice, vicarious experience, verbal persuasion and physical and emotional arousal (Bandura, 1997), however practice in clinical placement was listed as the strongest factor impacting Irish clinician's self-efficacy in concussion assessment and management (Postawa, O'Connor and Whyte, 2024). The value of practice and observation of role models for development of self-efficacy was also reported among medical (Tresolini *et al.*, 1994; Carson *et al.*, 2002; Young *et al.*, 2012) and nursing students (Ford-Gilboe *et al.*, 1997).

Considering the importance of professional education for development of clinicians' self-efficacy (Tresolini *et al.*, 1994; Carson *et al.*, 2002; Young *et al.*, 2012), this study aimed to explore Irish athletic therapy students' self-efficacy in concussion assessment and management and to establish the factors that impact its development. We hypothesised that student self-efficacy will vary depending on the skill assessed and that practice and observation would be the strongest self-efficacy influencing factors, as demonstrated in past research (Tresolini *et al.*, 1994; Ford-Gilboe *et al.*, 1997; Carson *et al.*, 2002; Young *et al.*, 2012; Savage and Covassin, 2018).

5.2 Methods

5.2.1 Participants

A cross-sectional design was utilised and all 98 final year athletic therapy students from the three higher-education institutions providing undergraduate athletic therapy education, accredited by professional body Athletic Rehabilitation Therapy Ireland, were eligible to participate. All of the participants completed a module on concussion assessment/management and must have participated in clinical and field placements.

5.2.2 Instrumentation

An anonymous, online questionnaire (Appendix B) was utilised. It was adapted from past research exploring self-efficacy in concussion assessment and management among American athletic trainers (Savage and Covassin, 2018). The original questionnaire had a good face validity and an acceptable test-retest reliability (Savage and Covassin, 2018). The questions were adapted for the Irish context and to reflect the advances in concussion assessment and management (Mani

et al., 2015; Cheever *et al.*, 2016; Weber *et al.*, 2018; Clugston *et al.*, 2019; Caccese *et al.*, 2021; Graham *et al.*, 2021; Ishii *et al.*, 2021). Two sections were added to investigate factors impacting self-efficacy in concussion assessment and management among athletic therapy students. The questionnaire consisted of 64 questions across four sections: participant demographics (Section 1), factors positively (Section 2) and negatively (Section 3) affecting self-efficacy and concussion assessment/management skills' self-efficacy (Section 4). Participants answered descriptive questions (Section1), used a 5-point Likert scale and provided opinions on positive and negative impact of 12 factors (e.g., ability to practice skill in a class, receiving feedback on their performance) on development of self-efficacy in concussion assessment and management (Sections 2 and 3). Next, they used a 0-100 scale to rate their self-efficacy for 19 concussion assessment/reassessment skills (e.g., Sport Concussion Assessment Tool (SCAT5), Vestibular/Ocular Motor test), 13 concussion management/rehabilitation skills (e.g., providing advice on cognitive rest, return to play progression) and the frequency of their use on clinical placement (Section 4). The scores of 0, 50 and 100 respectively represented beliefs of 'cannot do at all', 'moderately can do' and 'highly certain can do' in relation to self-efficacy (Bandura, 2006), and considering the frequency of skill use, the represented statements of 'never use the technique with concussed patients', 'use the technique with half of concussed patients' and 'use the technique with every concussed patient'. Alongside the ratings, participants reported whether the concussion-relevant skills were included in their curriculum. Cronbach alpha analysis demonstrated good/excellent internal consistency for self-efficacy (.94), frequency of use (.96) and positive (.86) and negative (.93) factors scales.

5.2.3 Procedures

Ethical approval was received from the Dublin City University Research Ethics Committee (DCUREC/2022/099). Participants provided informed consent before completing the questionnaire. Five multinational researchers (two Irish/two American/one Canadian), who authored numerous publications in a field of concussion, assessed face validity. A rating of 1-5 for clarity, comprehensiveness and appropriateness was provided. Any question with an average rating <4 was modified/removed, based on the experts' recommendations.[34] The survey was piloted on 6 athletic therapy students and took a mean of 19±7 minutes to complete. The final survey was distributed online using SurveyMonkey (SurveyMonkey, CA, USA) and emailed to programme

coordinators of all three athletic therapy programmes in Ireland for distribution among the final-year students. The survey was open from November 2022 to May 2023.

5.2.4 Statistical analysis

Data was analysed using SPSS (Version 27, IBM Corp, USA). Descriptive statistics (frequencies, means, standard deviations) were calculated for participant age, sex and number of concussions observed in clinical placement. Means and standard deviations were also calculated for self-efficacy scores, frequency of skills use and for the factors impacting self-efficacy. All data, apart from general concussion assessment and management self-efficacy scores were not-normally distributed. Friedman's test evaluated differences in ratings of factors positively and negatively impacting self-efficacy. Effect sizes were classified as small ($w=.1$), medium ($w=.30$) or large ($w=.50$) (Cohen, 1988). Multiple Wilcoxon Signed-Rank Order tests explored the impact of location of practice, type of feedback and source of encouragement, vicarious experience and feedback on self-efficacy levels. Bonferroni adjusted alpha level was .007, and the effect sizes were classified as small ($r=0.10$), medium ($r=0.30$), and large ($r=0.50$) (Cohen, 1988). Pearson's correlation coefficient and Spearman's Rank Order correlation examined the relationship between skills' self-efficacy and frequency of their use, as well as number of concussions observed in clinical placement and concussion assessment and management skills' self-efficacy. Effect sizes were classified as small ($r=0.10$), medium ($r=0.30$), and large ($r=0.50$) (Cohen, 1988). MANOVA examined differences in general concussion assessment and management self-efficacy scores between male and female students and those who observed less than average/more than average concussions on clinical placement. Statistical significance was set at $p<.05$, however Bonferroni adjustment was applied to post-hoc tests ($p<.008$). Effect sizes were classified as small ($\eta^2=.01$), medium ($\eta^2=.06$) or large ($\eta^2=.14$) (Cohen, 1988).

5.3 Results

We obtained a 71% total response rate (70 responses). However, participants who only completed the descriptive part of the survey were excluded, leaving 61 responses (62% response rate) in the analysis. More females (55.7%, n=34) were observed in the sample, than males (44.3%, n=27), with a mean age of 23.7±4.6 (20-44) years, and 5.3±7.1 (0-30) concussions were assessed/managed on clinical placement to date on average.

The overall levels of athletic therapy students' self-efficacy were moderate, 45.75±19.13 for concussion assessment and 51.93±24.12 for concussion management (on a scale of 0-100). The highest score, indicating the highest self-efficacy level was for concussion symptom checklist (82.40±24.37) and the lowest, indicating the lowest self-efficacy level was for computerised neurocognitive assessment (14.03±26.65). A strong positive correlation was observed between students' frequency of use and self-efficacy in concussion assessment (r=.542, p<.001) and management (r=.612, p<.001) overall, and for the majority of specific skills (Table 5.1). Only concussion symptom checklist and SCAT5 were reported as included in the curriculum by all the participants (Table 5.2). A strong positive correlation was also found for the number of concussions assessed/managed in clinical placement and the level of self-efficacy in concussion assessment (r=.547, p<.001) and management (r=.614, p<.001). The MANOVA demonstrated a significant effect of number of concussions observed in clinical placement on students' general concussion assessment [$F(1,37)$=6.11, p=.018, partial η^2 =0.14] and management [$F(1,37)$=8.47, p=.006, partial η^2 =0.19] self-efficacy scores. Students who observed less than the average number of concussions had significantly lower self-efficacy levels for concussion assessment and management. No differences in levels of assessment [$F(1,37)$=0.39, p=.538, partial η^2 =0.10] and management [$F(1,37)$=0.84, p=.365, partial η^2 =0.22] self-efficacy were observed for sex.

Table 5.1 Athletic therapy students' self-efficacy levels and frequency of use for concussion assessment and management relevant skills, with correlation coefficients for the relationship between self-efficacy and frequency of use

Concussion assessment/management skill	Self-efficacy (Mean ± SD)	Frequency of use with concussed patients (percentage) (Mean ± SD)	Correlation coefficient (*r*)	p value
Assessment of concussion relevant health history (e.g., previous concussions, ADHD, learning difficulties, migraines)	63.78 ± 29.74	35.61 ± 33.75	.436	.004*
History and clinical evaluation non-specific to concussion (e.g., cervical ROM, neck strength, myotomes/dermatomes)	79.45 ± 24.30	56.88 ± 36.38	.583	<.001*
Cervical spine tests (e.g., cervical joint-reposition error test, smooth-pursuit neck torsion test)	52.88 ± 32.35	33.12 ± 34.44	.629	<.001*
Cranial nerve examination	45.83 ± 32.00	27.50 ± 31.42	.661	<.001*
Any concussion symptom checklist	82.40 ± 24.37	55.81 ± 40.32	.470	.002*
Standard Assessment of Concussion (SAC)	54.17 ± 40.89	35.12 ± 38.05	.574	<.001*
Sport Concussion Assessment Tool (SCAT 5)	74.17 ± 29.82	42.00 ± 38.21	.398	.009*
Child version of Sport Concussion Assessment Tool (Child SCAT5)	48.05 ± 34.99	11.93 ± 18.53	.255	.107
Balance measure (e.g., BESS)	60.10 ± 42.32	37.66 ± 41.02	.663	<.001*
Gait measure (e.g., timed tandem gait)	54.37 ± 40.80	26.90 ± 35.28	.601	<.001*

Vestibular/Ocular Motor test (e.g., VOMS)	57.71 ± 36.98	31.44 ± 35.02	.604	<.001*
King-Devick Test	15.05 ± 30.30	7.5 ± 20.34	.710	<.001*
Paper/pencil neuropsychological test (e.g., The Symbol Digit Modalities Test)	17.78 ± 28.75	5.13 ± 12.88	.653	<.001*
Computerized neuropsychological test (e.g., ImPACT)	14.03 ± 26.65	12.20 ± 28.17	.753	<.001*
Reaction time testing not included in computerised neuropsychological testing (e.g., ruler drop test)	23.59 ± 35.74	6.05 ± 15.28	.482	.001*
Aerobic exercise tolerance test (e.g., Buffalo Concussion Treadmill Test)	33.10 ± 35.16	18.22 ± 32.28	.682	<.001*
Mood, anxiety or depression assessment (e.g., Brief Symptom Inventory-18)	23.90 ± 30.67	12.44 ± 26.28	.618	<.001*
Sleep quality and quantity measure (e.g., Pittsburgh Sleep Quality Index)	37.39 ± 37.14	20.63 ± 34.28	.578	<.001*
Migraine assessment (e.g., The Migraine Disability Assessment)	23.83 ± 31.42	13.29 ± 28.14	.614	<.001*
Providing advice on cognitive rest	60.76 ± 33.29	43.59 ± 40.85	.452	.003*
Providing advice on physical rest	73.61 ± 28.75	56.93 ± 39.58	.670	<.001*
Providing advice on use of medications	38.90 ± 34.25	30.51 ± 36.12	.565	<.001*

Providing advice on nutrition	33.27 ± 33.41	18.83 ± 29.98	.529	<.001*
Providing advice on driving	56.29 ± 38.33	35.90 ± 38.97	.629	<.001*
Providing advice on return to school/learning activities	58.56 ± 32.13	41.46 ± 37.46	.608	<.001*
Prescription of aerobic exercise	62.71 ± 33.10	51.34 ± 39.47	.693	<.001*
Return to play progression (as per consensus statements e.g., graduated stepwise progression)	66.12 ± 29.17	48.51 ± 39.53	.581	<.001*
Balance training	61.07 ± 35.24	41.24 ± 36.19	.636	<.001*
Cervical spine rehabilitation	49.85 ± 30.60	31.07 ± 34.46	.621	<.001*
Treatment of chronic headache	30.20 ± 28.66	13.00 ± 21.47	.480	<.001*
Vestibular/Ocular Motor rehabilitation	34.51 ± 37.10	20.88 ± 33.10	.707	<.001*
Referral to a specialist (e.g., optometrist, vestibular specialist, psychologist)	49.17 ± 36.34	26.17 ± 34.40	.454	.003*

* Statistical significance at the .01 level.

Table 5.2 An overview of final year athletic therapy student responses regarding the inclusion of concussion assessment and management skills in the curriculum of their professional education in Ireland

Concussion assessment/management skill	Included in the curriculum % (n)	Not included in the curriculum % (n)	Unsure % (n)
Assessment of concussion relevant health history (e.g., previous concussions, ADHD, learning difficulties, migraines)	85% (34)	7.5% (3)	7.5% (3)
History and clinical evaluation non-specific to concussion (e.g., cervical ROM, neck strength, myotomes/dermatomes)	95.1% (39)	4.9% (2)	N/A
Cervical spine tests (e.g., cervical joint-reposition error test, smooth-pursuit neck torsion test)	75.6% (31)	9.8% (4)	14.6% (6)
Cranial nerve examination	73.2% (30)	12.2% (5)	14.6% (6)
Any concussion symptom checklist	100% (41)	N/A	N/A
Standard Assessment of Concussion (SAC)	61% (25)	17.1% (7)	22% (9)
Sport Concussion Assessment Tool (SCAT 5)	100% (41)	N/A	N/A
Child version of Sport Concussion Assessment Tool (Child SCAT5)	57.5% (23)	22.5% (9)	20% (8)
Balance measure (e.g., BESS)	80% (32)	12.5% (5)	7.5% (3)
Gait measure (e.g., timed tandem gait)	57.5% (23)	12.5% (5)	30% (12)

Vestibular/Ocular Motor test (e.g., VOMS)	80% (32)	7.5% (3)	12.5% (5)
King-Devick Test	30.8% (12)	46.2% (18)	23.1% (9)
Paper/pencil neuropsychological test (e.g., The Symbol Digit Modalities Test)	17.5% (7)	32.5% (13)	50% (20)
Computerized neuropsychological test (e.g., ImPACT)	20.5% (8)	51.3% (20)	28.2% (11)
Reaction time testing not included in computerised neuropsychological testing (e.g., ruler drop test)	25% (10)	52.5% (21)	22.5% (9)
Aerobic exercise tolerance test (e.g., Buffalo Concussion Treadmill Test)	40% (16)	47.5% (19)	12.5% (5)
Mood, anxiety or depression assessment (e.g., Brief Symptom Inventory-18)	22.5% (9)	42.5% (17)	35% (14)
Sleep quality and quantity measure (e.g., Pittsburgh Sleep Quality Index)	45% (18)	32.5% (13)	22.5% (9)
Migraine assessment (e.g., The Migraine Disability Assessment)	30% (12)	45% (18)	25% (10)
Providing advice on cognitive rest	86.8% (33)	7.9% (3)	5.3% (2)
Providing advice on physical rest	94.7% (36)	2.6% (1)	2.6% (1)
Providing advice on use of medications	42.1% (16)	36.8% (14)	21.1% (8)
Providing advice on nutrition	28.9% (11)	47.4% (18)	23.7% (9)

Providing advice on driving	52.6% (20)	31.6% (12)	15.8% (6)
Providing advice on return to school/learning activities	73.7% (28)	15.8% (6)	10.5% (4)
Prescription of aerobic exercise	78.9% (30)	7.9% (3)	13.2% (5)
Return to play progression (as per consensus statements e.g., graduated stepwise progression)	76.3% (29)	5.3% (2)	18.4% (7)
Balance training	78.9% (30)	7.9% (3)	13.2% (5)
Cervical spine rehabilitation	71.1% (27)	13.2% (5)	15.8% (6)
Treatment of chronic headache	26.3% (10)	36.8% (14)	36.8% (14)
Vestibular/Ocular Motor rehabilitation	47.4% (18)	36.8% (14)	15.8% (6)
Referral to a specialist (e.g., optometrist, vestibular specialist, psychologist)	50% (19)	23.7% (9)	26.3% (10)

Utilizing a 1-5 scale, participants indicated that positive feedback from a lecturer (4.48±.96) had the strongest positive impact on their concussion self-efficacy (Figure 5.1), while inability to practice the skills in clinical placement (4.33±1.11) had the strongest negative impact (Figure 5.2). Friedman's test indicated significant differences between factors positively [χ2(12)=93.52, p<.001, W=.16] and negatively [χ2(12)=131.60, p<.001, W=.22] influencing self-efficacy. Separate Wilcoxon Signed-Ranks Order tests indicated that positive feedback from a lecturer (Z= -3.92, p<.001, r=.51) and peer (Z= -2.98, p=.003, r=.39) had a significantly higher positive impact on students' self-efficacy than negative feedback. Both types of feedback provided by a lecturer (positive, Z= -4.73, p<.001, r=.62; negative, Z= -4.36, p<.001, r=.56) were rated significantly higher than either type of peer feedback. Inability to observe the lecturer demonstrating a skill (Z= -4.34 p<.001, r=.58) as well as lack of their verbal encouragement (Z= -3.72, p<.001, r=.50) had significantly greater negative impact on students' self-efficacy than inability to observe a peer or not receiving their encouragement. Lack of lecturers' positive (Z= -3.92, p<.001, r=.52) and negative (Z= -4.67, p<.001, r=.62) feedback had a significantly higher negative impact on self-efficacy than lack of peer feedback.
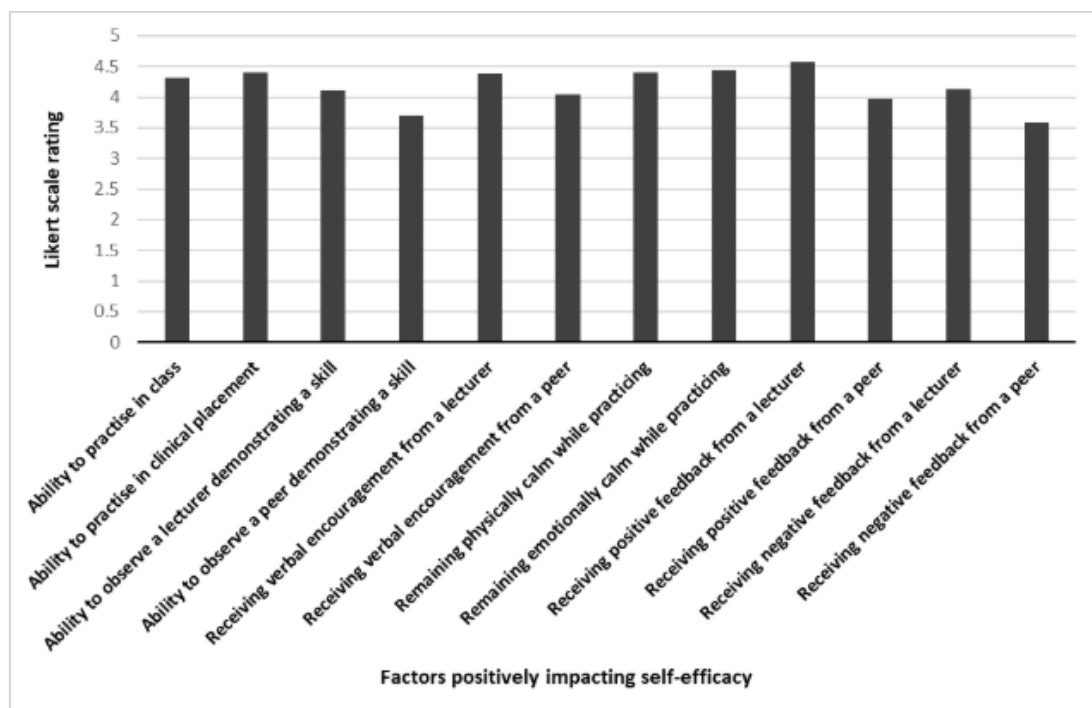
Figure 5.1 Distribution of mean scores for factors having positive impact on athletic therapy students' self-efficacy in concussion assessment and management
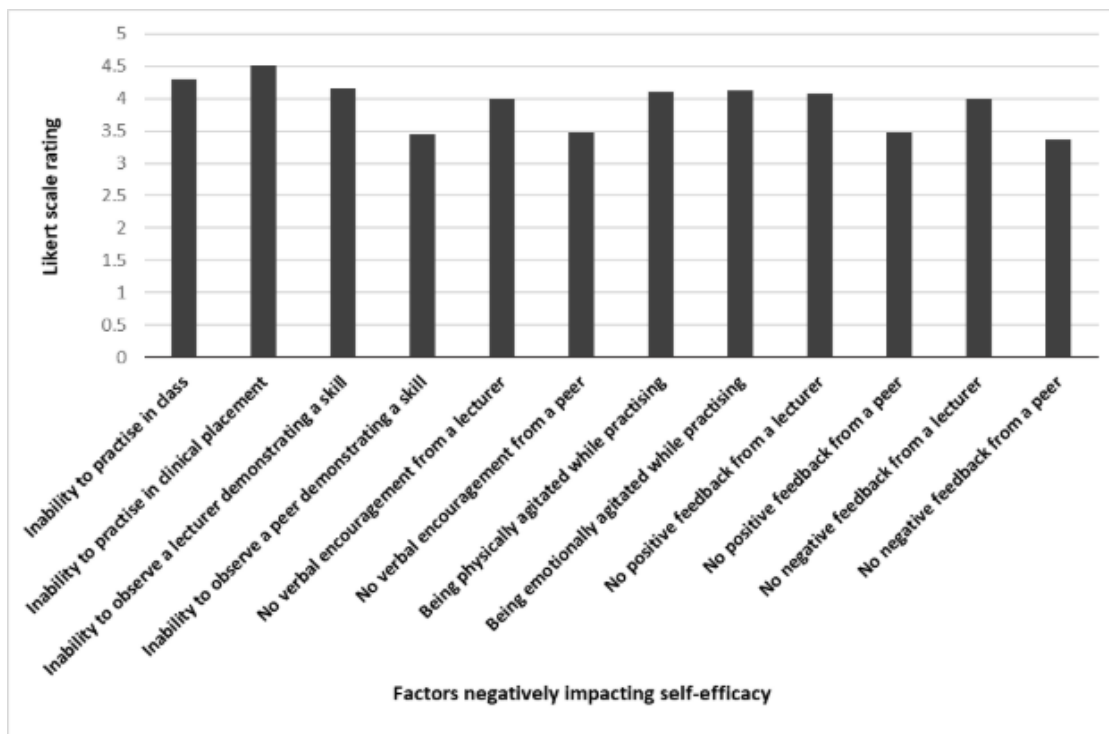
Figure 5.2 Distribution of mean scores for factors having negative impact on athletic therapy students' self-efficacy in concussion assessment and management

5.4 Discussion

Our study aimed to explore athletic therapy students' self-efficacy in concussion assessment and management and the factors influencing its development. Overall self-efficacy of our participants was moderate for concussion assessment (45.75±19.13) and management (51.93±24.12). In a previous study, American athletic trainers demonstrated a similar score for management (55.30±14.1), but higher for assessment (60.34±14.5) (Savage and Covassin, 2018). This difference may be because US clinicians reported assessing/managing 14 concussions annually (Savage and Covassin, 2018), compared to 5.34±7.10 in total in our study. Since practice strongly influences self-efficacy (Schunk, 1985; Tresolini *et al.*, 1994; Ford-Gilboe *et al.*, 1997; Carson *et al.*, 2002), it is understandable that clinicians being exposed to more concussions would have a higher self-efficacy in concussion-related skills. Our findings demonstrated the value of practice as there was a strong positive correlation between the number of concussions assessed/managed and the level of self-efficacy, in line with previous research (Schunk, 1985; Tresolini *et al.*, 1994; Ford-Gilboe *et al.*, 1997; Carson *et al.*, 2002). Educators should aim at

providing athletic therapy students with opportunities to practice their concussion-relevant skills in a clinical setting.

Similar to American athletic trainers (Savage and Covassin, 2018), our highest self-efficacy score was for concussion symptom checklist (82.40±24.37). This tool is well established in clinical practice (Aubry *et al.*, 2002) and in athletic training education in the USA (Wallace, Beidler and Covassin, 2018). Similarly, all our participants reported having it included in their curriculum, alongside SCAT5. However, considering the latest concussion consensus statement recommendation (Patricios, Davis, *et al.*, 2023; Patricios, Schneider, *et al.*, 2023), SCAT6/SCOAT6 should replace SCAT5 in athletic training/therapy professional education. The lowest score among our participants was for computerised neurocognitive assessment (14.03±26.65), far lower than reported in American athletic trainers (77.55±36.20) (Savage and Covassin, 2018). Computerised neuropsychological assessment is taught in 89.4% of the American athletic training programmes (Wallace, Beidler and Covassin, 2018) and utilised by 60% of American athletic trainers (Lempke, Schmidt and Lynall, 2020). However, its use among the Irish athletic therapists is very limited (Lempke *et al.*, 2023) which may explain the low level of self-efficacy for this skill among the Irish clinicians (17.46±31.42). Over 50% of our participants reported not having it included in their curriculum, while 28.2% were unsure. It is plausible that use of computerised neurocognitive assessments varies across institutions and clinics in Ireland, which ultimately affect students' self-efficacy. Future investigations should explore the factors impacting the access to and use of certain clinical tools. Efforts should be made to include practical application of all elements of 3-domain concussion assessment/management in the curriculum.

Literature suggests practice as one of the strongest self-efficacy influencing factors (Schunk, 1985; Tresolini *et al.*, 1994; Carson *et al.*, 2002). Our findings support this, as inability to practice skills had the strongest negative impact on participants' self-efficacy. Students acquire self-efficacy from past experiences (Schunk, 1985), therefore lack of practice may contribute to low self-efficacy in a particular skill. Although no evidence exists on this for self-efficacy, a negative impact of limited practice on general professional confidence has been reported previously in occupational therapy students (Holland, Middleton and Uys, 2012). The strongest positive impact on our participants' self-efficacy had positive feedback from a lecturer. Feedback is an integral part of learning in a clinical setting (Burgess *et al.*, 2020) as it enhances students' self-efficacy (Schunk, 1985) and motivation to persist (Bong and Skaalvik, 2003), however without

subsequent mastery experience that effect can be diminished (Schunk, 1985). Our students rated lecturer's feedback significantly higher than peer feedback. Literature agrees that 'significant other', a person viewed as credible in a professional context, has a particularly strong impact on self-efficacy, through appraisal, encouragement (Schunk, 1985; Tresolini *et al.*, 1994) and skill demonstration (Tresolini *et al.*, 1994). This agrees with our findings, inability to observe a lecturer's demonstration had a significantly higher negative impact on our participants' self-efficacy than lack of peer observation. Literature supports the value of observation/role modeling in development of self-efficacy in a healthcare setting (Tresolini *et al.*, 1994; Ford-Gilboe *et al.*, 1997; Carson *et al.*, 2002; Young *et al.*, 2012). Athletic training/therapy educators should become aware of their own influence on students' self-efficacy and aim to implement pedagogical strategies that contribute to its growth. Efforts should be made to facilitate observation and practice of skill delivery in a supportive environment. Importance of student-lecturer communication, as a source of feedback and encouragement to practice, should be acknowledged.

We acknowledge the limitation associated with the self-reporting nature of our study, whereby participants might not have been motivated to answer questions truthfully or fully accurately. Selection bias might be an issue, where those with more interest in concussion or higher concussion-related self-efficacy might participate. Although the range of collegiate sports in Ireland does not vary significantly among institutions, we cannot be sure that all participants had the same level of experience in assessment/management of concussed athletes. Future research should investigate concussion-relevant knowledge and competence of athletic therapy students and clinicians in Ireland. We recommend qualitative exploration of factors impacting athletic therapy students' self-efficacy, with an emphasis on teaching environment and educational practices-related barriers and facilitators to its development. Interventions aimed at addressing the factors affecting students' self-efficacy should be investigated.

5.5 Conclusion

Irish final year athletic therapy students displayed moderate self-efficacy in concussion assessment and management. Exposure to concussion during clinical placement has a significant effect on students' self-efficacy levels. Athletic training/therapy educators can impact students' self-efficacy through implementation of pedagogical strategies like practice-based learning and role modeling. Access to practice with a lecturer's positive feedback helps athletic therapy students

develop a good level of self-efficacy in concussion assessment and management. Student-lecturer interaction was rated significantly higher than that with a peer, when considering feedback, observation and encouragement to practice.

Summary of Chapter 5 and its link with Chapter 6 and Chapter 7

The findings presented in Chapter 5 complement the findings from Chapter 4 in provision of a thorough overview of concussion-related self-efficacy levels among the Irish clinicians and athletic therapy students, as well as their link with clinical practice (Aim 1). Chapter 5 reconfirms the value of the general self-efficacy sources for development of concussion-related self-efficacy in educational environments (Chapter 4), specifically the importance of the educator's feedback and practice in clinical environments during the initial stages of self-efficacy development. In order for these findings to have meaningful implications for clinical and educational practice, the exploration of the factors that contribute to clinician's and healthcare student's self-efficacy (Aim 2) need to be continued. Therefore, Chapter 6 and Chapter 7 present the investigation of the clinicians' and students' perceptions on this topic, guided by the findings from Chapter 4 and Chapter 5 regarding the relevance of the general self-efficacy sources, as well as the theoretical underpinnings of the self-efficacy concept (Chapter 2).

Chapter 6: A qualitative exploration of factors perceived to influence Irish clinicians' self-efficacy in concussion assessment and management

Author Contribution Statement

The research presented in this chapter was conceptualised and conducted by the author as part of their doctoral research. The author was responsible for developing the research objectives, designing the methodology, obtaining ethical approval, and conducting all aspects of data collection, including participant recruitment and facilitation of the semi-structured interviews. The author also carried out the transcription, reflexive thematic analysis, and interpretation of the findings. All written and visual content presented in this chapter was prepared by the author. Supervisory support was provided in an advisory capacity throughout the research process, with particularly significant input and feedback during the development of the interview guide, the process of data analysis and interpretation, to ensure methodological rigour and trustworthiness.

Currently Under Peer-Review:

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Abstract

Purpose: This qualitative study explored Irish certified athletic therapists' and chartered physiotherapists' perceptions of factors influencing their self-efficacy in concussion assessment and management, guided by the triadic reciprocal determinism model and general self-efficacy sources.

Methods: Twelve semi-structured online interviews were conducted to explore the influence of environmental, personal and behavioural factors on clinicians' self-efficacy. The value of practice, observation, verbal persuasion/feedback and emotional/physiological body responses were also investigated. Data was analysed using a reflexive thematic analysis, with a critical friend approach adopted to enhance rigour of analysis and persistent observation and thick description strategies implemented to ascertain trustworthiness.

Results: Two themes were identified and portrayed the parallel influence of environment-related and clinician-related factors. Exposure and success in dealing with concussion are crucial for clinicians' high self-efficacy, while an experience of misdiagnosis has a negative impact. Although these concussion-related experiences are, to a high degree, environmentally determined, clinicians' personal attributes, including emotional intelligence and mindset, can act as modifiers and control their self-efficacy.

Conclusion: Concussion-related self-efficacy level can vary throughout clinicians' professional life. Although the influence of stakeholders within clinicians' educational and work environment is critical, the power of clinicians' personal agency is indisputable. Future research should explore interventions facilitating development of clinicians' emotional intelligence and open mindset, allowing control of their own self-efficacy in the context of concussion and beyond.

6.1 Introduction

Concussion is considered one of the most challenging injuries that clinicians manage in a sporting environment (McCrory *et al.*, 2017). Gaps in theoretical and practical education evident worldwide (Haider *et al.*, 2017; Mathieu, Ellis and Tator, 2018; Gardner and Heron, 2022; Almalki *et al.*, 2023), as well as the breadth of concussion-related complexities (clinical, symptomological, biomechanical and socio-cultural) (AlHashmi and Matthews, 2022) contribute to sports medicine professionals' uncertainty regarding diagnosis, assessment, management and decision-making (McNamee, Partridge and Anderson, 2015; McLoughlin, 2023); (Bandura, 1977; Balthasar, 2011). Although the body of concussion literature is rapidly growing, merging the findings and implementing them in practice is challenging (McLoughlin, 2023). The epistemological uncertainty regarding concussion is evident among sports medicine clinicians, which may impact their confidence in delivery of concussion-related patient care (Malcolm, 2016).

Self-efficacy, a task-specific equivalent of confidence (Pagnotta *et al.*, 2013), grounded in Social Cognitive Theory (SCT) (Bandura, 1989), is a strong predictor of human behaviour and motivation to persist when facing challenges (Pajares, 1996). Specifically, the triadic reciprocal determinism (TRD) model explains this link, highlighting the multidirectional web of interactions between human perceptions/attitudes/beliefs, their actions/experiences and surrounding environments (Bandura, 1989). Considering the interconnectedness of personal, behavioural and

environmental factors, ascertaining clinicians' high self-efficacy in concussion-care may lead to improved clinical practices and safer sporting environments (Savage and Covassin, 2018). Past research indicated a positive association between the levels of self-efficacy in concussion-related skills and frequency of their use among Irish clinicians working in sport (Postawa, O'Connor and Whyte, 2024). Evidence on the factors impacting clinicians' self-efficacy in assessing/managing concussion is very limited. However, practice in a clinical environment, ability to observe and receive feedback, as well as remaining physiologically and emotionally calm while practising (four general self-efficacy sources), have been demonstrated to facilitate Irish clinicians' concussion assessment/management self-efficacy (Postawa, O'Connor and Whyte, 2024). This is in line with the past research investigating the general sources of skill-related self-efficacy in healthcare (Tresolini *et al.*, 1994; Carson *et al.*, 2002; Paloncy, Georges and Liggett, 2019) and other contexts (Bandura, 1977; Lewis, Weight and Hendricks, 2021; Mandouit and Hattie, 2023).

Exploration of personal beliefs, perceptions and experiences, through qualitative research, is important and relevant in sports medicine, to enhance interpretation of the existing, quantitative findings and improve healthcare practices (Slade *et al.*, 2018). Considering the inseparable link between human and the environment, indicated by TRD model (Bandura, 1989), it appears crucial to broaden the exploration of factors shaping clinicians' concussion-related self-efficacy, beyond the general self-efficacy sources. Thus, this study aimed to investigate Irish clinicians' perceptions on factors influencing their concussion-related self-efficacy, through the lens of TRD model and general sources of self-efficacy.

6.2 Materials and Methods

6.2.1 Philosophical underpinnings

The methodological approach of this study is grounded in constructivist and interpretivist research paradigms. Ontologically, constructivism emphasises that each individual constructs their own understanding of reality based on personal experiences and social interactions (Burns *et al.*, 2022). Therefore, multiple realities exist and their understanding should be informed by deep-level exploration of how each individual's experiences shape their attitudes and beliefs (Kouam, 2024). The interpretivist epistemological stance emphasises the role of meaning in knowledge production. It focuses on the understanding of each individual's subjective interpretation of their experiences and the value of context in this process (Pervin and Mokhtar, 2022). Considering the axiological

perspective, the authors were guided by appreciation for diversity of human needs, challenges and belief systems. The reflexive approach was implemented to assure openness to participants' perspectives and critical evaluation of authors' own bias (Fook, 1999). Its use was also supported by the constructivist paradigm (Kouam, 2024).

6.2.2 Study design

This study used an interpretative phenomenological approach, which is aligned with the ontology of multiple realities and the focus on meaning of personal experiences regarding certain phenomena (Burns et al., 2022), rather than its description based on predetermined concepts (Smith & Osborn, 2015). This was deemed appropriate considering our goal of exploring clinicians' lived experiences and understanding their perceptions of self-efficacy development. Semi-structured interviews were used to collect data, as they allow an in-depth exploration through the eyes of the participant, while providing a safe space for discussion of potentially sensitive topics. Considering the overall goal of this doctoral research and its link with the SCT, a fully inductive approach to data analysis was not appropriate. Therefore, reflexive thematic analysis (RTA) (Braun and Clarke, 2021) was deemed more appropriate than interpretative phenomenological analysis (Ramanadhan *et al.*, 2021). The research team consisted of five athletic therapy educators holding professional qualifications (chartered physiotherapist and/or certified athletic therapist). All researchers had experience in clinical work with athletes in Ireland and had previously undertaken concussion-related and/or sports medicine research.

6.2.3 Participants

A purposive sample of Irish clinicians who regularly assess/manage sport-related concussion as a part of their practice were recruited via social media and email, and were required to provide informed consent prior to data collection. Twelve clinicians [certified athletic therapists (n=6), chartered physiotherapists (n=4) and dual-qualified certified athletic therapists and chartered physiotherapists (n=2)] with mean 5.83±4.86 years of professional experience were interviewed between December 2023-February 2024. Demographic information is presented in Table 6.1.

Table 6.1 Participants' demographic information

	Sex	Professional qualifications	Professional experience (years)	Sport		
				Type	Level	Age group
C1	Male	Certified athletic therapist	2	Basketball Rugby	Elite Community	18+ 18+
C2	Male	Chartered physiotherapist	7	Soccer Gaelic football Rugby	Elite Academy Community Elite Academy	9-16 18+ 12-17
C3	Male	Certified athletic therapist & Chartered physiotherapist	5	Gaelic football Hurling Rugby	Elite Elite Community	18+ 18+ 18+
C4	Male	Certified athletic therapist	2	Gaelic football Gaelic football Hurling Hurling Rugby	Elite Community Elite Community Community	18+ 15-17 18+ 15-17 18+
C5	Male	Certified athletic therapist	3	Soccer Soccer	Elite Community	18+ 18+
C6	Male	Certified athletic therapist	2	Soccer Rugby Gaelic football Gaelic football Hurling	Elite Academy Elite Academy Community Community Community	10-17 12-17 18+ 12-13 12-13

C7	Female	Certified athletic therapist & Chartered physiotherapist	4	Gaelic football Gaelic football Rugby	Elite Community Community	18+ 18+ 18+
C8	Male	Chartered physiotherapist	11	Rugby Cricket	Community Elite	18+ 18+
C9	Male	Certified athletic therapist	2	Rugby Rugby Hurling	Community Community Community	18+ 16-17 18+
C10	Male	Certified athletic therapist	3	Gaelic football	Community	18+
C11	Male	Chartered physiotherapist	15	Gaelic football Rugby Boxing Rowing Tennis	Elite Elite Community Elite Community	18+ 18+ 18+ 18+ 18+
C12	Male	Chartered physiotherapist	14	Gaelic football Gaelic football Soccer Hurling Camogie	Elite Elite Elite Community Community	18+ 16-17 16-17 18+ 18+

6.2.4 Semi-structured interview guide

The interview guide was developed by the authors based on the study aim. The first section explored participants' views on the influence of (1) environment, (2) personal characteristics and (3) past experiences on development of concussion-related self-efficacy, to allow understanding of participant-specific interactions between these factors, as suggested by TRD model (Bandura, 1989). The second section explored participants' perceptions on the importance of (1) practice, (2) observation, (3) verbal persuasion/feedback and (4) emotional/physiological body responses, in development of their self-efficacy. This facilitated getting an in-depth, personal account of the value of each of the four self-efficacy sources (Bandura, 1977), in development of concussion-related self-efficacy, and exploring clinician-specific nuances. The interview guide structure was inspired by a spiral approach utilised in education (Harden and Stamper, 1999) and qualitative research (Mao *et al.*, 2016; Pagliarin, La Mendola and Vis, 2023). Topics were revisited throughout the session, to facilitate participants' reflection, and allow the researcher a deeper understanding of their perceptions. Open ended general and supporting questions were included in each section (Appendix C).

6.2.5 Procedures

The study procedures were approved by the Dublin City University Research Ethics Committee (DCUREC/2023/195). Two pilot interviews were conducted with relevant participants to examine the effectiveness of the interview guide, and to develop the primary researcher's expertise in obtaining and analysing qualitative data. No changes to the interview guide were necessary following the pilot interviews. Findings from the pilot data was analysis were not included in the results sec. Interviews were conducted online, audio and video-recorded and transcribed. The primary investigator conducted the interviews and reviewed transcripts to ensure data integrity.

6.2.6 Analysis and trustworthiness

Transcripts were uploaded to NVivo 14 (QSR International), and the six-phase process of reflexive thematic analysis (RTA) took place; (1) data familiarisation, (2) codes generation, (3) sub-themes/themes generation, (4) sub-themes/themes revision, (5) subthemes/themes defining and naming, and (6) reporting findings (Braun and Clarke, 2006). The transcripts were read

numerous times, and the analysis was completed over several weeks, until the primary researcher achieved a deep understanding of the interconnectedness of self-efficacy influencing factors. To enhance rigour of analysis, a 'critical friend approach' was utilised (Balthasar, 2011). An independent evaluator, experienced in qualitative research, analysed a sample of transcripts, discussed coding with the primary researcher, and stayed involved in all other stages of RTA, to review and challenge the interpretation of the primary researcher. Trustworthiness was enhanced by thick description and persistent observation (Korstjens and Moser, 2018). Data was gathered from clinicians who differed in length of professional experience, populations they worked with and concussion exposure frequency and setting. To allow transferability judgement, findings are presented using a thick description method (Korstjens and Moser, 2018). This report aligns with the Standards for Reporting Qualitative Research (O'Brien *et al.*, 2014).

6.3 Results

Two overarching themes and five subthemes were identified relating to environmental and clinician-related factors that previously contributed to, or continually challenge clinicians' concussion-related self-efficacy. Each theme and their associated sub-themes link with the TRD model and the general self-efficacy sources (Figure 6.1). Further details of themes/sub-themes are evident in Appendices D and E.
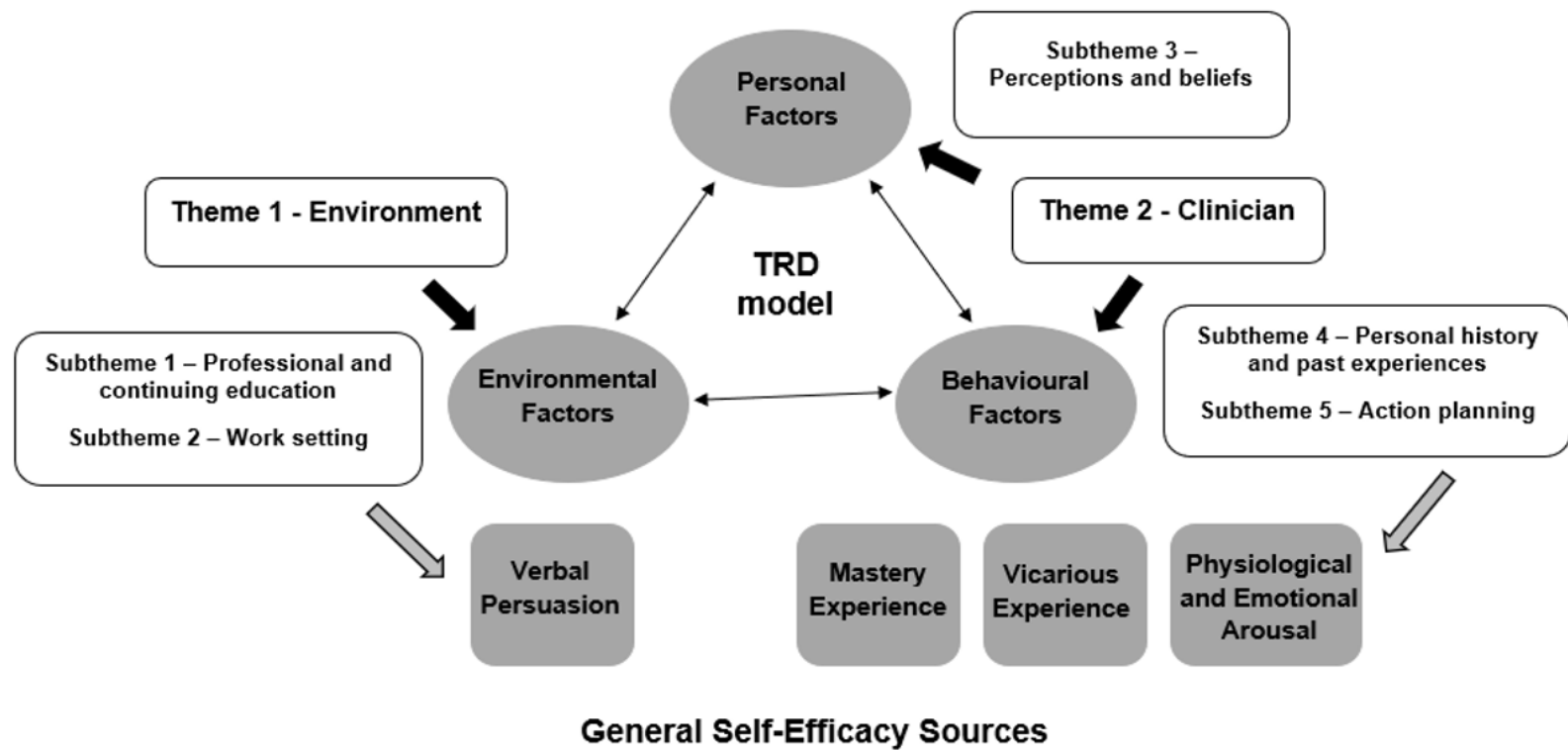
Figure 6.1 Themes and subthemes derived from the clinicians' data matched with elements of the triadic reciprocal determinism model and the general sources of self-efficacy.

6.3.1 Theme 1: Environment-specific factors

All participants discussed the importance of the environment during professional education and throughout their practice post-graduation. Two sub-themes were identified; (1) professional and continuing education and (2) work-setting.

6.3.1.1 Professional and continuing education

Past educational experiences, particularly at undergraduate/postgraduate levels, were acknowledged as crucial factors allowing clinicians to develop a foundation of concussion-related self-efficacy. The breadth of both concussion-related syllabi and teaching methods impacted the development of a good understanding of concussion and the most recent patient-care guidelines. This, accompanied by real-life exposures and hands-on opportunities in a controlled environment, were discussed as the ideal foundation for development of high concussion-related self-efficacy.

I think with confidence of concussion it all comes back to what you were taught from the offset. If the structures are in place to bring you from start to finish with concussion, you've gone through it theoretically, practically and then that was amalgamated altogether, you will be confident. (C11)

Participants who completed their professional education over 10 years ago in Ireland (C8, C11, C12) perceived they had poorer self-efficacy, as this topic was not included in their studies. Moreover, due to poor understanding of concussion significance, they did not upskill for many years. The global availability and breadth of concussion resources was a facilitator of clinicians' self-efficacy; however, the lack of highly sensitive and reliable concussion assessment measures/tools was suggested to have a potentially negative impact. The majority of participants indicated the critical value of educators during professional and continuing education, most notably as role-models, whose performance can be observed in a classroom and clinical/pitch-side environment, alongside the importance of receiving their feedback while developing skills. Interestingly, clinicians' self-efficacy changes did not follow a single pattern when subjected to various feedback types, in a mixture of environments. Clinician-specific factors were considered strong modifiers for self-efficacy fluctuation, particularly in the case of negative/poorly-phrased/absence of feedback or feedback delivered in front of others.

Feedback is very important for learning, but I've had situations where the phrasing could definitely be better and this feedback was not the best for improving confidence. One to one is always better, because even if it is negative feedback, it's only in front of yourself. If that was in front of people, it would impact your confidence much more. (C1)

The professional profile and experience of the educator, alongside their personal attributes, and the quality of the relationship with them were also acknowledged as factors strongly determining learner's self-efficacy. The importance of peer presence within the educational environment was also discussed by the majority of participants. The opportunity to observe peer performance, influenced clinicians depending on the quality of that performance, relationship with the peer, their own academic ability and mindset. Peer feedback was valued lower than that of an educator, and its impact on self-efficacy also varied among clinicians.

6.3.1.2 Work-setting

Work-setting was also discussed as a concussion self-efficacy modifier, including the club's organisational structure, sport type and level, and the involved stakeholders. The organisational structure determines the frequency of contact with the team, the specificity of concussion-related situations and the availability of medical support staff, support systems, resources and referral options, all of which influence self-efficacy. Sport type and level of competition dictate the likelihood of exposure to concussion, as well as the protocols to be followed, team attitudes to concussion and challenges related to characteristics of the game.

I suppose I find myself confident, because I'm in a quite well organised set-up in XXX Academy. The coaching staff are aligned and educated on concussion management, what the protocols are, which definitely helps. You don't feel like you have to convince them of your decision. There are medical personnel on site during game time and often during trainings, so I have decent support in case of lack of clarity over a diagnosis. In the past, working in other set-ups, it had been more difficult. (C2)

All participants discussed the importance of managers/coaches' concussion-related beliefs, attitudes and personal qualities, which influence the support or pressure clinicians experience. Greater perceived pressure diminishes their self-efficacy in voicing the diagnosis and making decisions regarding continuing performance or removing the athlete, while support is a self-efficacy facilitator. Coaches/managers' poor concussion knowledge can stimulate clinicians' determination to ascertain authority, as indicated by one clinician. Athletes' behaviours also influenced clinicians' self-efficacy, especially when it affected concussion assessment in a high-pressure situation. Although the majority of participants acknowledged athletes' concussion-related beliefs and attitudes as factors potentially challenging their self-efficacy, the impact of a lack of athlete's support was less significant than lack of coach/manager's support.

Sometimes coaches will argue against you, whether the player has a concussion or not. I think that can affect your confidence massively. Having to defend yourself as to why you think they're concussed, can be quite tough, and in some scenarios, it can be easier just to back down but that can affect your confidence as well. (C10)

Participants' self-efficacy decreased if their professional opinion was undermined by other clinicians, as well as when assessing concussion in front of a more experienced clinician. Of note, observing an inaccurate concussion assessment completed by another clinician can positively and/or negatively impact self-efficacy. Spectators and the wider community/society were additional sources of pressure for clinicians. As indicated by the more experienced participants, the old, ignorant approach to concussion in sport facilitated their high self-efficacy, despite minimal level of concussion-related knowledge, due to low societal expectations for concussion management. The current narrative and increased media coverage impair clinicians' self-efficacy in appropriate concussion assessment/management, which in turn motivates them to engage in continuing professional development.

In the environment I grew up in, which was rugby, concussion wasn't a thing. You could get concussed on a Monday and you were expected to train again two days later, full contact. For me, the concussion film was the first big recognition of concussions being a problem. Then I suppose watching rugby, and how concussion, head injuries evolved in the last maybe eight years. Then

seeing the legal actions being taken by past players. All of this made me realise I am not confident in it. (C11)

6.3.2 Theme 2: Clinician-specific factors

The importance of clinician-specific characteristics was evident across all the interviews. Three sub-themes were identified within this theme, (1) personal history and past experiences, (2) perceptions and beliefs, (3) action planning.

6.3.2.1 Personal history and past experiences

All participants indicated frequent, direct exposure to concussion as a pivotal factor that allows clinicians to develop and increase self-efficacy.

I honestly think practice is such a big thing with everything for clinicians, but especially concussion. You could read about a hamstring strain, practise the assessment once and you are OK. Whereas concussion varies so much. Some people will not be able to answer what day of the week it is, others are going to answer everything perfectly, but by getting practice, you will know that they are a little slower than they should be on those basic questions, or that they are being unusually emotional. I think practice after a good base level of education is so important. (C1)

The quality of, and reflection on, performance, were integral for the development of self-efficacy. A decrease in clinicians' self-efficacy that followed poor concussion-related performance was connected to negative self-talk and often linked with patient outcomes. The majority of participants indicated the importance of a growth mindset and engagement in productive reflection for coping with the potentially damaging impact of poor performance on self-efficacy. Self-regulation and stress management skills were also crucial for dealing with emotional/physiological body reactions while delivering concussion-care. A sporting background was discussed by multiple participants as a self-efficacy facilitator, through an early development of resilience, experience of team dynamics and personal history of concussion.

I played a collision sport from the age of 9 to 33. I was surrounded by concussion. Then I worked as a physio, and I saw it again and again. Because of my experience as a player, having pretended

that I was okay, on a number of occasions and knowing that management will probably try and push a player to stay on the field and gloss over it, I was switched on as a physio. (C8)

6.3.2.2 Perceptions and beliefs

Concussion-related beliefs were acknowledged as strong modifiers of clinicians' self-efficacy. Several participants indicated awareness of the complexity and unpredictability of concussion hinders their self-efficacy, especially regarding clinical decision-making in a high-pressure situation. However, some participants discussed using that awareness as a decision-making self-efficacy source.

The fact that there is such a variety of symptoms, and presentations doesn't affect my confidence too much, because I always play on the safe side of things. If I have any doubts at all, I am taking them out. So, confidence means that I know I'm doing the right thing in terms of what they're presenting with. (C3)

Conversely, naive perceptions, related to limited concussion education, led to high-level self-efficacy among participants who graduated over 10 years ago. The awareness of concussion-related protocols and frameworks was discussed as a facilitator of self-efficacy, giving clinicians a solid resource, they can revert to in case of self-doubt or conflict during decision-making. Although the trust in protocols was reported to positively influence clinician's belief in their ability to deliver high-quality concussion-care, the awareness of protocols/frameworks' shortcomings was also indicated as helpful for maintaining self-efficacy. This is through realising that mistakes are unavoidable. Despite the fact that awareness of the potential impact of inappropriately managed concussion on athletes' life adds pressure, as reported by majority of participants, it also facilitates clinicians' self-efficacy, through increasing their determination towards athlete safeguarding.

Self-related beliefs and perceptions for their role as clinicians were discussed by the majority of participants. Many discussed early-career clinicians' belief of being expected to be flawless, leading to added pressure with concussion management, and higher susceptibility of self-efficacy decreases with inaccurate performances, further amplified by a belief in clinician's absolute responsibility for athletes' health and wellbeing. The more experienced clinicians acknowledged that the awareness of responsibility for athletes can be used as a source of self-

efficacy to stand by their professional opinion during confrontations regarding concussion-related decision-making. Moreover, one of the participants indicated that awareness of their role limitations diminishes the self-efficacy decrease resulting from challenging confrontations.

I understand I can't physically take them off the pitch. It's up to the management, I can only recommend. So, I don't think it affects my confidence because there is only so much you can do. I can't babysit them. (C4)

An open mindset was also acknowledged as crucial to developing and maintaining high self-efficacy, allowing one to view oneself as a continuous learner, unshaken by challenges and eager to grow professionally. The participants also referred to certain personal qualities that support their self-efficacy. Cautiousness was discussed by one clinician as supportive in overseeing athlete performance, completing the assessment and removing from play. Another participant admitted that despite limited professional experience, their natural stubbornness allowed them to confidently defend their decision regarding concussed athletes, unlike other early-career clinicians working in similar environments. Several participants also disclosed the internal conflict that clinicians may experience with decision-making in scenarios, such as concussion sustained by the 'star athlete', athlete that they have a personal-level relationship with or concussion in a high-stake game, which in turn, impact clinician's self-efficacy. As indicated by a number of young clinicians, their quandaries refer to a concern about career and job security in case of making a decision that is not aligned with management's viewpoint.

I know people in the industry who really struggled for the first years, mainly with communication, because some people are just difficult to deal with. And because you don't have the confidence or the experience yet, you can question yourself, give them a little bit more leeway, let players come back earlier, even though you think they shouldn't, just to satisfy people. The sporting world is small. If players are out for extended periods and you're the clinician in charge, that gets around quite quickly, and it could impact your career. (C7)

6.3.2.3 Action planning

The majority of clinicians discussed action planning within the work environment, such as initiating discussions regarding their authority over the athletes' health, educating team staff and athletes regarding concussion protocols, and ensuring good rapport with the team, benefitted their self-efficacy.

I think you have to reinforce with the management and team an etiquette that there are certain things we can bend the rules on and there are certain things that are non-negotiable. If you have a good rapport with your medical team and coaching staff, they will respect your decision, but if you don't have it and don't go through these things, then they may try to pull the wool over your eyes a little bit. (C11)

The value of seeking advice and feedback from other clinicians was indicated by many, with one participant detailing multiple steps they had undertaken to increase concussion-related self-efficacy early in their career. Seeking concussion exposure through engaging in concussion-prevalent sports was also mentioned as a way of improving concussion self-efficacy.

6.4 Discussion

This study aimed to explore Irish clinicians' perceptions on factors impacting their sport-related concussion self-efficacy, through the lens of the TRD model and general sources of self-efficacy. Two key groups of factors were indicated as influencing clinicians' self-efficacy; the environment they learn and perform in, and their personal experiences and beliefs. Each of the four general self-efficacy sources (Bandura, 1977) were evidently linked with those factors. For example, success in dealing with concussion served as a strong indicator of competence, increasing their self-efficacy, reflecting the importance of mastery experience (Bandura, 1977). Concussed athlete-care in a sports setting was described as a complex operation including athlete on-pitch examination using a variety of tools, communication with the athlete and referee, clinical decision-making and working under time pressures. There were added complexities with the decision commonly impacting the whole team, and communication of that decision to all involved stakeholders. Although clinicians' personal experiences influence their self-efficacy in each of these tasks, their perception of success is not only dependent on their physical ability to complete

them but other stakeholders' actions and clinicians' self-reflection on the situation also have a significant impact. This complexity demonstrates the interconnectedness of humans and their environment, represented by the TRD model (Bandura, 1989). Those interactions are continuously relevant for clinicians' self-efficacy throughout their professional life, according to participants.

The foundation of clinicians' concussion-related self-efficacy develops during professional education. The development of capability to perform a task is a crucial precursor to holding a belief in one's own ability to successfully complete it (Bandura, 1997). The inclusion of concussion-relevant content in the programme of education is crucial. As highlighted by participants with over 10 years of clinical experience, concussion education was very limited or completely absent from their curriculum, leaving them unaware of how to properly assess/manage it. Interestingly, the poor level of knowledge stimulated their high concussion-related self-efficacy post-graduation. This relationship between knowledge and self-efficacy can be explained by the competence-confidence progression model, where the 'unskilled and unaware of it' stage occurs at the initial phase of learning (Kruger and Dunning, 1999). Overestimation of one's ability stems from lack of metacognitive awareness to realise one's own incompetence, due to poor understanding of the topic (Kruger and Dunning, 1999). Similarly, the 'unconscious incompetence' stage of the four-stage competence model (Swart, 2022) suggests that the initial lack of knowledge and ability may lead to high confidence. However, further learning and supervised practice facilitates the awareness of one's own shortcomings, and decreases confidence to the level of true competence (Swart, 2022). Participants agreed that knowledge and awareness of concussion alone are not sufficient to develop a high-level self-efficacy. They emphasised the importance of hands-on learning, initially in a controlled classroom environment and progressing into real-life clinical and pitch-side exposures. Past research agrees that practice in clinical/pitch-side environments is crucial for developing confidence and self-efficacy in concussion assessment/management (Finn, 2019; Postawa, O'Connor and Whyte, 2024). Conversely, inability to practise in clinical/pitch-side environments had the highest negative impact on concussion-related self-efficacy among both Irish clinicians (Postawa, O'Connor and Whyte, 2024) and final-year athletic therapy students (Postawa, Whyte and O'Connor, 2024). The importance of clinical exposures to concussion in medical curricula is also emphasised in the literature (Husain, 2024).

The educators' role in development of learner's self-efficacy is multifactorial, firstly through facilitating practice, and secondly by serving as role-models, providing feedback and support. Educator's positive feedback was also the strongest enhancer of concussion-related self-efficacy among Irish athletic therapy students (Postawa, Whyte and O'Connor, 2024), while inability to observe educator's demonstration was a significant barrier according to Irish clinicians (Postawa, O'Connor and Whyte, 2024). Interestingly, all educator-related interactions were rated significantly higher than those linked with peers, among both of these populations (Postawa, O'Connor and Whyte, 2024; Postawa, Whyte and O'Connor, 2024), which is in line with our research. However, the strength of the impact on self-efficacy depended also on the type and quality of the relationship, the educator's professional profile, the peer's academic ability and the personal characteristics of all involved, according to participants. Past research agrees that verbal persuasion from 'significant others' held in high regard is particularly impactful for self-efficacy (Schunk, 2011). Hence, feedback from an educator with a strong professional profile, academically-successful peer or anyone who's opinion is valued, has a great impact on self-efficacy level. An observation of 'similar others' performance is a specifically impactful type of vicarious experience (Schunk, 1985), and participants also valued that peer-observation. Although literature suggests that observation of 'similar others' success increases self-efficacy, while failures decrease it (Schunk, 1985), a more complex relationship was discussed by current participants. Observation of successful peer-performance facilitated self-efficacy when learning new skills, however when comparing it to past performances, it either increased or decreased it. Gaining awareness of past inaccuracies in concussion-care led to a short-term loss of self-efficacy in the majority of participants, with the long-term effect depending on their reflection patterns. An observation of a poor peer-performance did not produce self-efficacy decrease in participants, unlike suggested previously (Schunk, 1985). Instead, the opportunity to learn from peers' mistakes improved self-efficacy in delivery of new skills, and provided reassurance regarding participants' own ability. The inconsistencies between our findings and past research might be related to clinicians' personality traits, attitudes and beliefs. Personality traits are directly related to academic performance and life outcomes in general, determining one's reaction to uncomfortable circumstances, willingness to perform in group situations or influencing one's outlook on others (Dong *et al.*, 2022), all of which might impact self-efficacy changes related to interactions in a learning environment.

Self-efficacy fluctuations among young clinicians are also linked with exposure to concussion within the sporting environment, as evident previously in Irish clinicians (Postawa, O'Connor and Whyte, 2024) and New-Zealand doctors (Stuart *et al.*, 2022). Interaction with a concussed athlete allows clinicians to practise their skills, enabling mastery experience, the strongest of general self-efficacy sources (Bandura, 1997). Concussion exposure opportunities vary, depending mainly on sport type, as acknowledged by participants. Rugby, with its high concussion prevalence, exposes clinicians to many more concussions than Gaelic football or soccer (Walshe, Daly and Ryan, 2022, 2024). In addition, participants acknowledged concussion-related protocols and attitudes vary significantly among sports and their levels in Ireland, as highlighted with recent evidence (Walshe, Daly and Ryan, 2024). A lack of protocol consistency among sports confuses the involved stakeholders (Walshe, Daly and Ryan, 2024) and affects their attitudes towards protocol delivery by a clinician (Stuart *et al.*, 2022). Although participants agreed that the lack of uniform approach does not affect their self-efficacy in delivery of concussion-related assessment, and subsequent clinical diagnosis-making, it may affect their self-efficacy in making removal from play decisions. Athletes', coaches' and officials' attitudes play a significant role here. Athletes' willingness to cooperate during assessment, level of perceived pressure from coaches, support from officials and overall clinicians' perception of authority within the team are some of the factors influencing clinicians' self-efficacy. The culture of risky behaviours in sport in general (Safai, 2003) and regarding concussion (McNamee, Partridge and Anderson, 2015), as well as the 'head strong' attitudes among rugby players in Ireland (Liston *et al.*, 2018), potentially explain the challenges discussed by participants, particularly regarding poor cooperation and downplaying of symptoms during high-stake games. The coaches' pressure to keep an athlete on the pitch or return them to play early, are the most common in sporting environments with no clearly defined concussion-related protocols, according to participants. The resistance from various team members to allow athlete's recovery, often forces clinicians to make ethical and clinical compromises (Liston *et al.*, 2018). Participants agreed with the literature that the potential severity of adverse concussion outcomes and media attention towards them negatively impacts their confidence when being pressured (Kossman *et al.*, 2024).

A doctor-patient-team conflict of interest triad is a substantial barrier to appropriate concussion management (Partridge, 2014). However, according to participants, the more experienced clinicians handle these pressures better and generally hold greater authority within the

team. Literature supports that frequency of concussion assessment/management skills' use strongly correlates with clinicians' self-efficacy (Postawa, O'Connor and Whyte, 2024), and experienced clinicians reported a significantly higher confidence in differentiating between concussion trajectories (Hattrup, Root and Valovich Mcleod, 2022). Interestingly, participants with personal athletic experience reported greater resilience to team pressure and critique overall, regardless of length of clinical experience. They recognised the importance of exposure to team dynamics and general public attention, as resilience-building experiences, in line with previous research (Gupta and McCarthy, 2022). Regardless of knowledge and experience, there are aspects of the work environment that influence clinicians' self-efficacy. Depending on club set-up, clinicians might face limitations regarding time/frequency of contact with athletes, availability of support medical staff, access to resources and referral options, all of which negatively impact their self-efficacy. Similar barriers related to concussion management were reported by clinicians worldwide (McNamee, Partridge and Anderson, 2015; Bacon, Kay and Mcleod, 2017; Hattrup, Root and Valovich Mcleod, 2022; Stuart *et al.*, 2022). Although clinicians' presence was demonstrated to increase concussion-reporting and management (McGuine *et al.*, 2018), limited athlete-clinician contact is a problem across many countries (McNamee, Partridge and Anderson, 2015; Bacon, Kay and Mcleod, 2017; Hattrup, Root and Valovich Mcleod, 2022), including Ireland (Liston *et al.*, 2018). Participants confirmed that frequent contact with team members facilitates good rapport building, authority and recognition of concussions manifesting primarily with emotional changes, all of which increase self-efficacy. Facilitation of clinical reasoning is especially important considering the lack of objective assessment measures (Makdissi, Davis and McCrory, 2015; Kossman *et al.*, 2024). Participants agreed with this, however they also recognised the global availability and breadth of concussion resources as self-efficacy facilitators.

One of the most self-efficacy-damaging experiences for a clinician commonly exposed to concussions is a misdiagnosis. Adverse work events commonly affect self-efficacy in a professional world, with personal dispositions and contextual factors being possible impact-modifiers (Schmitt and Weigelt, 2023). Clinicians emphasised the value of an open mindset and productive reflection for coping with a misdiagnosis. An open mindset impacts their perceptions of themselves as clinicians/continuous learners and facilitates reflection aimed at learning from mistakes instead of dwelling on them, preventing long-term self-efficacy decreases. Past research confirms that poor ability to regulate affective states increases self-efficacy loss after negative

events, while action-orientation approach facilitates self-regulation and productive reflection (Schmitt and Weigelt, 2023). The link between the awareness of emotional and/or physiological arousal and self-efficacy (Bandura, 1977) was also discussed by participants. The awareness of emotional/physiological stress during concussion assessment impacted their self-efficacy, however ability to overcome those bodily reactions led to consequent self-efficacy increases. Literature agrees that the ability to sense, assess and control emotions, defined as emotional intelligence, is linked to successful stress management and advancement of thinking processes under pressure (Bandura, 1997), all of which may improve clinicians' performance and subsequently, self-efficacy. Concussion often does not allow diagnostic precision commonly sought in sports medicine (McNamee, Partridge and Anderson, 2015). This, combined with the time constraints and pressures clinicians face during the assessment process (McNamee, Partridge and Anderson, 2015; Kossman *et al.*, 2024), justifies intuitive decision-making, as suggested previously (Nalliah, 2016). Although decision-making style is influenced by personality traits, emotional intelligence facilitated intuitive decision-making among medical students (El Othman *et al.*, 2020). Hence, high self-efficacy regarding concussion diagnosis in challenging environments might be linked with clinicians' level of emotional intelligence. Our study demonstrated the importance of clinician-related factors for developing and sustaining high self-efficacy. Apart from modifying clinicians' responses to challenging situations, personal factors might have facilitated work- and education-related proactive behaviours. Literature agrees that personality-dependent work-place proactivity allows development of leadership capabilities and enhances performance (Zhang *et al.*, 2023), which could explain why it served as a source of self-efficacy among participants.

Our study demonstrated the multitude of factors impacting clinicians' concussion-related self-efficacy, their interconnectedness and variability between individuals. We confirmed the relevance of the general self-efficacy sources in a context not explored previously, while highlighting the power of clinicians' agency in shaping their own self-efficacy. Some limitations are: (1) transferability of findings regarding environmental impacts, due to intercountry differences in the professional education model, clinicians' work-setting and concussion-related legislation and; (2) possible gender bias, as only one female clinician participated. Future research should delve deeper into female-clinician perceptions, explore self-efficacy in contexts other than concussion, and explore interventions aimed at enhancing clinicians' self-efficacy by addressing

both environmental factors and personal development of their individual attributes, including emotional intelligence.

6.5 Conclusion

Clinicians' self-efficacy regarding concussion-related patient care in sport can fluctuate throughout their professional career. Exposure and success in dealing with concussion are crucial self-efficacy-increasing factors, while experience of misdiagnosis has a hugely detrimental effect on clinicians' self-efficacy. Although the environment has a critical impact on these experiences throughout clinicians' professional life, their personal factors can modify environmental influences, determining the final level of clinicians' concussion-related self-efficacy.

Summary of Chapter 6 and its link with Chapter 7

Chapter 6 presented clinicians' perceptions on factors influencing development of self-efficacy throughout education and independent professional practice. The findings provide depth and detail in relation to the relevance of practice, observation, feedback and experiences of physical and emotional arousal (general self-efficacy sources). Importantly, they emphasise the role of environmental and clinician-related factors as modifiers of the impact that the general self-efficacy sources have on clinicians' self-efficacy. This is in line with the TRD model (Chapter 2), and highlights the complexity of self-efficacy development process, as well as the interdependencies among the stakeholders within educational and professional practice environments (Aim 2, Chapter 1).

Chapter 6 indicates the importance of the period of professional education for development of foundations of concussion-related self-efficacy. The value of the relationship with educators and peers (Chapter 4 and Chapter 5) is reiterated, while providing insights into the role of the personal factors for interpretation of past experiences, and subsequent self-efficacy development. Reflecting on the importance of professional education for development of concussion-related self-efficacy foundations, it is crucial to explore the healthcare students' perspectives, in order to identify strategies that can facilitate that process (Aim 3, Chapter 1). Therefore, Chapter 7 presents the investigation of final-year athletic therapy students' perceptions on factors influencing development of their self-efficacy in concussion-related patient care.

Chapter 7: "It's complicated": Healthcare students' perceptions on factors influencing concussion-related self-efficacy development – a qualitative investigation

Author Contribution Statement

The research presented in this chapter was conceptualised and conducted by the author as part of their doctoral research. The author was responsible for developing the research objectives, designing the methodology, obtaining ethical approval, and conducting all aspects of data collection, including participant recruitment and facilitation of the semi-structured interviews. The author also carried out the transcription, reflexive thematic analysis, and interpretation of the findings. All written and visual content presented in this chapter was prepared by the author. Supervisory support was provided in an advisory capacity throughout the research process, with particularly significant input and feedback during the development of the interview guide, the process of data analysis and interpretation, to ensure methodological rigour and trustworthiness.

Abstract

Purpose: This qualitative study explored Irish final-year athletic therapy students' perceptions on the factors influencing their self-efficacy in concussion assessment and management, guided by the triadic reciprocal determinism model and general self-efficacy sources.

Methods: Eight focus groups were conducted and the lived experiences of 20 AT students were explored. The influence of environmental, personal and behavioural factors (social cognitive theory), as well as the value of practice, observation, verbal persuasion/feedback and emotional/physiological body responses (general self-efficacy sources) were investigated. Reflexive thematic analysis was used to analyse data. A critical-friend approach was adopted to enhance rigour of analysis.

Results: Three themes were identified and represent the parallel influence that academic and applied placement environments, and student's personal characteristics have on self-efficacy development. Theoretical knowledge and practical exposure to concussion are crucial for development of high self-efficacy, with the educators, peers and the applied environment's stakeholders having an important role in this process. Although unsuccessful performance can often negatively affect self-efficacy, student-specific attributes like resilience and emotional

intelligence are moderators of the long-term impact that these experiences have on student's self-efficacy.

Conclusion: The period of professional education is crucial for development of concussion-related self-efficacy, and all the stakeholders within the educational environment contribute to this process. Nevertheless, students' personal attributes and beliefs are crucial in shaping the trajectory of their self-efficacy development.

7.1 Introduction

Concussion diagnosis and clinical decision making poses a significant challenge to clinicians working in sport (McNamee, Partridge and Anderson, 2015). Multiple factors have been shown to impact their concussion-related patient care, including knowledge gaps, the publicly recognised level of uncertainty regarding concussion, as well as concussion-related sociocultural and clinical complexities (AlHashmi and Matthews, 2022). Although the importance of the multimodal concussion assessment/management has been evident in literature for several years (McCrory *et al.*, 2017), concussion-related clinical practices observed across various sports medical professions worldwide lack consistency and often do not follow best practice recommendations (Yorke, Littleton and Alsalaheen, 2016; Lempke, Schmidt and Lynall, 2020; Maxtone *et al.*, 2020; Lempke *et al.*, 2023; Postawa, O'Connor and Whyte, 2024). Significant differences in clinical practice have been reported among clinicians presenting a comparable level of concussion-related knowledge (Lempke, Schmidt and Lynall, 2020; Lempke *et al.*, 2023).

Clinical practice lies at an intersection of knowledge and self-efficacy (Cox and Simpson, 2016). Self-efficacy is defined within the Social Cognitive Theory (SCT) as one's own belief in one's capability to achieve success in a specific context (Schunk, 2011). The level of a task-related self-efficacy influences an individual's performance in relation to that task, and persistence in the face of challenges, as demonstrated previously across various settings (Schunk, 1985; Bandura, 1993; Pajares, 1996), including healthcare (Tresolini *et al.*, 1994; Carson *et al.*, 2002; Paloncy, Georges and Liggett, 2019). The SCT indicates four general sources of self-efficacy: mastery experience/practice, vicarious experience/observation, verbal persuasion/feedback and physical/emotional arousal (Bandura, 1993). Their direct influence on levels of self-efficacy had been extensively researched across various populations and environments, with practice

demonstrated as a crucial facilitator of concussion-related self-efficacy (Postawa, O'Connor and Whyte, 2024; Postawa, Whyte and O'Connor, 2024). The multidirectional nature of human-environment relationship is the fundament of SCT, graphically represented by the triadic reciprocal determinism (TRD) model. It indicates three distinct groups of factors (personal, behavioural and environmental) that influence each other throughout each individual's life (Bandura, 1989). Self-efficacy is one of the personal factors within the TRD model (Bandura, 1993), and in the context of concussion-care, clinicians' self-efficacy might impact their clinical practice (Postawa, O'Connor and Whyte, 2024).

Self-efficacy is a dynamic attribute (Cox and Simpson, 2016), and in the context of clinical skills, its foundation develops during professional education (Abusubhiah *et al.*, 2023). Previous research suggests that clinicians' self-efficacy in concussion-care develops throughout their undergraduate/postgraduate education and influences their clinical practice regarding concussion (Postawa *et al.*, 2025). Early exposure to concussion, hands-on practice with real-life patients, experienced educator's feedback and a supportive environment were some aspects of the educational environment listed as key for developing optimum self-efficacy. Interestingly, clinician's personal attributes modified those environmental influences throughout their professional education and clinical practice (Postawa *et al.*, 2025), which demonstrates the inextricable connection between human and the environment (TRD model) (Bandura, 1989), in a context of healthcare education and practice. In Ireland, the medical care in sport is commonly provided by certified athletic therapists (Postawa, O'Connor and Whyte, 2024), allied healthcare professionals specialised in assessment, treatment and rehabilitation of neuromusculoskeletal injuries and sport-related trauma, including concussion (Bacon, Kay and Mcleod, 2017; Lempke, Schmidt and Lynall, 2020; Lempke *et al.*, 2023). Past research indicated a moderate overall level of self-efficacy in concussion assessment/management among Irish certified athletic therapists and chartered physiotherapists. However, skill-specific self-efficacy levels varied and correlated with their frequency of use (Postawa, O'Connor and Whyte, 2024), in line with findings from the American athletic trainers' cohort (Savage and Covassin, 2018). No other clinicians have been investigated globally.

To date, only one study explored concussion-related self-efficacy among healthcare students, utilising a cohort of final-year Irish athletic therapy (AT) students (Postawa, Whyte and O'Connor, 2024). Their self-efficacy levels, and their relationship with practice were in line with

those reported among clinicians (Savage and Covassin, 2018; Postawa, O'Connor and Whyte, 2024). The four general self-efficacy sources, modified to an academic context, were used to investigate the factors influencing self-efficacy during education. The impact of practice, physiological/emotional states while practicing, and influence of educators and peers were all deemed relevant (Postawa, O'Connor and Whyte, 2024; Postawa, Whyte and O'Connor, 2024), however the quantitative approach did not allow a deep-level exploration of students' perspectives. Considering the value of both personal and environmental factors in development of concussion-related self-efficacy among clinicians (Postawa *et al.*, 2025), and its possible positive impact on clinical practice, this study aimed to explore Irish AT students' perceptions of factors influencing their concussion-related self-efficacy, through the lens of TRD model and the general sources of self-efficacy.

7.2 Materials and Methods

7.2.1 Philosophical underpinnings

This study adopts a methodological approach rooted in the constructivist and interpretivist research paradigms. From an ontological perspective, constructivism recognises that individuals form their own understanding of reality through personal experiences and social interactions (Burns et al., 2022). Reality is seen as multiple and subjective, requiring in-depth exploration of how individual experiences shape attitudes and beliefs (Kouam, 2024). Epistemologically, interpretivism highlights the central role of meaning-making in the construction of knowledge. It focuses on individuals' subjective interpretations of their experiences and emphasises the importance of contextual factors in shaping these interpretations (Pervin & Mokhtar, 2022). In terms of axiology, the researchers were guided by a respect for the diversity of human challenges, needs, and belief systems. A reflexive approach was adopted to maintain openness to participants' viewpoints and to critically reflect on the researchers' own potential biases (Fook, 1999). This reflexivity is consistent with the principles of the constructivist paradigm (Kouam, 2024).

7.2.2 Study design

Our study used an interpretative phenomenological approach, which facilitates exploration of participants' lived experiences and perspectives in a context of specific phenomenon (Smith and Osborn, 2015). Considering our goal of investigating students' views on factors influencing their

self-efficacy development and understanding the relationships between their unique personal and environmental factors, this approach was deemed the most appropriate. Data were collected through semi-structured focus groups comprising students enrolled in athletic therapy programmes at the same educational institutions. This format facilitated open, in-depth discussions of students' shared experiences in the context of concussion-related self-efficacy development. One of its key features is flexibility throughout the discussion, that allows the interviewer to follow participants as they diverge from the main question into spaces that are important for them, personally (Dejonckheere and Vaughn, 2019). Focus group discussions facilitate exploration of collective perspectives and experiences, while allowing to illuminate inconsistency and disagreement (Gill and Baillie, 2018). Our research aimed at exploring differences between participants' perspectives and understanding why individuals studying in the same educational environment may develop different levels of self-efficacy, hence facilitating discussion between participants was deemed crucial. Considering the overall goal of this doctoral research and its link with the SCT, a fully inductive approach to data analysis was not appropriate. Therefore, reflexive thematic analysis (RTA) (Braun and Clarke, 2021) was deemed more appropriate than interpretative phenomenological analysis (Ramanadhan *et al.*, 2021). The research team consisted of five athletic therapy educators holding professional qualifications (chartered physiotherapist and/or certified athletic therapist). All researchers had experience in clinical work with athletes in Ireland and had previously undertaken concussion-related and/or sports medicine research.

7.2.3 Participants

A purposive sample of 20 Irish final-year athletic therapy students [females (n=15), males (n=5)] was recruited via emails sent to the chairs of the three undergraduate athletic therapy programmes, accredited by Athletic Rehabilitation Therapy Ireland. In total, 98 students were eligible to participate across the three educational institutions. Participants self-selected their focus group partners to create a safe space for discussion and to facilitate honesty of responses. In total, eight focus groups (2-4 students in each group) were conducted in January and February 2024.

7.2.4 Semi-structured focus group guide

The focus group guide, consisting of two separate sections, was developed by the authors. Considering the study aim, section one explored participants' views on the influence of (1)

environment, (2) personal characteristics and (3) past experiences on development of concussion-related self-efficacy. These questions were included to facilitate the understanding of participant-specific interactions between these factors, as suggested by TRD model (Bandura, 1989). Section two explored participants' perceptions on the importance of (1) practice, (2) observation, (3) verbal persuasion/feedback and (4) emotional/physiological body responses, in development of their self-efficacy. These questions aimed at exploring in-depth, personal views on the value of each of the four general self-efficacy sources (Bandura, 1977). Open ended general and supporting questions were included in each section (Appendix F).

7.2.5 Procedures

The study procedures were approved by the Dublin City University Research Ethics Committee (DCUREC/2023/195). A pilot focus group of three participants was conducted to examine the effectiveness of the interview guide and to facilitate training of the primary researcher in moderating discussion, obtaining and analysing qualitative data. The results from the pilot discussion were not included in the analysis. All participants provided informed consent prior to participation. All focus groups were conducted online, video-recorded and auto-transcribed via MS Teams/Zoom. To ensure data integrity, the primary investigator conducted all the discussions and reviewed all transcripts.

7.2.6 Analysis and trustworthiness

Transcripts were uploaded to NVivo 14 (QSR International) and the reflexive thematic analysis (RTA) was completed, consisting of (1) data familiarisation, (2) codes generation, (3) sub-themes/themes generation, (4) sub-themes/themes revision, (5) subthemes/themes defining and naming, and (6) reporting findings (Byrne, 2022). Over the several weeks of data analysis the primary investigator achieved a deep understanding of participants perspectives and the complexity of self-efficacy development process. A 'critical friend' approach facilitated rigour of analysis (Balthasar, 2011). An independent evaluator experienced in qualitative research analysed a sample of transcripts and contributed to all other stages of RTA, by reviewing and challenging the primary researcher's interpretation. Trustworthiness was enhanced by continuous self-reflection, bias-recognition and open-minded attitude of the primary researcher, constituting persistent observation (Sirwan, 2024). To delve deep into participants' perceptions and facilitate their reflection, the key

topics were revisited during the discussion, resembling a spiral approach utilised in education (Harden and Stamper, 1999) and qualitative research (Mao *et al.*, 2016; Pagliarin, La Mendola and Vis, 2023). This report aligns with the Standards for Reporting Qualitative Research (O'Brien *et al.*, 2014).

7.3 Results

Three overarching themes were identified representing the importance of the academic setting, clinical placement and student's personal characteristics during professional education. Respondents elaborated on the contribution of each of these factors to the process of shaping their concussion-related self-efficacy. Each of the themes/subthemes is distinctly associated with the TRD model and the general self-efficacy sources (Figure 7.1). The details of themes/sub-themes are presented in Appendix G.
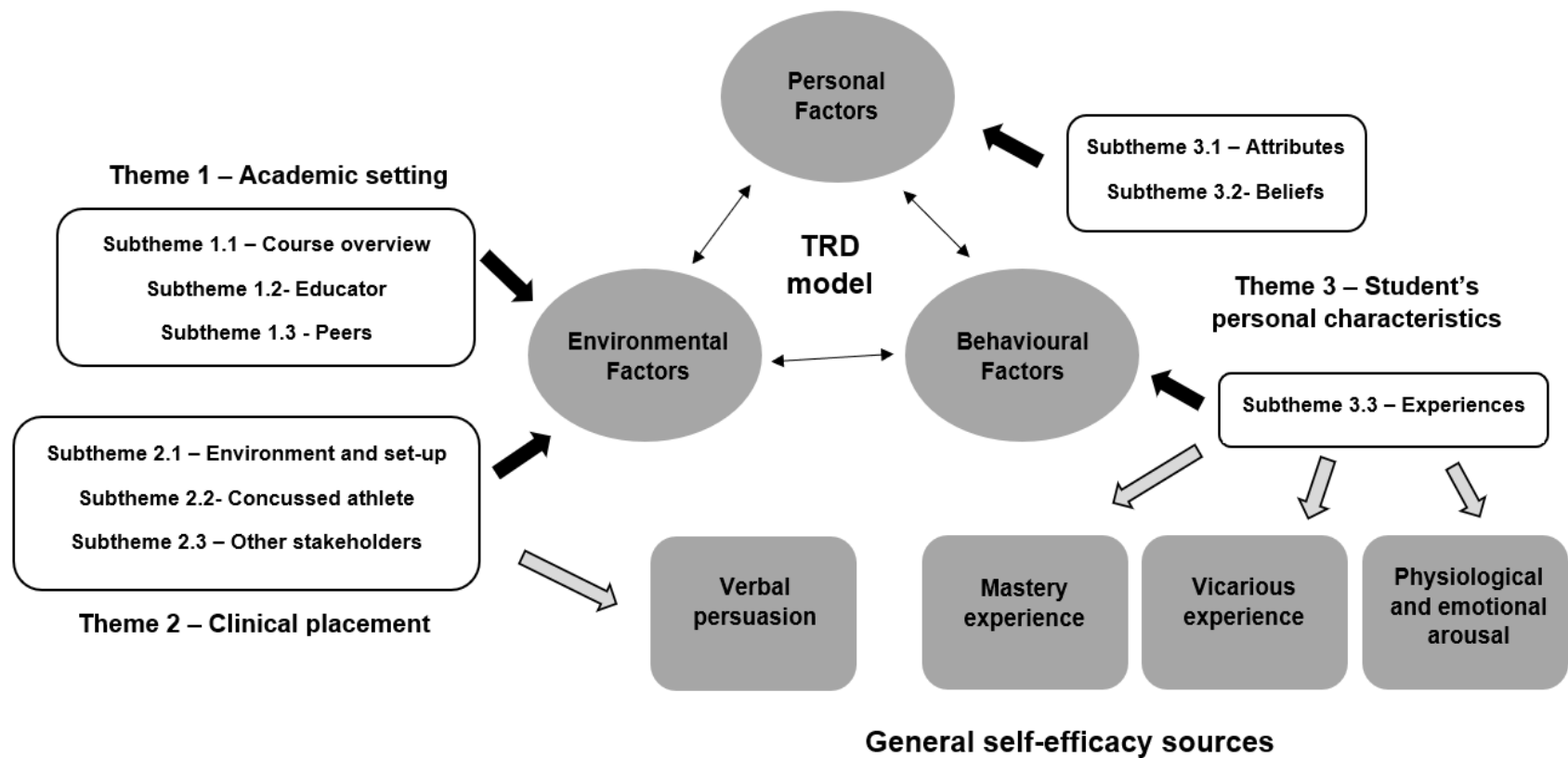
Figure 7.1 Themes and subthemes derived from the athletic therapy students' data matched with elements of the triadic reciprocal determinism model and the general sources of self-efficacy

7.3.1 Theme 1: Academic setting-related factors

All participants discussed the importance of developing fundamental concussion-related knowledge and skills, in a controlled, educational environment. Three subthemes were identified within this theme, (1) course overview, (2) educator and (3) peers.

7.3.1.1 Course overview

The content of concussion-related syllabus is the primary factor that shapes students' understanding of concussion and their attitudes and beliefs regarding provision of optimal concussion-care. The breadth and depth of provided education is highly important for developing self-efficacy.

Having explained in detail all tests, how to do them, what's expected from the player, likelihood of concussion happening, which sports they're more prevalent in, or the outcomes in short and long term. All this is essential, if you're gonna work in sport. I can't imagine confidently dealing with a head injury, if I hadn't gotten that education. (FG6S1)

Some of the participants highlighted that the general academic workload limited their ability to dedicate the sufficient time to concussion-related learning. The other crucial elements of education are implementation of a variety of teaching methods, hands-on learning opportunities with real-time feedback, a step-by-step progression of difficulty during the practical sessions and inclusion of complex patient-cases. Several suggestions were made regarding extension of time dedicated to concussion curriculum, and implementation of recurrent concussion-training sessions throughout the programme of education. Moreover, an opportunity to interact with a concussed patient in the early stages of learning was considered invaluable by the majority of participants, along with imitating the chaos of the sporting environment within the classroom.

I know it's really hard to replicate a real-life scenario in the classroom, but I would have loved to have done something like that. The patient is on the ground and you need to go over to them and assess them that way, not just be sitting in a chair right beside someone reading off a sheet. You could then even have another student being like, what's wrong with him? Is he OK? Can he come

back out? Because a lot of the time, that's what the scenario is like on a pitch. It would be good to make it as stressful as possible, because it is quite daunting when you are out on the pitch. (FG3S1)

Use of background noise, limited delivery time, pressure of being observed by peers were other examples listed as supportive in gaining self-efficacy to deliver concussion-care in a real-life environment. The transition could also be facilitated by providing an opportunity to experience a sporting environment without the responsibility of patient care, and familiarise the student with duties of a medical team and concussion-related procedures, that might vary between sports.

I remember that the first match we covered in college, we were so nervous running on because we didn't really know what we were doing. We were never actually told what you do when someone goes down, especially for the different sports. The main sport that I covered on placement was soccer and initially I did not know that the referee had to actually call you on the pitch. You're only allowed to overrule the referee if you think there's a serious head injury. If the managers had not told me that, I probably would have run without being called on. Every sport is different, so knowing what you are expected to do is crucial. (FG1S3)

Lack of preparation for interacting with team managers and coaches who undermine their clinical decisions was indicated by the majority of participants. The loss of self-efficacy resulting from these interactions could be minimised by provision of student mentoring and emotional support prior to and throughout the placement. Participants acknowledged the importance of raising students' awareness regarding the interpersonal relations' dynamics within a team-sport environment, preparing them to deal with challenging confrontations and fostering their general resilience. Moreover, concussion-specific clinical pearls and guidance on managing uncertainty regarding diagnosis were suggested as supportive in gaining self-efficacy in concussion-related patient care.

7.3.1.2 Educator

The central role of educators in the development of student's self-efficacy was discussed by the majority of our participants. Clear and informative demonstrations facilitate role-modelling and confidence to practise, particularly if delivered by an educator with extensive concussion-related professional experience and knowledge. Provision of constructive feedback that indicates strengths and inaccuracies can increase self-efficacy through improved understanding of how to refine the performance. This can be facilitated by a timely provision of clues and tips. However, the wording of feedback can impact students' interpretation of the delivered information, and affect self-efficacy. All participants indicated that a negative feedback provided in front of peers, may not only lower a student's self-efficacy, but also take their focus away from the feedback's key message. Thus, instead of facilitating learning and self-efficacy, it may lead to dwelling over failure and its impact on a student's social status. Interestingly, positive feedback delivered in a group setting may have a similar, negative effect, as discussed by one participant.

Receiving good feedback in front of the class would make me feel really conscious. I wouldn't want people thinking, oh, look at her, she thinks she's really good. I just hate receiving feedback in front of people, unless it's simple well done. I know it should boost your confidence, but for me that knocks the confidence. I go into my little introvert-shell and dwell on people judging me for being good at what I do. It would be different if it was in front of strangers, I would be happy for them to think I'm unreal. But not in front of people in my class. (FG4S1)

Although some participants admitted to gaining self-efficacy after receiving good feedback in a group setting, a one-on-one situation was acknowledged as ideal by all participants. Of note, trust and a good relationship with educators and peers can mediate the negative impact of poorly delivered feedback.

7.3.1.3 Peers

Peers within the academic environment were discussed by all participants. Peer observation leads to forming an opinion regarding a student's own ability, which can notably increase or decrease self-efficacy, depending on the quality of the peer performance and student's personal characteristics.

I think if I saw a peer doing something better than me, I would lose confidence. Just because we've had the same time to practice it. So, if I look at them, and they're miles ahead, my confidence would drop. It is probably because I put a lot of pressure on myself, and I compare myself to peers quite a lot. So, if I felt I wasn't up to scratch with a standard of something, my confidence would be really low. And I would doubt myself in all the aspects of the course, not just what we're doing at that moment. (FG7S1)

Interestingly, observation of peer-performance with conscious withdrawal from social comparison, always positively impacts self-efficacy, as indicated by several participants. Observation of a good peer-performance can also increase a student's self-efficacy by enhancing their trust in the quality of received education.

I think that when people who have gone through the same education as you are confidently diagnosing concussions and getting it right, that would give you confidence in yourself too. You would be like, okay, I've learned exactly what they've done learned, I'm in the same spot, I'll be ok. (FG6S1)

In- and out-of-classroom practice requires a physical peer-support, hence it facilitates self-efficacy in practical skills. Peers also serve as a source of feedback and reassurance. Their academic ability and relationship with the student moderate the effect on self-efficacy. Importantly, all participants considered peer-feedback inferior to educator's feedback.

7.3.2 Theme 2: Placement-related factors

The importance of placement was evident across all focus group discussions, and three subthemes (1) environment and set-up, (2) concussed athlete and (3) other stakeholders were identified within this theme.

7.3.2.1 Environment and set-up

The type of sport and level of competition the student experiences during clinical placement, determines the frequency of concussion exposures, type of concussion-related protocol and general concussion awareness and attitudes within that environment. The majority of participants indicated that working in rugby leads to an intense exposure to concussion, which initially is challenging. However, the clear and detailed protocol implemented within this sport nationally facilitates their self-efficacy, by providing guidance at each step of the assessment/management process and taking the decision-making responsibility away from the student. Of note, since the protocol mandates removal from play in all cases of head injury, some athletes may be reluctant to undergo the assessment, which can affect student's self-efficacy in provision of good level patient care, as indicated by one participant. This self-efficacy is also affected by the lack of uniform concussion approach across other sports in Ireland. As indicated by several participants, it may lead to students questioning their own decision-making, particularly when dealing with lack of athlete-cooperation and poor coach/manager's support. A couple of participants suggested that an introduction of a standardised approach that students are to follow when working in environments with no nationally standardised protocols, would facilitate their decision-making self-efficacy. This could be further enhanced by provision of a visual tool summarising the steps of concussion assessment/management and decision-making process, that could be shared with the team.

Having a clear protocol is very important. It gives you a clear yes or no to follow, and it takes a little bit of the pressure off yourself in situations where you're not 100% sure, especially with athletes who want to go back to play. Being the person to say, sorry you cannot play is very hard, but a protocol changes how confident you are in diagnosing concussion. And you can explain to

142

the athlete: the protocol says clearly, you cannot play. We have this step, this step and this step,
and we're going to get you back to play, but have a timeline and guidelines for this. (FG6S1)

Among other sport type/level related factors negatively influencing self-efficacy, was the responsibility to decide when to intervene without being called by the referee in soccer, and lack of athlete baseline-testing across lower-level sports. The lack of a private space for patient assessment, presence of crowds and team members actively interested in the evaluation outcome were the common challenges of a pitch-side environment that increase student's perceived pressure and negatively impact their self-efficacy. Moreover, the chaos and noise of a pitch-side environment or a busy changing room, does not support students in sustaining mental clarity needed to deal with concussion. A similar negative impact was facing multiple injuries in a short space of time, especially in case of the high-stake games. The degree of concussion-related responsibilities influences the type of skills students get to practice, while frequency of contact with the team dictates which stages of post-concussion management they are exposed to.

7.3.2.2 Concussed athlete

The cooperation of concussed athletes and their willingness to accept the diagnosis are important factors influencing students' self-efficacy. Several participants indicated that female athletes displayed better attitudes during concussion evaluations and trust in clinical decisions, facilitating development of students' self-efficacy. According to some participants, the lack of authority and consequently poor attitudes of some athletes were linked with the female sex of the student-therapists and the fact they were not yet graduated professionals.

It's a male environment and they don't trust females, our knowledge and everything. So, when you
have to do something they don't agree with, you feel like you're being judged even more than you
already are, as a student. My confidence goes down because I feel like I'm giving in to them,
whereas I should be more authoritative. But it's hard when you're the only female there, they can
very easily just bully you into things. (FG4S3)

One participant, exposed to adolescent athletes, indicated that they struggle with description of symptoms, which negatively impacts concussion evaluation and student's self-efficacy. The type

of event was also a factor influencing athletes' cooperation level, with training/practice and low-level matches increasing the likelihood of a good attitude. Most participants acknowledged the importance of athletes' high-level concussion-related knowledge for better cooperation. However, it may also facilitate them avoiding a concussion-diagnosis, as indicated by one participant. The athlete's attitude to concussion plays a key role here.

It is a double-edged sword. An educated athlete knows how to verbalise that they are concussed, but they also know how to verbalise that they're not. If they don't want to show concussion, they will not admit certain symptoms or purposely do worse during baseline testing. Realising that impacts your confidence. (FG5S2)

The value of good rapport was discussed by all participants. Familiarity with concussed athlete's personality and behaviours facilitates recognition of concussion symptoms, while strong emotional connection increases self-efficacy during concussion-assessments. However, a close relationship with concussed athletes might also be a barrier to confident decision making and removal from play, as discussed by some participants. This links with athlete's appreciation being one of the factors positively influencing student's self-efficacy. Although a close relationship allows more opportunities for athletes to display their appreciation, it also facilitates verbalising a disapproval of a student's clinical decision, which affects their self-efficacy.

7.3.2.3 Other stakeholders

Other stakeholders within the placement environment also influence student's self-efficacy development. The coach's support during concussion assessment is invaluable, especially when dealing with an athlete's lack of cooperation. The majority of participants discussed situations where the coach undermined their clinical decision, leading to a decrease in their self-efficacy.

I think I'm more confident now than when I started placement, but still when a big man is screaming at you to keep their player on the pitch it's daunting. I think I'd stand my ground, but inside I'm like, oh my God. (FG1S2)

The use of derogatory language not only directly affects student's self-efficacy, but also negatively impacts their perception of authority and trust among the athletes. This is another barrier to the development of self-efficacy, particularly in placements with no direct clinical supervision. The role of a placement supervisor in fostering the growth of professional confidence was discussed by several participants. By normalising student's feelings of uncertainty, reassuring them regarding their abilities, and facilitating real-life learning opportunities, they can positively influence development of students' concussion-related self-efficacy. Of note, a perception of being judged by an experienced clinician can negatively influence self-efficacy. The presence of peers within the placement environment facilitates the informal learning from each other's experience and allows shared decision making, both having a positive influence on self-efficacy.

7.3.3 Theme 3: Student's personal characteristics-related factors

Students' personal attributes, beliefs and experiences were discussed by all participants. A good level of overall confidence was indicated as crucial. *Your general confidence affects how you act as a clinician. You're not going to be highly confident in your concussion assessment if you are a low-confidence person. (FG5S1)* Mental health and resilience were also recognised as key to face the challenges of the academic and placement environments, and develop concussion-related self-efficacy. As acknowledged by all participants, stress is an inseparable element of educational experiences. A high-level of self-awareness and implementation of productive coping mechanisms, like positive self-talk or thoughts aimed at normalising stress during concussion encounters, allow students to self-regulate and develop higher self-efficacy. Interpretation of stress as an indicator of poor competence was considered a barrier to breaking the stress cycle, and decreased self-efficacy. In contrast, considering stress as a sign of care for the athlete and engagement in the role of student-therapist had a positive effect. Students' self-efficacy was also supported by utilising the understanding of physiological 'fight or flight' reactions to rationalise their body responses. A post-performance reflection involving realisation of success despite stress was a strong self-efficacy facilitator. Most participants identified reflection and its potential to either increase or decrease self-efficacy post-performance. Reflective practice that focuses on the positive aspects and perceives mistakes as opportunities for learning facilitates growth of self-efficacy.

You need to reflect on what you did wrong and it helps confidence because you're aware of the mistakes you made, and you know not to make those mistakes again. You're more cautious about it, and over time you get into a routine, and your confidence grows. (FG2S3)

However, it requires an appropriate mindset and trust in the learning process. Overthinking and dwelling on inaccuracies of the performance, has a strong negative effect on self-efficacy. Of note, one participant highlighted hormone-related mood fluctuations in females as a potential barrier to productive reflection. Several participants discussed their proactive nature as helpful in overcoming challenges and facilitating high self-efficacy development. Pre-match preparation of resources, use of checklists, revision of protocols and active distancing from environmental pressures decrease level of stress and facilitate productive coping. An informal concussion-related education of team members was utilised to assure their cooperation in case of concussion.

Have a conversation with them, this is what I'm going to do if concussion happens. I'm going to have to say they can't play, for everyone's benefit. It doesn't matter if it's a championship match, if it's the star player. You need to lay those boundaries. And when the time comes and they're saying, it's only a little bang, you can say, no, we've had that conversation. (FG6S1)

Moreover, engaging in work with a variety of populations and sports was a way of gaining a sense of preparedness. Self-related beliefs, regarding the level of knowledge and preparedness, as well as the responsibilities of the student-therapist are important factors influencing self-efficacy, as indicated by the majority of participants. The belief of responsibility for the athlete's health and safety facilitates students' self-efficacy during challenging confrontations that may follow a decision of removal from play. High self-efficacy is also supported by a belief that perfection is not expected from a student-therapist. Of note, the awareness of limited concussion-related knowledge among the team members further facilitates it, as students do not feel evaluated on their performance. The awareness of symptom variability and subjectivity negatively impacts students' self-efficacy in clinical decision-making, as discussed by several participants. Although the awareness of concussion adverse effects can further affect it, some students use it as a source of self-efficacy to strictly follow the protocol and remove from play in case of any uncertainty.

Students' past experiences were one of the key self-efficacy-influencing factors discussed by all participants. The initial exposure to concussion-related skills in a controlled classroom environment facilitates development of base-level self-efficacy, through repetitive practice. Progression to performance in real-life situations is an essential next step, hence exposure to concussion during placements across a variety of clinical- and sport-environments, and practical application of the previously learnt skills facilitated development of students' self-efficacy. Of note, the quality of performance was crucial during those exposures, while misdiagnosis was indicated as the strongest self-efficacy inhibiting factor. The presence of unexpected events while delivering concussion-care was also highlighted as decreasing self-efficacy. *When something unexpected happens, something you haven't seen before, your confidence goes straight back to the start and then you're slowly building it back up again. (FG7S1)* As acknowledged by several participants, sporting background was a factor that facilitated self-efficacy development, through familiarity with a pitch-side environment and team dynamics, increased resilience to pressure and personal concussion history.

7.4 Discussion

This study aimed to explore the Irish athletic therapy students' perceptions of factors impacting their concussion-related self-efficacy, through the lens of the TRD model and general self-efficacy sources. The three groups of factors indicated were academic environment, placement environment and students' personal characteristics, and all linked with the four general self-efficacy sources (Bandura, 1997). Mastery experience, considered the strongest of the four (Schunk, 1985), is a personal experience of success in dealing with concussion. When present, it is individually experienced by all students and influenced by their personal characteristics. it occurs in the academic and placement environments where it is influenced by a multitude of environment-related factors. Similarly, the vicarious experience (Bandura, 1997) of observing others dealing with concussion and the verbal persuasion (Bandura, 1997) regarding student's own concussion-related performance are individually experienced and interpreted. Despite being facilitated by the stakeholders within academic and placement environments, the impact of these experiences on student's self-efficacy depends on their individual beliefs and other attributes. The influence of the physiological/emotional arousal during concussion-care, the last of self-efficacy sources (Bandura, 1997), also significantly depends on the student's personal interpretation of the experience.

147

However, the environment and its stakeholders linked with the experience may influence student's viewpoint, and subsequently their self-efficacy. The interconnectedness of these three groups of factors portrays the complexity of interactions between humans and their environment, represented by the TRD model (Bandura, 1989). Our findings demonstrate that these complex influences are relevant to development of student's concussion-related self-efficacy throughout their education. Consequently, provision of opportunities to observe other's performance, successfully practice and receive feedback is crucial, and the stakeholders of the educational environments can modify the impact of those experiences on students' self-efficacy. However, their final effect will depend on students' individual attributes.

Self-efficacy is preceded by the development of capability to complete the required task (Bandura, 1997). In relation to concussion, the content of curriculum dictates the breadth and depth of knowledge and skills the students are exposed to. The teaching methods implemented throughout education are crucial, as indicated by participants and supported by literature (Al Attar and Husain, 2021). The foundation of self-efficacy in concussion assessment and management skills develops in the controlled classroom environment, which facilitates role modelling and practice under supervision, with timely delivered feedback, as acknowledged by our participants. All of those factors were indicated as positively influencing self-efficacy in concussion-related skills (Postawa, O'Connor and Whyte, 2024; Postawa, Whyte and O'Connor, 2024). Since the experience of a successful task completion is the strongest source of self-efficacy (Schunk, 1985), it is clear why our participants initially appreciated the learning environment that facilitated success. However, they also acknowledged that the clinical/sport placement environments differ from the classroom. Hence the difficulty of practice has to progress in order for them to have a high self-efficacy to perform in those environments. This supports the desirable difficulties approach in that the difficulty level of learning conditions should be perceived as effortful by the learner, however it must be appropriate and need constant adjustment to enhance performance and increase the chances of successful transfer to other contexts (de Bruin *et al.*, 2023). This might explain the decrease of self-efficacy after a direct progression from classroom into placement environment or in the case of other unexpected events. Ultimately, successful delivery of concussion-related patient care in a sporting environment is essential, however perceptions of success differ among individuals (Karabanova and Bukhalenkova, 2016). Success can be interpreted as a recognition of abilities by the environment or "authoritative others" (Karabanova and Bukhalenkova, 2016), which explains

why a team's attitude and level of support influence students, and how the presence of a placement supervisor can moderate that impact. When direct supervision does not occur, robust concussion-care guidelines, and students' clarity regarding their responsibilities facilitates awareness of the achieved success. Considering the authority issues indicated by several female participants and the level of gender bias in sports medicine (Tsukahara *et al.*, 2022), female students may require additional support. Same-gender mentoring was shown to facilitate female clinicians' decision to enter male-dominated specialisation fields (Whitaker *et al.*, 2023).

The interactions with the environment's stakeholders are an inseparable part of student's concussion-related experiences, hence their impact on self-efficacy is substantial. The multifactorial influence of the educator as a role model, facilitator of practice and feedback provider was previously described in the context of concussion assessment and management self-efficacy (Postawa, O'Connor and Whyte, 2024; Postawa, Whyte and O'Connor, 2024). Our findings allow a deeper understanding of the environment- and stakeholder-related modifiers of those impacts. Literature indicates that feedback provided by a "significant other", a person held in high regard, is more influential (Schunk, 2011). This explains why the educator's professional profile, peer's academic ability and quality of relationship with both were relevant for our participants. An observation of "similar other's" performance is considered a particularly valuable vicarious experience, that positively impacts self-efficacy when observing success and negatively impacts it when observing failure (Schunk, 1985). Although peer observation was viewed as critical, the trajectory of its impact on self-efficacy differed among participants. Observation of peer-success generally facilitated self-efficacy, however when it led to realisation of past inaccuracies, the impact varied. A self-efficacy increase was observed among students who consciously decided to perceive it as an opportunity for improvement, while a decrease occurred in those with a tendency to dwell on past mistakes. This is in line with the mindset theory, which suggests that a belief in development through practice and perseverance in face of setbacks positively influences academic performance and resilience (Karabanova and Bukhalenkova, 2016). However, this view has been considered controversial, as emphasised in the more recent research (Yeager and Dweck, 2020; Macnamara and Burgoyne, 2023). Since performance evaluation within academic environments is commonly based on social comparison (Tao *et al.*, 2022), a decrease of self-efficacy among certain participants reiterates the value of individual characteristics and the importance of students' personal development.

The perception of pressure and ability to perform under pressure differ among individuals and link with personality traits (Bosch, Wilbert and Marsh, 2023; Bapayeva *et al.*, 2024). This may explain the variability of self-efficacy level-changes in exposure to chaos and ambiguity, challenging interactions or performance in group situations. Increased resilience to those factors observed among participants with past sporting background is in line with literature, that suggests the ability to withstand and/or adapt to adversities is a functional necessity for success in sport (Dong *et al.*, 2022). The impact of resilience and grit on healthcare students' coping with placement pressures is supported by past research (Gupta and McCarthy, 2022). The most significant negative impact on our participants' self-efficacy was an experience of misdiagnosis, in line with past research (Postawa, O'Connor and Whyte, 2024; Postawa, Whyte and O'Connor, 2024). However, the long-term self-efficacy decrease was prevented by productive reflection among certain participants. Adverse events commonly affect self-efficacy, however personal and contextual factors can modify this impact (Calo *et al.*, 2019). Reflection is considered crucial for learning (Zhai *et al.*, 2023), and ideally is followed by goal-setting (Anseel, Lievens and Schollaert, 2009), which might explain how participants used it to sustain self-efficacy. To minimise pressure and assure self-efficacy development some participants demonstrated proactive behaviours, recognised in literature as personality-dependent strategies for enhancing performance (Schmitt and Weigelt, 2023). Feeling prepared increases confidence (Carroll *et al.*, 2020), which might explain why participants' proactive behaviours aimed at ensuring preparedness. The strategies utilised for coping also depend on personality (Zhang *et al.*, 2023) and emotional intelligence, defined as the ability to sense, assess and control emotions (Bapayeva *et al.*, 2024). Hence the variability of self-efficacy changes in response to demands of academic and placement environments among our participants can be attributed to differences in their personal characteristics.

Our study demonstrated that the general self-efficacy sources are relevant in the context of influencing concussion-related self-efficacy among healthcare students. Importantly, the educational environment and students' personal characteristics can modify that impact. Consequently, ensuring educational environments that support self-efficacy development, and emphasise the value of students' personal development might lead to enhanced concussion-related patient care. Some limitations of the study related to transferability of (1) environmental impacts, due to differences in education model internationally and inter-professionally; (2) personal impacts due to sociocultural differences. Future research should explore the barriers and facilitators to

providing educational environments that support the development of students' self-efficacy. Exploration at the faculty, institutional, and policy levels is warranted to inform the design of effective future interventions.

7.5 Conclusion

The period of professional education is crucial for the development of concussion-related self-efficacy. All stakeholders within the learning environment have an active role in this process, including the students themselves. Personal factors like emotional intelligence and resilience can modify potential negative environmental impacts, hence they might be the key to assuring high-level self-efficacy, regardless of the environmental barriers.

Chapter 8: Recommendations for educational practice

The research presented in this thesis, which investigated the development of self-efficacy in concussion assessment and management, identified a range of environmental and personal factors that influence this process. Consequently, its facilitation throughout professional education requires a multi-layered approach. This chapter presents a set of educational recommendations developed based on the findings of our research and the knowledge I gained through professional coaching certification. These recommendations were externally reviewed by four academic experts, each contributing unique disciplinary insights: (1) a concussion specialist in the field of athletic therapy provided guidance to ensure clinical and educational relevance of the content; (2) a researcher in metacognitive strategies offered input on optimising teaching and learning approaches; (3) a health psychologist with expertise in behaviour change reviewed the psychological underpinnings of the proposed strategies, and (4) a specialist in talent development contributed to the refinement of strategies aimed at supporting long-term skill acquisition and performance in clinical education. The exploration of concussion-related self-efficacy through the lens of four general self-efficacy sources (Bandura, 1997) demonstrated that although opportunities can be provided within the learning environment to promote development of students' self-efficacy, the outcomes of those experiences may vary (Chapter 6, theme 1, subtheme 1; Chapter 7, themes 1 and 2). Certain student-specific characteristics can negatively impact students' ability to benefit from the environment they are exposed to during professional education (Chapter 6, theme 2; Chapter 7, theme 3). Therefore, the provision of student-centred support that facilitates personal development is recommended to help equalise students' opportunities to develop high levels of self-efficacy (Figure 8.1).
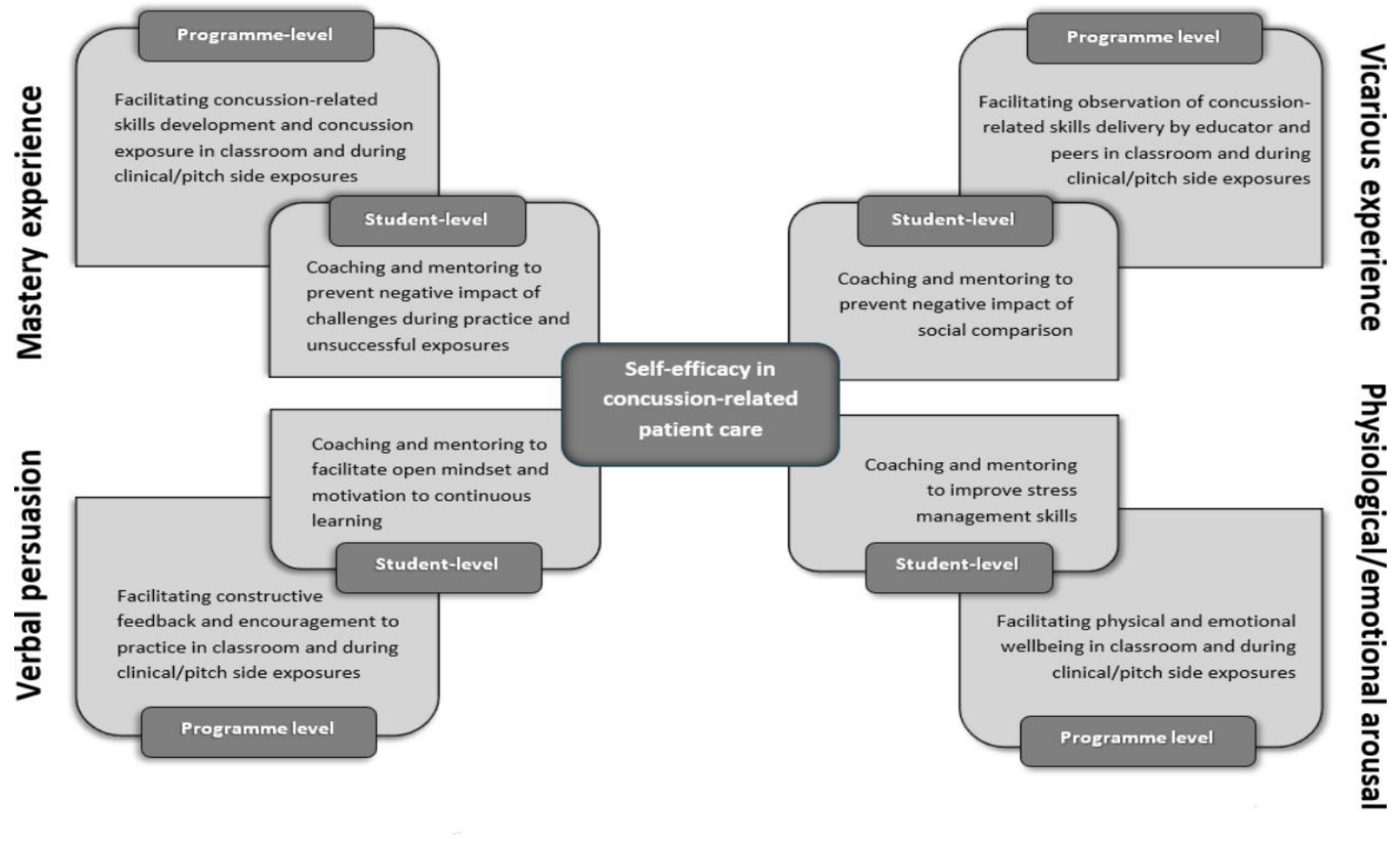
Figure 8.1 The programme-level and student-level actions that can facilitate development of concussion-related self-efficacy during professional education, mapped onto the four general self-efficacy sources

Therefore, the recommendations discussed below emphasise the importance of general, programme-level actions, complemented by student-specific adjustments, targeting personal-level student requirements (Table 8.1). The programme-level recommendations refer to (1) concussion-related curriculum, (2) teaching and learning methods, (3) educator-related aspects and (4) applied practice in a sporting environment, in line with the findings (Chapter 6, theme 1, subtheme 1; Chapter 7, themes 1 and 2). The individual-level recommendations target student-specific requirements for personal and professional growth (Chapter 6, theme 2; Chapter 7, theme 3). The value of a student-centred approach in healthcare education is evident across literature, particularly in relation to enhancing generic and healthcare-specific skills, student motivation and satisfaction (Metsälä and Törnroos, 2021). This research emphasises the importance of general confidence, emotional intelligence and resilience for success in concussion-related patient care. Past literature demonstrated the value of these attributes for healthcare practitioners' wellbeing, performance, job satisfaction and quality of relationships in the work environment (El Othman *et al.*, 2020; Sadiku *et al.*, 2022; Louwen, Reidlinger and Milne, 2023). Hence, we recommend promotion of student self-directed personal and professional growth, aiming at development of these attributes. We invite educators to encourage active student engagement in identification of their individual challenges and requirements for successful performance in academic and applied clinical and sporting environments. This can be achieved by promotion of self-coaching practice among the students (Fukuda, Sakata and Pope, 2019), as well as provision of professional coaching (Solms *et al.*, 2021) and mentoring support (Shi, 2018) as a part of their professional healthcare education. We recommend a progressive transfer of ownership and increased students' independence in the process of their personal and professional development, to facilitate successful transition to practice and readiness for lifelong learning.

8.1 Recommendations regarding concussion-related syllabus

Healthcare student's/practitioner's perception of their concussion-related knowledge and preparedness impacts their level of self-efficacy in concussion assessment and management. The belief that they received a quality concussion-related education is crucial (Chapter 6, theme 1, subtheme 1; Chapter 7, theme 1, subtheme 1.1). Hence, we recommend a provision of up-to-date, evidence-based information that will facilitate understanding of concussion, its clinical trajectories, short- and long-term consequences, and appropriate patient assessment, management and rehabilitation. An emphasis should be placed on building a student's awareness of the evolving nature of concussion-related patient care. Students should be encouraged to keep abreast of the latest consensus-statements on concussion in sport and the national sports governing bodies' policies regarding concussion.

8.2 Recommendations regarding teaching and learning methods

8.2.1 Programme-level

Experiencing success in assessment and management of concussion is essential for high-level self-efficacy (Chapter 6, theme 2, subtheme 4; Chapter 7, theme 3, subtheme 3.3), and it should be facilitated during the education process. Considering the complex nature of concussion, the multitude of techniques required for a comprehensive assessment, management and rehabilitation, and variety of environmental challenges within the academic, clinical and sporting settings, concussion teaching and learning should be a longitudinal, gradually evolving process (Chapter 6, theme 1, subtheme 1; Chapter 7, theme 1, subtheme 1.1). We recommend that students are encouraged to recognise their personal barriers to successful learning and seek support. In the early stages of learning, the educator demonstrates all critical skills, which is then followed by hands-on student practice and formative assessment supported through individual feedback in the form of constructive criticism. The initial role-modelling facilitates student's execution of the accurate skill delivery. The subsequent practice and formative assessment, reinforced with individualised feedback, allows experiential learning and critical self-reflection, and facilitates motivation for continuous growth. It is of utmost importance that students perceive feedback as a means for professional growth and not judgement of their abilities (Chapter 6, theme 2, subtheme

3; Chapter 7, theme 3, subthemes 3.1 and 3.2). Growth-mindset might facilitate productive coping with failures and fosters curiosity for life-long learning (Sahagun *et al.*, 2021). Therefore, educators should encourage students to actively work on achieving this mindset and offer support that they might need. To facilitate this process, as well as the process of personal challenges identification, we propose a newly developed SOAP Healthcare Excellence coaching model, based on the Rational Emotive Behavioural (REB) framework and its general ABCDE coaching model (see subsection 8.6). To foster students' independence in the process, we developed an easy to follow self-coaching tool, based on the principles of SOAP Healthcare Excellence coaching (see subsection 8.6). Once students develop self-efficacy for performance in a fully controlled academic environment, gradual progression of difficulty is recommended, in line with the desirable difficulties approach (de Bruin *et al.*, 2023). This can be achieved by facilitating practice under pressure (e.g. limited time, presence of audience or background noise), exposure to authentic, not book-perfect case studies and where possible, real-life patients. The use of simulation training would also be recommended, especially considering possible limitations in access to concussed patients within a clinical environment. Finally, we recommend familiarising students with the general and concussion-specific demands of sporting environments they will be exposed to during their applied placement, the provision of mentoring regarding practice-related pressures and challenges, and the value of productive reflection and resilience for professional growth.

8.2.2 Student-level

We invite educators to acknowledge the diversity of challenges that students face in general, and specifically regarding concussion-related patient care (Chapter 6, theme 2; Chapter 7, theme 3). At the early stages of skill development, individual-level demonstrations are recommended. Students should be encouraged to take advantage of those one-on-one learning opportunities, ask questions or seek other support. Although educators may attempt to accommodate students by delivering feedback in a way they find most helpful, recommending and facilitating mindset coaching may offer broader long-term benefits, including encouraging students to seek feedback and embrace reflective practice. While progressing the difficulty of concussion assessment and management practice, introducing authentic scenarios and real-life patients, as well as familiarising

students with placement environment and requirements, active student involvement in identifying their personal challenges is essential. Moreover, the next crucial step is partnering with the students in identification of ways to overcome these challenges. This can be achieved by promotion of self-coaching practice and increased students' self-awareness and productive coping through implementation of the SOAP Healthcare Excellence self-coaching tool. Provision of support in a form of individual mentoring and coaching would be also highly beneficial for developing students' belief in preparedness to undertake the applied sporting environment placement, and for their broader professional and personal growth.

8.3 Educator-related recommendations

8.3.1 Programme-level

The educator has a significant impact on the development of students' belief in their ability to succeed in the concussion-care context. Students' perception of quality and accuracy of their own knowledge partially stems from the professional profile of their educator. (Chapter 6, theme 1, subtheme 1; Chapter 7, theme 1, subtheme 1.2). It would be recommended that students have an opportunity to learn from educators experienced in concussion-related patient care or research. Moreover, the environment created within the classroom and quality of student-educator relationship are of high importance. Both impact students' physical and emotional wellbeing, and ability to learn and develop self-efficacy. Educators should acknowledge the value of their role in this process. We recommend maintaining a relaxed and supportive learning environment and facilitating students' trust by considerate communication. In addition, we invite educators to aid the process of growth mindset shaping by emphasising the value of peer-learning, while highlighting the dangers of social comparison, like negative self-perception and low self-esteem.

8.3.2 Student-level

We invite educators to take advantage of the direct contact they have with the students, to build individual-level relationships based on trust, open communication and respect (Chapter 6, theme 1, subtheme 1; Chapter 7, theme 1, subtheme 1.2). Considering the interpersonal differences among students, this can be facilitated by a use of verbal and non-verbal mirroring during one-on-one interactions (Peterson and Limbu, 2009). A good rapport with individual students would allow educators to encourage self-awareness and identification of students' personal wellbeing needs. This engagement and support might be especially important in the case of neurodivergent students (Aguilera Rodríguez *et al.*, 2024) and those with mental health issues (Bennett *et al.*, 2024). Increased self-awareness might also allow students to identify limiting beliefs that solidify their fixed mindset and affect their professional and personal growth (Maurer *et al.*, 2023; van Ede *et al.*, 2023). We recommend that educators promote the value of identifying those beliefs and overcoming them in a process of personal coaching and self-coaching, as well as availing of other student support services offered by the university.

8.4 Recommendations regarding applied practice in sporting environment

8.4.1 Programme-level

We recommend that over the course of professional education, students are exposed to a variety of sports and sport settings. The experience of working within set-ups varying in concussion incidence and concussion-related protocols, impacts students' perception of preparedness for delivering concussion care in any environment (Chapter 6, theme 1, subtheme 2; Chapter 7, theme 2, subtheme 2.1). Diversity of exposures would also facilitate interactions with athletes and other stakeholders differing in concussion-related attitudes and beliefs, allowing students to experience individual-level interpersonal challenges while assessing and managing concussion. Nevertheless, all team members and stakeholders involved in contact with the students should actively engage in ensuring a supportive environment and maintaining professional and respectful communication, to facilitate development of students' professional confidence (Chapter 6, theme 1, subtheme 2; Chapter 7, theme 2, subthemes 2.2 and 2.3). Among all social interactions within a sporting environment, those with placement supervisors play a key role for student learning and professional

confidence growth. It is crucial that placement supervisors share their professional knowledge, skills and experience in a considerate manner, aiming to motivate students toward continued learning and to positively influence their personal and professional growth. While we recommend that placement supervisors embrace the responsibility that lies upon them, as senior clinicians, and strive to ensure a quality relationship with the students, we acknowledge the challenges posed by their dual responsibility for patient care and student development. Therefore, we urge educational institutions to explore strategies that can support placement supervisors in fulfilling their important roles. To foster the development of students' belief in their ability to successfully provide concussion-related patient care, we recommend decreasing individual student's perceived pressure during the early stages of applied practice placement in a sporting environment (Chapter 7, theme 3, subtheme 3.2). This can be facilitated by the presence of peers and encouragement of peer support, shared decision-making and informal peer-learning. Progression to individual placements or shared placements in high concussion-incidence environments would be recommended at the later stages, to promote students' independence and individual decision-making.

8.4.2 Student-level

Sporting environment poses the greatest challenge for practicing concussion assessment and management skills. Students not only have to deliver a wide range of practical skills but also engage in critical decision-making and challenging interpersonal situations, under time constraints and with many environmental distractions. The perception of burden of those sport environment-specific stressors differs among students, depending on their personal characteristics, and previous sporting background (Chapter 7, theme 3). In order to develop high level self-efficacy, students need to experience success in dealing with concussion, however, achieving it in such a demanding real-life environment, may require overcoming challenges of a personal nature. We recommend that utilising coaching and mentoring support is promoted among students, as means of professional and personal development, and that this kind of support is provided by the educational institutions throughout the period of applied practice in sporting environment. Importantly, the benefits of these initiatives cannot be obtained without students welcoming and embracing these personalised development opportunities.

Table 8.1 The overview of programme-level and student-level actions that can facilitate development of concussion-related self-efficacy during professional education

	Programme-level		Student-level	
	Action	**Goal**	**Action**	**Goal**
Concussion-related syllabus	Inclusion of variety of concussion assessment and management tools	Student gains a belief that they are receiving quality education which impacts their perception of own concussion-related knowledge and preparedness	N/A	N/A
	Evidence-based learning, up to date with concussion consensus-statements			
Teaching and learning methods	Demonstration of concussion-related skills	Role-modelling and facilitating student's awareness of steps required for accurate completion of the task	Educator encourages the student to identify aspects requiring individual level demonstration and support	Addressing student-specific queries regarding delivery of the task and facilitating the development of self-reflective skills to provide the foundation for lifelong learning
	Hands-on learning with individual feedback in a form of constructive criticism	Student develops competence in a controlled environment, gains an understanding of how to improve their performance and is motivated to do so	Educator partners with the student to identify individual level requirements regarding feedback and encourages mindset coaching	Addressing student-specific needs to facilitate motivation to further practice; encouraging self-directed learning

Step-by-step progression of difficulty – in line with desirable difficulties approach	Gradual increase in effort needed to successfully complete the task, to finally mimic the real-life scenario	Educator and student collaborate to identify their individual challenges and supports them in overcoming them (coaching and mentoring)	Student gains awareness of their limitations and how to overcome them
Realistic scenarios	Experiencing concussion-related cases that are not book-perfect, exposure under pressure (background distractions, limited time)		
Exposure to sporting environment before starting placement	Familiarity with sporting environment, differences in placement-requirements and set-ups between sports	Educator partners with the student to identify key-learnings that they require from this exposure (e.g. familiarity with a specific sport or pressures of sporting environment)	Student gains a belief of preparedness to undertake the clinical placement or identifies potential challenges they require support with
Mentoring regarding student responsibilities, pressures, resilience and value of productive reflection	Student gains awareness of placement-related expectations and challenges that might be relevant to them personally	Individual coaching	Student develops an action plan to overcome their challenges

Educator-related aspects	Experience in concussion-related patient care	Student gains a belief in quality and accuracy of their concussion-related knowledge	N/A	N/A
	Relaxed and supportive environment	Promoting physical and emotional wellbeing during learning	Educator encourages the student to identify their individual-level wellbeing needs (especially in case of student's neurodiversity or mental health issues)	Supporting wellbeing of each individual student
	Considerate communication style	Facilitating trust and quality relationship with students	Use of mirroring during communication	Building good individual-level relationships and rapport
	Emphasising the value of peer-learning while highlighting the dangers of social comparison	Facilitating growth mindset	Individual coaching	Overcoming limiting beliefs that contribute to a fixed mindset
Applied practice in sporting environment	Exposure to variety of sports and sporting set-ups	Student experiences work in environments varying in concussion incidence, concussion-related protocols, and attitudes/beliefs among team members	Individual coaching and mentoring, if required	Student experiences success in concussion-related patient care and overcomes their personal challenges

	Shared placements for early-stage students	Facilitation of informal peer-learning in a real-life environment and decreased individual student pressure through shared decision-making and peer-support		
	Individual placements or shared placements in high concussion-incidence environments	Facilitation of individual exposure and decision-making		
	All stakeholders engaged in contacts with students should aim for ensuring supportive environment and respectful communication	Facilitation of professional confidence growth	Individual coaching in case of interpersonal conflict and personality clashes	Student identifies what supports them in maintaining professionalism and confidence in challenging relationship
	Placement supervisor should display qualities of a good educator and experienced clinician	Facilitation of real-life learning and professional confidence growth		

8.5 Coaching and mentoring in healthcare education

Coaching and mentoring are both described as goal-oriented, one-on-one interventions aiming at professional and personal development (Irby and Pashmforoosh, 2024). The value of mentoring has been recognised in healthcare education for some time now, and it has been successfully implemented in medical (Wu and Olagunju, 2024), nursing (Richardson *et al.*, 2023), physiotherapy (Baker, 2006), athletic therapy/training (Mazerolle, Nottingham and Barrett, 2018) and occupational therapy education settings (Schoen, Gee and Ochsenbein, 2021). Coaching, however, has only recently emerged as a promising approach to professional and personal development among healthcare professionals (Mukherjee, LaCross and Khalsa, 2024), and is slowly being introduced into medical (Mukherjee, LaCross and Khalsa, 2024) and nursing (Richardson *et al.*, 2023) education. The process of coaching is a self-regulatory cycle facilitated by a coach and guided by a coachee. The role of a coach is to ask questions that evoke the coachee's self-awareness, and in turn allow them to construct solutions to challenges and action steps to achieve goals, in line with their values and beliefs (Grant, 2016). Conversely, during mentoring, the mentor guides the process, facilitates learning and provides solutions, as the more experienced and knowledgeable individual (Irby and Pashmforoosh, 2024). In the context of concussion-related education, we recommend inclusion of both coaching and mentoring as means for professional and personal students' growth. The educators who currently teach on the programmes, as well as the placement supervisors, could become student mentors, as they already have professional knowledge and experience needed to guide the students. However, a certified coach is needed to facilitate the coaching process (Carden, Passmore and Jones, 2022), which might be one of the barriers to its implementation (Jansen *et al.*, 2024). In order to address this potential issue, we propose promotion of self-coaching practice among students. Self-coaching is defined as an inner dialogue aiming at solving problems and reaching goals (Fukuda, Sakata and Pope, 2019) and literature supports its use alongside individual coaching in a higher education environment (Losch *et al.*, 2016). The research that can guide development of coaching programmes within the healthcare environment is limited (Miller-Kuhlmann *et al.*, 2023). We provide a concrete framework for the promotion of coaching and self-coaching practice in a way familiar to healthcare professionals.

8.6 The proposed model of coaching in healthcare education

We propose enhancing educational practice by introducing a newly developed model of coaching, based on an evidence based Rational Emotive Behavioural (REB) approach, utilised in psychotherapy and coaching (Saulius and Malinauskas, 2023) and effective in enhancing performance, resilience and reducing stress (Palmer, 2009). The REB framework is based on the ABC model suggesting that cognitive, behavioural and emotional outputs (C) are not determined by the activating events (A), but the beliefs (B) held in relation to those events (Saulius and Malinauskas, 2023). Hence, certain beliefs can lead to emotional, physiological and behavioural outcomes that inhibit performance and goal-attainment. However, logical and pragmatic questioning of these limiting beliefs, has a potential to change them, and in turn lead to positive consequences. To facilitate this process, the ABC model was expanded into the ABCDE model of emotional management, resilience and performance in 1994. The additional components were disputation, logical questioning and restructuring of the limiting beliefs (D) and elimination of the old approach, and introduction of an alternative one (E) (Palmer, 2009). Emotional intelligence, stress management skills and resilience are among the personal characteristics impacting students' concussion-related self-efficacy, as indicated by our research. Hence, the ABCDE coaching model appears to be suitable for facilitation of professional and personal development in the healthcare education environment. In order to normalise the use of coaching among healthcare professionals and students (Silver *et al.*, 2024), positively influence their perception of coaching credibility and increase their self-efficacy in going through the coaching process (Reinhard, Scharmach and Sporer, 2012), we decided to develop a new model that healthcare students and professionals could identify with. Throughout the coaching/self-coaching process, the coachee is encouraged to critically analyse reality and their own beliefs, synthesize information and produce solutions (Grant, 2016), skills which healthcare students are trained to use in professional practice (Jay, Davenport and Patel, 2024). The Subjective, Objective, Assessment and Plan (SOAP) model is a commonly used approach to clinical documentation. It also serves as a cognitive framework for evaluation of findings and clinical reasoning (Lopes *et al.*, 2020). We propose expanding this further and utilising it as a familiar framework for coaching and self-coaching among healthcare professionals. Our newly developed SOAP Healthcare Excellence coaching model follows the REB approach (ABCDE model), while maintaining the structure of SOAP notes (Table 8.2).

Table 8.2 The overview of the SOAP Healthcare Excellence coaching model, including the links with SOAP note and REB approach

	SOAP NOTE (Lopes *et al.*, 2020)	SOAP HEALTHCARE EXCELLENCE COACHING MODEL	REB APPROACH (ABCDE MODEL) (Saulius and Malinauskas, 2023)
SUBJECTIVE (S)	Subjective data from a patient or a person close to them; includes experiences, personal views and feelings regarding presenting complaint, and a 0-10 VAS scale pain rating.	Superficial look at the challenge, its relevance and significance; description of the 'story' and its surrounding circumstances; overview of actions taken to date and an initial 0-10 VAS scale rating of perceived difficulty of the problem.	Overview of the activating event (A) and its cognitive, emotional and behavioural consequences (C)
OBJECTIVE (O)	The objective data from a patient encounter; consists of findings from a range of assessments performed by a clinician.	Objective evaluation of the feelings linked with the challenge; reflection on core life values and beliefs, and consideration of their contribution to the problem and its perceived severity.	Refining of the issue by analysing beliefs (B) linked to the activating event (A)
ASSESSMENT (A)	Synthesis of subjective and objective data and clinical reasoning to produce a diagnosis.	Critical analysis of information provided in the previous sections; establishing links between life values and feelings/perceived significance of the problem; evaluation of own statements and discerning between facts and assumptions; visualisation of an ideal solution ('miracle question' aimed at shifting away from a problem-focused thinking, and increasing problem-solving self-efficacy) (Solms *et al.*, 2022)	Disputation (D) of the limiting beliefs using empirical, logical and pragmatic questioning and restructuring of these beliefs.
PLAN (P)	Formulation of actions steps to be taken in order to manage a patient's complaint.	Reflection on support systems and strategies that could be utilised; formulation of action steps aiming at dealing with the challenge and second 0-10 VAS scale rating of perceived difficulty of the problem, to facilitate reflection on progress made throughout the process.	Formulation of an effective new approach (E) – immediate tasks to address the issue.

8.6.1 Self-coaching using the SOAP Healthcare Excellence model

The REB approach promotes self-coaching as a method of professional and personal development outside of individual coaching sessions, and for this purpose recommends the use of self-applicable forms that stimulate reflection based on the REB approach framework (Shrestha *et al.*, 2021). Utilising the SOAP Healthcare Excellence coaching model, we developed a self-coaching tool that promotes self-awareness and self-reflection, and in turn it may facilitate productive coping with challenges, identification of solutions and setting achievable goals (Table 8.3). The development of this tool was guided by the past research on development of coaching and self-coaching tools (Hultgren, Palmer and O'Riordan, 2016; Wolfenden, 2020), the 'Feeling wheel' tool for expanding awareness of emotions (Willcox, 1982) and the questions typically used during subjective part of patient assessment (Podder, Lew and Ghassemzadeh, no date).

Table 8.3 The self-coaching tool based on SOAP Healthcare Excellence coaching model

	Question	Answer
S	Briefly describe the challenge you are currently facing.	
	When did it start? When did you start to think about this as a problem?	
	What led to it? How did the situation occur?	
	What contributes to this being a challenge? What made it so hard to handle lately?	
	What have you tried so far to solve this problem?	
	How would you rate this problem, on a scale of 0-10? 0-Problem already solved 10- Problem that I believe cannot be solved	
O	How do you feel when thinking about this? (You can choose all the options that apply)	Uncertain Sad Playful Envious Daring Surprised Hopeless Disappointed Confused Tired Fearful Powerless Outraged Optimistic Anxious Exhausted Angry Excited Grateful Confident Proud Hurt Content Insecure Appreciative Bitter Loved Suspicious Lonely Satisfied Bored Betrayed Upset Embarrassed Free Ashamed Happy Calm Pessimistic Distressed Critical Resentful Hopeful Scared Overwhelmed Judged Alienated Ashamed
	Explain how each of these feelings link to your problem.	

	What do you value in life? (You can choose all the options that apply)	Adventure Curiosity Integrity Security Peace Generosity Courage Fun Transparency Unity Growth Success Boldness Respect Love Wisdom Faith Relationships Authenticity Happiness Harmony Loyalty Stability Humour Honesty Reputation Health Kindness Responsibility Life Fairness Creativity Diversity Wealth Recognition Justice Compassion Balance Forgiveness Contribution Learning Family Freedom Openness Beauty Spirituality Independence
	Explain what each of these values means to you and how they link to your problem.	
A	Look back at your feelings and think if there is a connection between them and the values you listed above.	
	What is the reality and what might not be true? Which of the above are your assumptions and not facts?	**REALITY / FACTS** **ASSUMPTIONS**
	What would be the ideal solution?	
P	What would support you in doing this/ making this happen?	
	What is the first step to take?	
	Having reflected on your situation, how would you rate this problem on a scale of 0-10? 0-Problem already solved 10- Problem that I believe cannot be solved	

8.6.2 Self-coaching within concussion education

We invite educators to promote active student engagement in self-coaching practice at all stages of concussion-related education. Past research suggests that a variety of factors may contribute to students' perceived challenges and their engagement in the classroom, including their own self-awareness, peer-, gender- and cultural-influences, as well as the characteristics of the education environment (Michalec *et al.*, 2017; Wang, 2023). This suggests that performance in a potentially safe and controlled classroom environment may be perceived as challenging for some students. Therefore, early familiarisation with self-coaching practice may positively influence students' well-being and academic performance, as well as facilitate a habitual use of active coping strategies at the later stages of learning. Literature suggests that performance in applied placement environments poses a variety of challenges (Khan *et al.*, 2020; Aryuwat *et al.*, 2024), and may elicit difficult emotions, including guilt, sadness and self-doubt. However, engagement in transformative self-care activities has been indicated as supportive for students' resilience (Aryuwat *et al.*, 2024). We believe that this tool can support students throughout their concussion-related education, as well as with challenges related to other areas of professional practice. The examples of its use in the context of concussion education can be found in Table 8.4 and Table 8.5.

Table 8.4 A sample use of SOAP Healthcare Excellence self-coaching tool – fictional case 1

	Question	Sample answer
S	Briefly describe the challenge you are currently facing.	I think that I am on the wrong course, I do not think I can be a good clinician.
	When did it start? When did you start to think about this as a problem?	It started last month when we began to learn about concussion and started practicing concussion assessment.
	What led to it? How did the situation occur?	I did not realise how complicated concussion is. There is so much to remember, and I cannot even get it right when practicing with my friend. What will I do when I need to deal with a real patient on the pitch?
	What contributes to this being a challenge? What made it so hard to handle lately?	There is a lot happening in general. We are in the middle of the semester and assessments are starting soon, so it is all quite stressful. We had a practical class where we role played concussion, and I did not do a good job as a therapist. I completely messed up one part of SCAT6. Also, I have only realised that concussion can have such serious consequences. What if I do not spot it on the pitch and the player will get seriously hurt because of me?
	What have you tried so far to solve this problem?	I spoke to my classmate, but she says it will be fine, that I will get better at it. But it is easy for her to say it, she is always getting everything right. It does not help at all.

	How would you rate this problem on a scale of 0-10? 0-Problem already solved 10- Problem that I believe cannot be solved	8
O	How do you feel when thinking about this? (You can choose all the options that apply)	**Uncertain**, Sad, Playful, **Envious**, Daring, Surprised, Hopeless, Disappointed, Confused, Tired, **Fearful**, Powerless, Outraged, Optimistic, Anxious, Exhausted, Angry, Excited, Grateful, Confident, Proud, Hurt, Content, Insecure, Appreciative, Bitter, Loved, Suspicious, Lonely, Satisfied, Bored, Betrayed, Upset, Free, Embarrassed, Ashamed, Happy, Calm, Pessimistic, Distressed, Critical, Resentful, Hopeful, Scared, Overwhelmed, Judged, Alienated, Ashamed
	Explain how each of these feelings, links to your problem	**Uncertain** – I do not know what to do, I feel like I might not be well suited for this course. Most of my classmates seem to be having no issues with concussion assessment and I feel like I am really unsure of what I am doing. And in 3 months' time I will need to do those assessments at my placement. **Envious** – I wish I could be so confident in it like my classmates, they seem to be having no worries about going to placement **Fearful** – I am really worried that someone might die because of me. This second impact syndrome is so scary.
	What do you value in life? (You can choose all the options that apply)	Adventure Curiosity Integrity **Security** Peace Generosity Courage Fun Transparency Unity Growth Success Independence Respect Love Wisdom Faith Life Authenticity **Happiness** Harmony Loyalty Stability Humour Honesty Reputation **Health** Kindness Responsibility Relationships Fairness Creativity Diversity Wealth Recognition Justice Compassion Balance Forgiveness **Contribution** Learning Family Freedom Openness Beauty Spirituality Boldness

	Explain what each of these values means to you and how they link to your problem	**Security** – physical and emotional safety is very important to me, and I like to be in control of everything. This makes me feel safe. When I think about assessing concussion, I feel like it will be very hard to control the situation, I will feel very vulnerable being in charge on the pitch **Happiness and Health** – these two go hand in hand for me. I appreciate the value of health and how it contributes to general happiness and wellbeing. My mum suffers from chronic pain, so health for me is a huge priority in life. So, when I think about concussion and its possible side effects, it worries me. **Contribution** – I like to help others, and I have always done some voluntary work. This is also why I want to become a clinician. But now I worry I will not only be unable to help a concussed patient, but I could even make their situation worse.
A	Look back at your feelings and think if there is a connection between them and the values you listed above.	**Uncertain** – Until now I was convinced I would be a good therapist. It was easier to control the situation with patients who I had so far, and they always gave me good feedback. But to be honest, I have only managed easy injuries so far and so did my classmates. It is possible that with health being a priority for me, I put myself under a lot of pressure with concussion assessment. **Envious** – I think I envy my classmates not only because they are better at concussion assessment, but also because they do not seem to care as much as I do. Some of them seem not bothered at all with the possibility of misdiagnosing concussion. I wish I could take a bit of that pressure off myself. **Fearful** – I want to be able to help people, but how can I do it if sometimes you cannot tell if they are concussed? This lack of control is really scary. When they have a fracture, ok, it is scary, but at least I know something is wrong. It really scares me that concussion can be overlooked.

	What is the reality and what might not be true?	**REALITY / FACTS** I have always got good feedback from patients. I have handled easy injuries so far. The majority of classmates performed concussion assessment correctly. Concussion is a challenging injury and can be overlooked. **ASSUMPTIONS**
	Which of the above are your assumptions and not facts?	Classmates do not worry about concussion misdiagnosis. A good therapist does not make mistakes. I will be the only student therapist on the pitch and have no support with decision-making.
	What would be the ideal solution?	I would not like to withdraw from the programme, but I feel I really need to start feeling more confident with concussion. I guess if I knew that I am not the only one having those doubts I might feel better. I would also like to know how other clinicians handle the pressure related to diagnosing concussion.
P	What would support you in doing this/ making this happen?	Having a conversation with my lecturer and classmates
	What is the first step to take?	I am going to email the lecturer and ask if she has time to meet me or maybe discuss this with the whole class.
	Having reflected on your situation, how would you rate this problem on a scale of 0-10? 0-Problem already solved 10- Problem that cannot be solved	6

Table 8.5 A sample use of SOAP Healthcare Excellence self-coaching tool – fictional case 2

	Question	Sample answer
S	Briefly describe the challenge you are currently facing.	I have recently had a situation on the pitch where a player was making it hard for me to go through the concussion assessment, I was really annoyed with it, and I do not know what to do if this happens again.
	When did it start? When did you start to think about this as a problem?	I got annoyed straight away, but when I got home that evening, I started thinking that if I cannot manage the players, it could become a real issue.
	What led to it? How did the situation occur?	After the hit the player was sent out for the assessment, but he kept saying he is fine, and he needs to get back to play. He did not want to focus on going through the protocol.
	What contributes to this being a challenge? What made it so hard to handle lately?	Concussion is hard to assess and if the player does not want to answer your questions it is so much worse. The coach was dealing with something else at that time, so he was not helping either. I feel responsible for those players, especially since I am the only student therapist there, I need to be confident when making the decision regarding them going back to the pitch.
	What have you tried so far to solve this problem?	Nothing, really. The player apologised to me after the game, and explained he really wanted to go back. They did win in the end, and he was in a good mood so it probably helped to have this conversation but next time it might be different.
	How would you rate this problem on a scale of 0-10? 0-Problem already solved 10- Problem that I believe cannot be solved	5

O	How do you feel when thinking about this? (You can choose all the options that apply)	Uncertain, Sad, Playful, Envious, Daring, Surprised, Hopeless, **Disappointed**, Confused, Tired, Fearful, Powerless, Outraged, Optimistic, Anxious, Exhausted, Angry, Excited, Grateful, Confident, Proud, Hurt, Content, Insecure, Appreciative, Bitter, Loved, Suspicious, Lonely, Satisfied, Bored, Betrayed, **Upset**, Free, Embarrassed, Ashamed, Happy, Calm, Pessimistic, Distressed, Critical, Resentful, Hopeful, Scared, **Overwhelmed**, Judged, **Alienated**, Ashamed
	Explain how each of these feelings, links to your problem	**Disappointed** – I did not know how to manage that situation, and I am disappointed with myself. I thought I really have a good grasp of how to deal with concussion. **Upset** – I do not think I have done my best job with that player, there must be a way of dealing with those situations, but I could not figure out what to do. **Overwhelmed** – I am the only therapist with that team, what if there was another player injured on the top of that one. What would I do if I could not handle that situation? **Alienated** – no one else on the team seemed to notice it was really hard for me. They all were just interested in the score.
	Which of your life values might have been affected in that situation? (You can choose all the options that apply)	Adventure Curiosity **Integrity** Security Peace Generosity Courage Fun Transparency **Unity** Growth Success Independence Respect Love Wisdom Faith Life Authenticity Happiness Harmony Loyalty Stability Humour Honesty Reputation Health Kindness **Responsibility Relationships** Fairness Creativity Diversity Wealth Recognition Justice Compassion Balance Forgiveness Contribution Learning Family Freedom Openness Beauty Spirituality Boldness
	Explain what each of these values means to you and how they link to your problem	**Integrity** and **Responsibility** are very important to me. As therapists we are responsible for the health of the players, and I take this responsibility seriously. I got annoyed that he did not allow me to do my job. **Unity** and **Relationships** – I like to have a sense of belonging and I feel connected with that team. Overall, I have a good relationship with everyone there, but I worry that if they will not let me do my job, I will not be able to stay calm about it. But I do not want to create tension either.

A	Look back at your feelings and think if there is a connection between them and the values you listed above.	**Disappointed** – my disappointment in myself was linked with the strong sense of responsibility for the players, and also the unity that is important to me. I am part of the team, and I care for the team. I want to be able to provide the best care for them. **Upset** and **Overwhelmed** – these feelings are linked with a sense of responsibility for the team and not being good enough to care for them. At the same time, although I feel a part of the team and I value that unity, I did not feel supported at that time, which made me feel **Alienated**.
	What is the reality and what might not be true? Which of the above are your assumptions and not facts?	**REALITY / FACTS** The player did not cooperate during concussion assessment So far, I have always managed to deal with concussed patients **ASSUMPTIONS** There is an easy way to deal with similar situations Others easily deal with players like that I would be fully responsible for the consequences of a mistake made in situation like this
	What would be the ideal solution?	Ideally all the players would cooperate with me during the assessments. However, I feel it might not be possible in high-pressure games. It is probably also not realistic to have a supporting therapist to help with decision making in this particular placement. It looks like I need to find a way of feeling less pressure and responsibility on the pitch.
P	What would support you in doing this/ making this happen?	I think I need to speak to the coach and find out what he thinks about situations where players do not cooperate with me. If he was of the opinion that each player is partly responsible for their own health, and the players knew that as well, I would feel much better. I would also like to know what other therapists do in similar situations.
	What is the first step to take?	I am going to approach the coach tomorrow.
	Having reflected on your situation, how would you rate this problem on a scale of 0-10? 0-Problem already solved 10- Problem that cannot be solved	3

Chapter 9: General discussion and conclusion

9.1 General discussion

The review of current literature presented in Chapter 2 highlighted the complexities surrounding provision of optimal concussion-related patient care within a sporting context. Clinicians, as the direct providers of care for concussed athletes, are positioned within a complex network of influences that continuously challenges their clinical practice. This interconnectedness of humans and their environment had been broadly discussed within the SCT and represented by the TRD model (Bandura, 1989). The essence of the SCT, relevant in the context of this research, is that humans have agency over their lives, and that one of the most crucial personal attributes facilitating human engagement in action is self-efficacy (Bandura, 1997). Therefore, to gain a better understanding of the problem of sub-optimal concussion-related patient care, we deemed it essential to research concussion-related self-efficacy among clinicians. Only one study explored this topic in the past and indicated low levels of clinicians' self-efficacy across several concussion assessment and management techniques (Savage and Covassin, 2018). However, no evidence had been provided on factors contributing to this problem, and the potential solutions. As an educator within a field of healthcare, passionate about supporting students in becoming confident, competent and resilient clinicians, I decided to explore the topic of concussion-related self-efficacy in the Irish context. This guided the development of the following research aims:

1. To explore the relevance of clinician's/healthcare student's concussion-related self-efficacy for delivery of the optimal concussion-care within a sporting environment.
2. To explore the factors that contribute to clinician's/ healthcare student's self-efficacy in concussion-related patient care within a sporting environment.
3. To explore the strategies that can facilitate development of clinician's/ healthcare student's self-efficacy in concussion-related patient care within a sporting environment.

Chapter 4 and Chapter 5 outlined that although the overall levels of self-efficacy among the Irish clinicians and healthcare students were moderate, the individual, technique-specific levels varied significantly. The highest scores were indicated for the techniques that have been well established in clinical practice and healthcare education, in line with past research (Savage and

Covassin, 2018), which reaffirms the link between self-efficacy and practice. The exploration of the relationship between each technique's self-efficacy and frequency of use with concussed patients indicated that both are strongly correlated. The more often the technique is used in clinical practice the higher the self-efficacy, in line with the theory of the self-perpetuating relationship between self-efficacy and task performance presented in Chapter 2. The investigation of clinicians' perceptions on the relevance of the general self-efficacy sources for development of their concussion-related self-efficacy within both educational and professional environments indicated that ability to practice skills in an applied, real-world setting and remaining emotionally and physically calm throughout the process are the most influential for development of self-efficacy. On the other hand, inability to practice in a real-world environment and observe the educator's demonstrations, while learning the techniques, were deemed to have the most negative impact. Interestingly, healthcare students perceived the educator's positive feedback as the most influential for development of self-efficacy. Moreover, both participant groups valued the relationship with the educator significantly higher than that with the peers, considering both feedback and observation.

The findings of the investigations presented in Chapter 4 and Chapter 5 allowed us to achieve the first aim of this research and confirm the relevance of clinician's and healthcare student's concussion-related self-efficacy for delivery of the optimal concussion-care within a sporting environment. The findings also allowed us to gain some insight into the factors that contribute to the level of clinician's and healthcare student's self-efficacy, specifically in relation to concussion-care, in line with the second aim of this research. However, in order to be able to influence the educational practice and the concussion-related clinical practices, it was crucial to achieve the third aim of this research, which was the exploration of strategies that can facilitate development of clinician's and healthcare student's self-efficacy, specifically within a sporting environment.

Chapter 6 and Chapter 7 presented the findings of the qualitative investigation of the clinicians' and healthcare students' perceptions on factors influencing their concussion-related self-efficacy. In summary, the views of both participants groups were that the period of professional education is a stepping-stone for development of concussion-related self-efficacy and confident engagement in professional practice. In line with the TRD model (Bandura, 1989), the environment and its stakeholders, both within the educational and clinical setting, can have a significant, positive or negative, impact on self-efficacy. This can occur directly, for example by facilitation of feedback

or observation, and indirectly, through influencing an individual's concussion-related experiences, and in turn impacting their self-efficacy. However, one of the findings that is especially significant for educational and clinical practice is that the process of interpretation of past experiences differs between individuals. This suggests that a potentially similar situation may elicit different thought patterns among individuals, which in turn may lead to different changes in their self-efficacy levels. Moreover, each individual can actively moderate their thought process, and their experiences, and in turn influence the change that occurs in their self-efficacy level. These findings are in line with the SCT, which emphasises each individual's agency over the course of their life (Bandura, 1989). Considering the third aim of this research, the findings presented in Chapter 6 and Chapter 7 suggest that the strategies designed to influence clinicians' or healthcare students' concussion-related self-efficacy cannot be limited to the introduction of environmental changes.

Chapters 4-7 indicate the significance of the experiences gained throughout professional education. Therefore, the change towards optimising concussion-related patient care might need to be implemented within the professional education setting. Considering the interpersonal variety in the interpretation of past experiences (Chapter 6 and Chapter 7) that I observed while collecting data, I decided to upskill to be able to provide practically meaningful recommendations. Over the past year I engaged in developing skills required to facilitate others' personal and professional growth through purposive reflection, and I acquired professional coaching certification. This experience, together with the findings presented across this thesis, and the 12 years of my personal experience as a healthcare educator, led me to developing the recommendations for educational practice, aiming at facilitating development of concussion-related self-efficacy (see Chapter 8). Given the demonstrated link between self-efficacy and performance outlined in Chapter 3, an improved level of concussion-related self-efficacy among Irish clinicians may positively influence their clinical practices implemented with concussed athletes.

9.2 Thesis limitations

Considering the overarching aim of this research, which was to identify strategies that can facilitate development of concussion-related self-efficacy during professional healthcare education, several limitations can be highlighted. Despite the efforts to engage a variety of medical and healthcare professionals and students, only the clinicians from three professional groups (certified athletic therapists, chartered physiotherapists and emergency medical services

practitioners) and one student group (athletic therapy) participated in this research. The findings may reflect the education models and clinical cultures experienced by these specific groups, therefore, the levels of self-efficacy presented in Chapter 4 and Chapter 5 may not be fully transferable to other populations of clinicians and healthcare students across Ireland. Moreover, considering the self-selection bias, it is possible that clinicians/students with more interest and/or confidence in relation to concussion participated in this research. This may have led to an overestimation of self-efficacy levels, in consequence affecting their generalisability. However, since the concept of self-efficacy is supported by a well-established theory (Bandura, 1989, 1997), the findings presented in Chapter 4 and Chapter 5 allowed progression to the next stages of research. The clinician and student populations that participated in the qualitative studies (Chapter 6 and Chapter 7) were also limited. Therefore, transferability of the findings might be limited to clinician groups working in similar environments, and student cohorts exposed to similar learning environments. Finally, the potential influence of researcher reflexivity must be acknowledged. Although steps were taken to maintain transparency and critical self-reflection throughout the research process the researcher's positionality may have influenced interpretation and prioritisation of data (Korstjens and Moser, 2018). Therefore, the findings should be considered within the context of the researcher's role.

9.3 Recommendations for future research

This thesis can inspire future research across several contexts. First and foremost, future research should explore the efficacy of the educational recommendations presented in Chapter 8. Considering the breadth of these recommendations, several separate investigations might be required to evaluate the influence of the adjustments to concussion-related syllabus, teaching and learning methods, applied practice in sporting environment and educator-related factors, both at programme- and student-level. Such evaluations should be conducted across a range of healthcare education programmes beyond athletic therapy, including physiotherapy, nursing, medicine, and other allied health professions. This would support the transferability of the recommendations across disciplines and contexts. Methodologically, a combination of quasi-experimental designs, longitudinal cohort studies, and qualitative evaluations could be utilised to assess the changes in students' concussion-related self-efficacy. Considering the novelty of the SOAP Healthcare Excellence coaching model and self-coaching tool, future research should explore their utility in

the context of challenges relevant to concussion education, as well as in other areas of clinical education and professional practice. Mixed-methods studies could be particularly valuable in exploring personal experiences and educational outcomes associated with these tools. Moreover, future research should supplement the findings presented within this thesis with information on concussion-related self-efficacy among other clinician and student groups, across a variety of medical and healthcare professions, in Ireland and internationally. Finally, exploration of the effects of self-efficacy-enhancing interventions on concussion-related clinical practice is warranted. These efforts would help bridge the gap between educational research and policy, and support the development of more confident, competent healthcare professionals.

9.4 Conclusion

The overall aim of my doctoral research was to identify pragmatic and sustainable strategies to enhance concussion-related patient care by supporting healthcare students in developing self-efficacy in the assessment and management of concussion, both during their professional education and later in independent clinical practice. I envisioned myself being able to produce a set of guidelines that would be easy to implement and reproduce. However, while exploring this topic, it became clear to me that 'complexity' and 'interdependence' are the keywords that represent the essence of the findings. Beginning with the complexity and ambiguity of concussion as an injury, through the multifactorial nature of concussion as a healthcare problem, onto the complexity of self-efficacy development process, and the interconnectedness of clinicians and their educational, and professional environments. Complexity is often associated with difficulty, and in the context of this research it indicated no simple strategy for facilitation of clinicians' concussion-related self-efficacy. However, the theoretical underpinnings of this research that explain the complexity and interdependence of human existence, inspired the strategy presented within this thesis. According to SCT, humans are not unidirectionally determined by their environment, but can have an active influence on the course of their life. Therefore, optimisation of clinicians' concussion-related self-efficacy cannot be programmed through a set of changes only within the educational environment. It requires an active involvement of each individual student, which should be encouraged and supported throughout the period of professional education.

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Appendix A - Questionnaire for professionals

'Self-efficacy in concussion assessment and management among medical and healthcare students and professionals.'

School of Health Human Performance, Dublin City University.
Primary Investigator: Anna Postawa anna.postawa2@mail.dcu.ie
Additional Investigators: Dr. Siobhán O'Connor & Dr. Enda Whyte.

Consent section

I have read the Plain Language Statement (or had it read to me) *
- o   Yes
- o   No

I understand the information provided *
- o   Yes
- o   No

I understand that in case of any questions I had an opportunity to contact the primary investigator on the email provided in the Plain Language Statement (PLS) and have received satisfactory answers to my questions if I contacted them *
- o   Yes
- o   No

I understand the information provided in relation to data protection *
- o   Yes
- o   No

I understand I may withdraw from this research study at any point *
- o   Yes
- o   No

I have read and understand the arrangements to be made to protect confidentiality of data, including that confidentiality of information provided is subject to legal limitations *
- o   Yes
- o   No

I have read and understand confirmations relating to any other relevant information as indicated in the PLS *
- o   Yes
- o   No

I consent to participate in this study *
- o   Yes

o   No

The survey will end if the participant chooses a 'No' option in any of the questions.
<u>Descriptive information</u>

Q1. What is your age in years? (Dropdown menu provided)
Q2. What is your gender?
- Male
- Female
- Non-binary
- Prefer not to say
- Other: _____

Q3. Are you a practicing medical or healthcare professional?
o   Yes
o   No

The survey will end for participants that choose 'No'.

Q4. What was the field of your undergraduate study?
o   Athletic therapy
o   Health Science/Nutrition
o   Medicine
o   Nursing
o   Paramedic studies
o   Physiotherapy
o   Occupational therapy
o   Sports Science/Exercise Physiology
o   Other: _____

Q5. Was assessment of concussion included in any of your undergraduate study modules?
o   Yes
o   No
Q6. Was management of concussion included in any of your undergraduate study modules?
o   Yes
o   No
Q7. How long ago did you graduate from the undergraduate degree (in years)? (Dropdown menu provided)

Q8. Did you study at a postgraduate level?
o   Yes
o   No

Participants will be redirected to Q13 if they choose the 'No' option.

Q9. What was the field of your postgraduate study?

  o Athletic therapy
  o Medicine
  o Nursing
  o Occupational therapy
  o Physiotherapy
  o Sports and exercise medicine
  o Sports physiotherapy
  o Sports rehabilitation
  o Other: _____

Q10. Was assessment of concussion included in any of your postgraduate study modules?
  o Yes
  o No

Q11. Was management of concussion included in any of your postgraduate study modules?
  o Yes
  o No

Q12. How long ago did you graduate from the postgraduate degree (in years)? (Dropdown menu provided)

Q13. What are your professional qualifications? (Tick all that apply)
- Certified Athletic Therapist
- Chartered Physiotherapist
- Doctor of Medicine
- Occupational Therapist
- Paramedic
- Registered Nurse
- Other: _____

Q14. Are you currently working as a medical or healthcare professional with sporting populations?
  o Yes
  o No

Participants will be redirected to Q16 if they choose the 'No' option.

Q15. How long have you been working as a medical or healthcare professional with sporting populations, in years? (Dropdown menu provided)

Q16. Do you assess and/or manage concussion as a part of your clinical practice?
  o Yes
  o No

The survey will end for participants who choose the 'No' option.

Q17. Have you ever participated in a concussion focused CPD event?
  o Yes
  o No

Q18. How many times have you participated in a concussion focused CPD event? (Dropdown menu provided)

Confidence, learning experience and current practices

A number of concussion assessment and management techniques are listed below.

Please use the blank spaces in the first column to rate how certain you are that you can correctly perform each of these techniques and use their findings to guide your clinical decisions in concussion assessment and management.

Rate your degree of confidence by recording a number from 0 to 100 using the scale given below:

    0   10   20   30   40   50   60   70   80   90   100
 Cannot do at all   Moderately can do   Highly certain can do

Please note that you can choose any number from 0 to 100, i.e. 43, 57, 78 etc.

Please use the blank spaces in the second column to rate how often you use the techniques in your clinical practice.

Rate that frequency by recording a number from 0 to 100 using the scale given below:

    0   10   20   30   40   50   60   70   80   90   100
  Never use the   Use the technique with   Use the technique with
  technique   half of concussed athletes   every concussed athlete

Please note that you can choose any number from 0 to 100, i.e. 43, 57, 78 etc.

Please use the blank spaces in third, fourth and fifth columns to record whether or not the technique was included in the curriculum of your undergraduate/postgraduate education or in a CPD course.

Y – Yes; N – No; U – Unsure

Baseline assessment techniques	Confidence (0-100)	Frequency of use in your clinical practice	Included in your undergraduate curriculum (Y/N/U)	Included in your postgraduate curriculum (Y/N/U)	Included in CPD (Y/N/U)

	(0-100)				
Presence of risk modifiers for prolonged recovery (e.g. previous concussions, ADHD, learning difficulties, migraines)					
Concussion symptom checklist					
Standard Assessment of Concussion (SAC)					
Sport Concussion Assessment Tool (SCAT 5)					
Child version of Sport Concussion Assessment Tool (Child SCAT5)					
Balance measure (e.g. BESS)					
Vestibular/Ocular test (e.g. VOMS)					
King-Devick Test					
Paper/pencil neuropsychological test					
Computerized neuropsychological test (e.g. ImPACT)					
Reaction time testing (e.g. ruler drop test)					
Psychological state assessment (e.g. Brief Symptom Inventory-18)					

Assessment/ reassessment technique	Confidence (0-100)	Frequency of use in your clinical practice (0-100)	Included in your undergraduate curriculum (Y/N/U)	Included in your postgraduate curriculum (Y/N/U)	Included in CPD (Y/N/U)
History and clinical evaluation non-specific to concussion (e.g. cervical ROM, neck strength, myotomes/dermatomes)					

Cervical spine tests (e.g. cervical joint-reposition error test, smooth-pursuit neck torsion test)					
Cranial nerve examination					
Post-concussion symptom checklist					
Standard Assessment of Concussion (SAC)					
Sport Concussion Assessment Tool (SCAT 5)					
Child version of Sport Concussion Assessment Tool (Child SCAT5)					
Balance measure (e.g. BESS)					
Vestibular/Ocular test (e.g. VOMS)					
King-Devick Test					
Paper/pencil neuropsychological test					
Computerized neuropsychological test (e.g. ImPACT)					
Reaction time testing (e.g. ruler drop test)					
Aerobic exercise tolerance test (e.g. Buffalo Concussion Treadmill Test)					
Psychological state assessment (e.g. Brief Symptom Inventory-18)					
Sleep quality and quantity measure (e.g. PSQI)					
Migraine assessment (e.g. MIDAS					

Management or rehabilitation technique	Confidence (0-100)	Frequency of use in your	Included in your undergraduate	Included in your postgraduate	Included in CPD (Y/N/U)

		clinical practice (0-100)	curriculum (Y/N/U)	curriculum (Y/N/U)	
Providing advice on cognitive rest					
Providing advice on use of medications					
Providing advice on diet					
Providing advice on driving					
Providing advice on return to school/learning activities					
Prescription of aerobic exercise					
Return to play progression (as per consensus statements e.g. graduated stepwise progression)					
Balance training					
Cervical spine rehabilitation					
Vestibular/Ocular rehabilitation					
Referral to a specialist (e.g. optometrist, vestibular specialist, psychologist)					

<u>Factors impacting confidence</u>

A number of factors that could have a <u>positive impact</u> on the development of confidence are listed below. Please consider how much the following factors facilitated or positively impacted your confidence in concussion assessment and management.

Factors	No positive impact at all	Little positive impact	Mild positive impact	Significant positive impact	Very significant positive impact
Practicing the technique in class					
Practicing the technique in clinical placement					

Practicing the technique while working independently after graduation					
Observing a lecturer/placement supervisor performing the technique					
Observing a peer/fellow student performing the technique					
Being verbally encouraged by a lecturer/placement supervisor, that you can successfully perform the technique					
Being verbally encouraged by a peer/fellow student, that you can successfully perform the technique					
Being physically calm and collected when practicing the technique					
Being emotionally calm and collected then practicing the technique					
Receiving feedback on positive aspects of your performance, provided by a lecturer/placement supervisor					
Receiving feedback on positive aspects of your performance, provided by a peer/fellow student					
Receiving feedback on negative aspects of your performance, provided by a lecturer/placement supervisor					
Receiving feedback on negative aspects of your performance, provided by a peer/fellow student					

A number of factors that could have a <u>negative impact</u> on the development of confidence are listed below. Please consider how much the following factors acted as barriers or negatively impacted your confidence in concussion assessment and management.

Factors	No negative impact at all	Little negative impact	Mild negative impact	Significant negative impact	Very significant negative impact
Being unable to practice the technique in class					
Being unable to practice the technique in clinical placement					
Being unable to practice the technique while working independently after graduation					

Being unable to observe a lecturer/placement supervisor performing the technique					
Being unable to observe a peer/fellow student performing the technique					
Receiving no verbal encouragement from a lecturer/placement supervisor, that you can successfully perform the technique					
Receiving no verbal encouragement from a peer/fellow student, that you can successfully perform the technique					
Being physically agitated (i.e. experiencing increased heart rate, sweating) when practicing the technique					
Being emotionally stressed and anxious when practicing the technique					
Receiving no feedback on positive aspects of your performance, from a lecturer/placement supervisor					
Receiving no feedback on positive aspects of your performance, from a peer/fellow student					
Receiving no feedback on negative aspects of your performance, from a lecturer/placement supervisor					
Receiving no feedback on negative aspects of your performance, from a peer/fellow student					

The survey will end after this section and the following statement will be displayed

Thank you for taking time to complete this survey.

Appendix B - Questionnaire for students

'Self-efficacy in concussion assessment and management among medical and healthcare students and professionals.'

School of Health Human Performance, Dublin City University.
Primary Investigator: Anna Postawa anna.postawa2@mail.dcu.ie
Additional Investigators: Dr. Siobhán O'Connor & Dr. Enda Whyte

Consent section
I have read the Plain Language Statement (or had it read to me) *
- o   Yes
- o   No

I understand the information provided *
- o   Yes
- o   No

I understand that in case of any questions I had an opportunity to contact the primary investigator on the email provided in the Plain Language Statement (PLS) and have received satisfactory answers to my questions if I contacted them *
- o   Yes
- o   No

I understand the information provided in relation to data protection *
- o   Yes
- o   No

I understand I may withdraw from this research study at any point *
- o   Yes
- o   No

I have read and understand the arrangements to be made to protect confidentiality of data, including that confidentiality of information provided is subject to legal limitations *
- o   Yes
- o   No

I have read and understand confirmations relating to any other relevant information as indicated in the PLS *
- o   Yes
- o   No

I consent to participate in this study *
- o   Yes
- o   No

The survey will end if the participant chooses a 'No' option in any of the questions.

Descriptive information

Q1. What is your age in years? (Dropdown menu provided)
Q2. What is your gender?
- Male
- Female
- Non-binary
- Prefer not to say
- Other: _____

Q3. Are you an undergraduate student or a postgraduate student?
- Undergraduate student
- Postgraduate student

The following questions will apply to those who choose 'undergraduate student' option

Q4. What is your field of study?
- Athletic therapy
- Health Science/Nutrition
- Medicine
- Nursing
- Paramedic studies
- Physiotherapy
- Occupational therapy
- Sports Science/Exercise Physiology
- Other: _____
Q6. Are you a final year student?
- Yes
- No

The survey will end for those who choose 'No'

Q7. Was assessment of concussion included in any of your modules?
- Yes
- No
Q8. Was management of concussion included in any of your modules?
- Yes
- No

Q9. Approximately, how many patients have you assessed for concussion during any clinical placement/s so far? (Dropdown menu provided)

Participants will be redirected to the next section after this question.

The following questions will apply to those who choose 'postgraduate student' option

Q4. What was the field of your undergraduate study?
- o   Athletic therapy
- o   Health Science/Nutrition
- o   Medicine
- o   Nursing
- o   Paramedic studies
- o   Physiotherapy
- o   Occupational therapy
- o   Sports Science/Exercise Physiology
- o   Other: _____

Q5. Was assessment of concussion included in any of your undergraduate modules?
- o   Yes
- o   No

Q6. Was management of concussion included in any of your undergraduate modules?
- o   Yes
- o   No

Q7. What is your current field of study?
- o   Athletic therapy
- o   Medicine
- o   Nursing
- o   Occupational therapy
- o   Physiotherapy
- o   Sports and exercise medicine
- o   Sports physiotherapy
- o   Sports rehabilitation
- o   Other: _____

Q8. What is your current year of study?
- •   1st
- •   2nd
- •   3rd
- •   4th
- •   5th

Q9. Was assessment of concussion included in any of your postgraduate study modules so far?
- o   Yes
- o   No

Q10. Was management of concussion included in any of your postgraduate study modules so far?
- o   Yes

o   No

Q11. How long ago did you graduate from your undergraduate degree (in years)? (Dropdown menu provided)

Q12. Do you hold any professional qualifications?

- Certified Athletic Therapist
- Chartered Physiotherapist
- Doctor of Medicine
- Occupational Therapist
- Paramedic
- Registered Nurse
- Other: _____
- None

Q13. Are you currently working as a medical or healthcare professional with sporting populations?

o   Yes
o   No

Those who choose the 'No' option will be redirected to the next section.
The following questions apply to those who choose the 'Yes' option.

Q14. How long have you been working as a graduate medical or healthcare professional with sporting populations, in years? (Dropdown menu provided)

Q15. How many patients on average do you assess for concussion annually? (Dropdown menu provided)

Q16. Have you ever attended a concussion focused CPD event?

o   Yes
o   No

Participants who choose 'No' will be redirected to the next section.
Participants who choose 'Yes' will answer Q17 before being redirected to the next section.
Q17. How many times have you participated in a concussion focused CPD event? (Dropdown menu provided)

<u>Confidence, learning experience and current practices</u>

The following will be displayed for the undergraduate students and postgraduate students who currently are not involved in independent professional practice.

A number of concussion assessment and management techniques are listed below.

Please use the blank spaces in the first column to rate how certain you are that you can correctly perform each of these techniques and use their findings to guide your clinical decisions in concussion assessment and management.

Rate your degree of confidence by recording a number from 0 to 100 using the scale given below:

| 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |

Cannot do at all   Moderately can do   Highly certain can do

Please note that you can choose any number from 0 to 100, i.e. 43, 57, 78 etc.

Please use the blank spaces in the second column to rate how often you use the techniques in your clinical placement.

Rate that frequency by recording a number from 0 to 100 using the scale given below:

| 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |

Never use the   Use the technique with   Use the technique with
  technique   half of concussed athletes   every concussed athlete

Please note that you can choose any number from 0 to 100, i.e. 43, 57, 78 etc.

Please use the blank spaces in the third column to record whether or not the technique was included in the curriculum of your study.

Y – Yes; N – No; U – Unsure

Baseline assessment techniques	Confidence (0-100)	Frequency of use in your clinical placement (0-100)	Included in your programme curriculum (Y/N/U)
Presence of risk modifiers for prolonged recovery (e.g. previous concussions, ADHD, learning difficulties, migraines)			
Concussion symptom checklist			
Standard Assessment of Concussion (SAC)			
Sport Concussion Assessment Tool (SCAT 5)			

Assessment/ reassessment technique			
Child version of Sport Concussion Assessment Tool (Child SCAT5)			
Balance measure (e.g. BESS)			
Vestibular/Ocular test (e.g. VOMS)			
King-Devick Test			
Paper/pencil neuropsychological test			
Computerized neuropsychological test (e.g. ImPACT)			
Reaction time testing (e.g. ruler drop test)			
Psychological state assessment (e.g. Brief Symptom Inventory-18)			

Assessment/ reassessment technique	Confidence (0-100)	Frequency of use in your clinical placement (0-100)	Included in your programme curriculum (Y/N/U)
History and clinical evaluation non-specific to concussion (e.g. cervical ROM, neck strength, myotomes/dermatomes)			
Cervical spine tests (e.g. cervical joint-reposition error test, smooth-pursuit neck torsion test)			
Cranial nerve examination			
Post-concussion symptom checklist			
Standard Assessment of Concussion (SAC)			
Sport Concussion Assessment Tool (SCAT 5)			
Child version of Sport Concussion Assessment Tool (Child SCAT5)			
Balance measure (e.g. BESS)			
Vestibular/Ocular test (e.g. VOMS)			

King-Devick Test			
Paper/pencil neuropsychological test			
Computerized neuropsychological test (e.g. ImPACT)			
Reaction time testing (e.g. ruler drop test)			
Aerobic exercise tolerance test (e.g. Buffalo Concussion Treadmill Test)			
Psychological state assessment (e.g. Brief Symptom Inventory-18)			
Sleep quality and quantity measure (e.g. PSQI)			
Migraine assessment (e.g. MIDAS)			

Management or rehabilitation technique	Confidence (0-100)	Frequency of use in your clinical placement (0-100)	Included in your programme curriculum (Y/N/U)
Providing advice on cognitive rest			
Providing advice on use of medications			
Providing advice on diet			
Providing advice on driving			
Providing advice on return to school/learning activities			
Prescription of aerobic exercise			
Return to play progression (as per consensus statements e.g. graduated stepwise progression)			
Balance training			
Cervical spine rehabilitation			
Vestibular/Ocular rehabilitation			

Referral to a specialist (e.g. optometrist, vestibular specialist, psychologist)			

The following will be displayed for the postgraduate students who are currently involved in independent clinical practice.

A number of concussion assessment and management techniques are listed below.

Please use the blank spaces in the first column to rate how certain you are that you can correctly perform each of these techniques and use their findings to guide your clinical decisions in concussion assessment and management.

Rate your degree of confidence by recording a number from 0 to 100 using the scale given below:

0	10	20	30	40	50	60	70	80	90	100
Cannot do at all				Moderately can do				Highly certain can do		

Please note that you can choose any number from 0 to 100, i.e. 43, 57, 78 etc.

Please use the blank spaces in the second and third column to rate how often you use the techniques in your clinical placement and independent clinical practice.

Rate that frequency by recording a number from 0 to 100 using the scale given below:

0	10	20	30	40	50	60	70	80	90	100
Never use the technique		Use the technique with half of concussed athletes						Use the technique with every concussed athlete		

Please note that you can choose any number from 0 to 100, i.e. 43, 57, 78 etc.

Please use the blank spaces in fourth, fifth and sixth columns to record whether or not the technique was included in the curriculum of your undergraduate/postgraduate education or in a CPD course.

Y – Yes; N – No; U - Unsure

Baseline assessment techniques	Confidence (0-100)	Frequency of use in your clinical placement (0-100)	Frequency of use in your independent clinical practice (0-100)	Included in your undergraduate curriculum (Y/N/U)	Included in your postgraduate curriculum (Y/N/U)	Included in CPD (Y/N/U)
Presence of risk modifiers for prolonged recovery (e.g. previous concussions, ADHD, learning difficulties, migraines)						
Concussion symptom checklist						
Standard Assessment of Concussion (SAC)						
Sport Concussion Assessment Tool (SCAT 5)						
Child version of Sport Concussion Assessment Tool (Child SCAT5)						
Balance measure (e.g. BESS)						
Vestibular/Ocular test (e.g. VOMS)						
King-Devick Test						
Paper/pencil neuropsychological test						
Computerized neuropsychological test (e.g. ImPACT)						
Reaction time testing (e.g. ruler drop test)						
Psychological state assessment (e.g. Brief Symptom Inventory-18)						

Assessment/ reassessment technique	Confidenc e (0-100)	Frequenc y of use in your clinical placement (0-100)	Frequency of use in your independen t clinical practice (0-100)	Included in your undergraduat e curriculum (Y/N/U)	Included in your postgraduat e curriculum (Y/N/U)	Include d in CPD (Y/N/U)
History and clinical evaluation non-specific to concussion (e.g. cervical ROM, neck strength, myotomes/dermatomes)						
Cervical spine tests (e.g. cervical joint-reposition error test, smooth-pursuit neck torsion test)						
Cranial nerve examination						
Post-concussion symptom checklist						
Standard Assessment of Concussion (SAC)						
Sport Concussion Assessment Tool (SCAT 5)						
Child version of Sport Concussion Assessment Tool (Child SCAT5)						
Balance measure (e.g. BESS)						
Vestibular/Ocular test (e.g. VOMS)						
King-Devick Test						
Paper/pencil neuropsychological test						
Computerized neuropsychological test (e.g. ImPACT)						

Reaction time testing (e.g. ruler drop test)						
Aerobic exercise tolerance test (e.g. Buffalo Concussion Treadmill Test)						
Psychological state assessment (e.g. Brief Symptom Inventory-18)						
Sleep quality and quantity measure (e.g. PSQI)						
Migraine assessment (e.g. MIDAS)						

Management or rehabilitation technique	Confidence (0-100)	Frequency of use in your clinical placement (0-100)	Frequency of use in your independent clinical practice (0-100)	Included in your undergraduate curriculum (Y/N/U)	Included in your postgraduate curriculum (Y/N/U)	Included in CPD (Y/N/U)
Providing advice on cognitive rest						
Providing advice on use of medications						
Providing advice on diet						
Providing advice on driving						
Providing advice on return to school/learning activities						
Prescription of aerobic exercise						
Return to play progression (as per consensus statements e.g. graduated stepwise progression)						

Balance training					
Cervical spine rehabilitation					
Vestibular/Ocular rehabilitation					
Referral to a specialist (e.g. optometrist, vestibular specialist, psychologist)					

<u>Factors impacting confidence</u>

The following will be displayed for undergraduate students and postgraduate students not currently involved in independent clinical practice.

A number of factors that could have a <u>positive impact</u> on the development of confidence are listed below. Please consider how much the following factors facilitated or positively impacted your confidence in concussion assessment and management.

Factors	No positive impact at all	Little positive impact	Mild positive impact	Significant positive impact	Very significant positive impact
Practicing the technique in class					
Practicing the technique in clinical placement					
Observing a lecturer/placement supervisor performing the technique					
Observing a peer/fellow student performing the technique					
Being verbally encouraged by a lecturer/placement supervisor, that you can successfully perform the technique					
Being verbally encouraged by a peer/fellow student, that you can successfully perform the technique					
Being physically calm and collected when practicing the technique					
Being emotionally calm and collected then practicing the technique					

Receiving feedback on positive aspects of your performance, provided by a lecturer/placement supervisor					
Receiving feedback on positive aspects of your performance, provided by a peer/fellow student					
Receiving feedback on negative aspects of your performance, provided by a lecturer/placement supervisor					
Receiving feedback on negative aspects of your performance, provided by a peer/fellow student					

A number of factors that could have a <u>negative impact</u> on the development of confidence are listed below. Please consider how much the following factors acted as barriers or negatively impacted your confidence in concussion assessment and management.

Factors	No negative impact at all	Little negative impact	Mild negative impact	Significant negative impact	Very significant negative impact
Being unable to practice the technique in class					
Being unable to practice the technique in clinical placement					
Being unable to observe a lecturer/placement supervisor performing the technique					
Being unable to observe a peer/fellow student performing the technique					
Receiving no verbal encouragement from a lecturer/placement supervisor, that you can successfully perform the technique					
Receiving no verbal encouragement from a peer/fellow student, that you can successfully perform the technique					
Being physically agitated (i.e. experiencing increased heart rate, sweating) when practicing the technique					
Being emotionally stressed and anxious when practicing the technique					
Receiving no feedback on positive aspects of your performance, from a lecturer/placement supervisor					

Receiving no feedback on positive aspects of your performance, from a peer/fellow student				
Receiving no feedback on negative aspects of your performance, from a lecturer/placement supervisor				
Receiving no feedback on negative aspects of your performance, from a peer/fellow student				

The survey will end after this section and the following statement will be displayed

Thank you for taking time to complete this survey.

The following will be displayed for postgraduate students who are currently involved in independent clinical practice.

A number of factors that could have a <u>positive impact</u> on the development of confidence are listed below. Please consider how much the following factors facilitated or positively impacted your confidence in concussion assessment and management.

Factors	No positive impact at all	Little positive impact	Mild positive impact	Significant positive impact	Very significant positive impact
Practicing the technique in class					
Practicing the technique in clinical placement					
Practicing the technique while working independently after graduation					
Observing a lecturer/placement supervisor performing the technique					
Observing a peer/fellow student performing the technique					
Being verbally encouraged by a lecturer/placement supervisor, that you can successfully perform the technique					
Being verbally encouraged by a peer/fellow student, that you can successfully perform the technique					
Being physically calm and collected when practicing the technique					

Being emotionally calm and collected then practicing the technique					
Receiving feedback on positive aspects of your performance, provided by a lecturer/placement supervisor					
Receiving feedback on positive aspects of your performance, provided by a peer/fellow student					
Receiving feedback on negative aspects of your performance, provided by a lecturer/placement supervisor					
Receiving feedback on negative aspects of your performance, provided by a peer/fellow student					

A number of factors that could have a <u>negative impact</u> on the development of confidence are listed below. Please consider how much the following factors acted as barriers or negatively impacted your confidence in concussion assessment and management.

Factors	No negative impact at all	Little negative impact	Mild negative impact	Significant negative impact	Very significant negative impact
Being unable to practice the technique in class					
Being unable to practice the technique in clinical placement					
Being unable to practice the technique while working independently after graduation					
Being unable to observe a lecturer/placement supervisor performing the technique					
Being unable to observe a peer/fellow student performing the technique					
Receiving no verbal encouragement from a lecturer/placement supervisor, that you can successfully perform the technique					
Receiving no verbal encouragement from a peer/fellow student, that you can successfully perform the technique					

Being physically agitated (i.e. experiencing increased heart rate, sweating) when practicing the technique				
Being emotionally stressed and anxious when practicing the technique				
Receiving no feedback on positive aspects of your performance, from a lecturer/placement supervisor				
Receiving no feedback on positive aspects of your performance, from a peer/fellow student				
Receiving no feedback on negative aspects of your performance, from a lecturer/placement supervisor				
Receiving no feedback on negative aspects of your performance, from a peer/fellow student				

Appendix C – Semi-structured interview guide

Study Title: Factors perceived to influence Irish clinician's and athletic therapy students' self-efficacy in concussion assessment and management.

Aim: To explore the factors perceived to influence the Irish clinicians' self-efficacy in concussion assessment and management, utilising the Social Cognitive Theory triadic model of reciprocal determinism and general self-efficacy sources.

Opening Statement:

Thank you for joining me today for this interview. I would like to start by reviewing the study procedures with you. If you have any questions, please feel free to ask. The aim of this research is to explore the factors perceived to influence the Irish clinicians' self-efficacy in concussion assessment and management. We are looking to explore the factors that make it harder or prevent you from becoming confident in concussion-related patient care and the factors that make it easier for you to develop that confidence.

During this interview, I am interested in understanding your experience of developing confidence in concussion assessment and management and the factors that in your opinion had an impact on this process. I would like you to know that there are not right or wrong answers in this interview, as I am interested specifically in your own individual perspective. Please answer the questions to the best of your ability, and feel free to ask for further clarification or prompts at any stage. Please remember that you are not required to discuss topics that are sensitive to you, so if you feel uncomfortable at any stage, you may refuse to answer any of the questions. You may also withdraw from the interview at any time.

Can I have your verbal consent to proceed with the recording of this interview?

Bridging question – As a clinician directly involved in assessment and management of concussed patients, can you tell me whether you find it challenging, and why you do or do not?

Question Guide - Section 1

Questions based on triadic model of reciprocal determinism

Triadic reciprocal determinism factor	Question	Follow-up questions if not addressed in original answer
Environmental	Can you tell me what factors you think help you feel confident with concussion assessment and management skills?	Can you tell me about situations where you think the work environment may positively influence your confidence?
Environmental	I want you to think about your own confidence when it comes to concussion assessment and management skills. Are there any factors you think have helped in the past or would help in the future for you to become more confident?	Can you tell me about situations where you think work colleagues can positively influence your confidence?
Environmental		Can you think of ways your patients may positively influence your confidence?
Behavioural/ Personal		Can you tell me about situations where you personally can positively influence your own confidence? What about the things you do or think about while learning or practising?
Environmental		Thinking of your professional education or CPDs, can you tell me about situations where you think the learning environment positively influenced your confidence?
Environmental		Can you tell me about situations where you think the lecturer positively influenced your confidence?
Environmental		Can you think of ways in which peers positively influenced your confidence?
		Now that we have discussed the influence of the environment and others, are there any other factors you think are important to you when it comes to positive influence on your confidence with concussion assessment and management?
Environmental	Can you tell me what factors you think make you feel not confident in concussion assessment and management skills?	Can you tell me about situations where you think the work environment may negatively influence your confidence?

Environmental	I want you to think about your own confidence when it comes to concussion assessment and management skills. Are there any factors you think made it harder for you in the past or would make it harder in the future to become confident?	Can you tell me about situations where you think work colleagues can negatively influence your confidence?
Environmental		Can you think of ways your patients may negatively influence your confidence?
Behavioural/ Personal		Can you tell me about situations where you personally can negatively influence your own confidence? What about the things you do or think about while learning or practising?
Environmental		Thinking of your professional education or CPDs, can you tell me about situations where you think the learning environment negatively influenced your confidence?
Environmental		Can you tell me about situations where you think the lecturer negatively influenced your confidence?
Environmental		Can you think of ways in which peers negatively influenced your confidence?
		Are there any other factors you think are important to you when it comes to negative influence on your confidence with concussion assessment and management?

Prompts for acquiring further detail:
When you say _____, what do you mean by that?
Would you mind expanding on your thoughts on _____ more for me?
Just going back to what you said _____, can you elaborate more on this?
You briefly mentioned _____, how important is this in your opinion?
Does it mean _____ is a barrier/facilitator? How do you think that acts as a barrier/facilitator?
What exactly do you mean by _____?
Can you further explain what you mean by _____?
Would you be able to tell me more about _____ as a barrier/facilitator?
Why do you believe _____is a barrier/facilitator?

Question Guide - Section 2
Questions based on general self-efficacy sources.

Source of self-efficacy	Question	Follow-up questions if not addressed in original answer
Mastery experience	What do you think is the value of practice in the development of your confidence in concussion assessment and management skills? Thinking of your past experiences, what impact on your confidence had ability or inability to practice skills?	Can you tell me about situations where you think practice could allow you to become more confident?
		Can you tell me about situations where you think practice could lower your confidence?
		In your opinion, what conditions related to practice are important for developing confidence? Can you think of a way time of practice impacts confidence? Can you tell me what impact has the location of practice had in your opinion? How do you think the presence of others during practice impacts your confidence? Is it a positive or a negative impact?
		What had a greater impact on your confidence, practice during professional education or during your independent practice after graduation? Can you tell me about it?
		What do you think would happen to your confidence in a skill if you did not have a chance to practice it?
Vicarious experience/Modelling	What is the value of observing others' performing skills in development of your own confidence in concussion assessment and management skills? Thinking of your past experiences, what impact on your confidence had ability or inability to observe others demonstrating a skill?	Can you tell me about situations where you think observation could allow you to become more confident?
		Can you tell me about situations where you think observation could lower your confidence?
		In your opinion, what conditions related to observation of others performing a skill are important for developing confidence? Can you tell me how important you think for your confidence is who demonstrates the skill?

		Can you think of a way time of observation impacts confidence? Can you tell me what impact the location of observation has in your opinion? Is it a positive or a negative impact?
		What had a greater impact on your confidence, ability to observe others during professional education or during independent practice after graduation? Can you tell me about it?
		What do you think would happen to your confidence in a skill if you did not have a chance to observe its demonstration?
Verbal persuasion	What is the value of verbal encouragement from others in the development of your confidence in concussion-relevant skills? Thinking of your past experiences, what impact on your confidence had presence or lack of verbal encouragement from others?	Can you tell me about situations where you think verbal encouragement from someone would allow you to become more confident in a skill?
		Can you tell me about situations where you think verbal encouragement from someone could lower your confidence?
		In your opinion, what conditions related to receiving verbal encouragement are important for developing confidence? Can you tell me how important you think for your confidence is who provides the encouragement? Can you think of a way time of encouragement impacts confidence? Can you tell me what impact has the environment in which you receive encouragement in your opinion? Is it a positive or a negative impact?
		What had a greater impact on your confidence, receiving verbal encouragement during professional education or during independent practice after graduation? Can you tell me about it?
		What do you think would happen to your confidence in a skill if you did not receive verbal encouragement from anyone?

Physiological and emotional reactions	What is the value of your bodily physiological and emotional reactions in the development of your confidence in concussion-relevant skills?	Can you tell me about situations where you think realizing that your heartbeat increases or your hands get sweaty as you practice could impact your confidence in a skill?
	Thinking of your past experiences, what impact on your confidence had realizing and reflecting on your emotions or body reactions while practising?	Can you tell me about situations where you think realizing your fear, anxiety or excitement as you practice could impact your confidence in a skill?
		Can you think of situations where this could make you more confident?
		Can you think of situations where this could lower your confidence?
		Which bodily reactions do you think have the greatest impact on your confidence? Is it a positive or a negative impact?

Prompts for acquiring further detail:
When you say _____, what do you mean by that?
Would you mind expanding on your thoughts on _____ more for me?
Just going back to what you said _____, can you elaborate more on this?
You briefly mentioned _____, how important is this in your opinion?
Does it mean _____ is a barrier/facilitator? How do you think that acts as a barrier/facilitator?
What exactly do you mean by _____?
Can you further explain what you mean by _____?
Would you be able to tell me more about _____ as a barrier/facilitator?
Why do you believe _____is a barrier/facilitator?

Concluding Statement:

I have now asked all the questions I had prepared for today. Is there anything you would like to add? If anything, you said today makes you feel uncomfortable and you wish me to redact or remove it from the transcript please let me know. Moreover, if you have experienced any distress during the session or have any other concerns, please contact me at a time that suits you or make a contact with your GP. Thank you for your time and contribution to this research project.

Overview of theme one: environment, relevant quotes and link with general sources of self-efficacy.

Environment				
Subtheme	**Code**	**Context**	**Quote**	**Link with the general self-efficacy sources**
Professional and continuing education	**Concussion-related educational content**	Syllabus content	*I know one person who covered a game with me and was far less confident on it, because they had only 1 lecture on concussion, whereas we went through the SCAT, the Glasgow coma scale, your vestibular ocular, variations of everything. Having that base knowledge does give you a lot more confidence. (C1)* *I did four years of physiotherapy underground followed by master's in sports physiotherapy and not once was it mentioned. Now there are specific concussion courses, but they were not a part of my physiotherapy undergraduate and postgraduate syllabuses, so I just think it's a gap in the knowledge that makes concussion challenging. (C11)*	No direct link
		Breadth of teaching methods	*I feel like I didn't have a whole lot of confidence in concussion before graduating. We did get a lot of theory on it, but the lack of confidence was probably just from not having the practical experience or even just mock experience. Instead of reading how to do a SCAT5, practically running through it or through the initial concussion treatment would be better. So, I had the knowledge, but my practical confidence wasn't there. (C7)* *Going through assessments with the lecturer, seeing how they conduct them is valuable. Then repetition, working on them in class with your classmates. But it doesn't replicate the learning of the patients. You could go through a full protocol in class with a classmate, who does not have a concussion, and it's going to be a lot different to going through it with a concussed patient. If you had a concussed patient to work with in those classes, that would be good. (C10)*	**Mastery experience** By creating environments where students can practise concussion-related skills, educators provide them with opportunities to develop self-efficacy in those skills

		Global level availability and breadth of concussion resources	*I think there's a lack of specific resources. It's difficult to ascertain the significance of a concussion, without imaging and even with imaging alone, is probably not enough to guide good quality rehab. (C11)* *My confidence in concussion care, I suppose, comes from being able to access the consensus statements that are being updated. This is the first direction I will go to. (C12)*	No direct link
Educators		Role-models (observation)	*Being able to observe is massive. It's so much better than just reading or seeing a video. It resonates with you a lot more. You feel a lot more confident when that situation arises at a later stage because you are not just experiencing this the first time while doing it, I've seen it happen in person. You know what they did, so you can base what you do off that. (C1)* *It was great having the support of a supervisor, a physio that you're working under during clinical placement. They might be doing concussion assessment, and you can sit in on that, observe and ask questions. I know what to expect before going in and trying it, so I feel more confident. Working with an unsupervised team would negatively affect my confidence. (C5)*	**Vicarious experiences** Providing opportunities to observe educators demonstrating delivery of concussion-related skills allows students to develop their own self-efficacy in those skills.
		Source of feedback	*Feedback during education is important because it builds that confidence. Coming into practice you're more likely to use that skill if you have already been given good feedback on it. You know you've been objectively assessed, they pointed out where you had gone wrong, and you had worked on it. This gives you a lot of confidence and you're way more likely to use it in the field. But it also depends on the person. If you're not getting any feedback, it can stop your learning as you may think you're doing everything right. Or you may be uncertain if you are doing it right, and not utilise that skill in practice. There is also a third option that takes a lot of maturity and self-confidence, which a lot of clinicians don't have early on. It is seeking out that feedback and going for more learning. (C5)*	**Verbal persuasion** Feedback provided by educators regarding concussion-related skills, allows students to develop self-efficacy in those skills.

		Personal qualities and relationship	*I had lectures who were always very positive, always trying to help you as much as possible to get better, this helps you be confident. If they were sarcastic, not very sympathetic to what's going on outside of college, that would be very disheartening and knock confidence a good bit. (C1)* *When your educator is enthusiastic and excited when passing knowledge, they're exuding confidence from that. The people learning see that confidence and how engrossed they are in the subject; they automatically have confidence in what they're learning. And when you have confidence in what you're learning and practising it, you become a little more confident. If the person teaching you was very insecure, and wasn't great at communicating the knowledge they had, even if it was accurate information, I feel like I would have been less confident in it. (C7)*	No direct link
		Professional profile	*I feel like physiotherapy and athletic therapy are very broad. So, you have people that would be specialists in certain injuries. The clinician I was learning from, his area of expertise for the past 10 years was head injuries and concussion, so I felt a lot of confidence in that environment. If I went to a clinician with a main focus on hip injuries or hamstrings, they wouldn't have as much experience or in-depth interest in the area, and I would probably be less confident coming out of it, I think. (C7)* *I'd like to know that I'm learning from somebody that's competent and confident in doing the assessment. I would look at their credentials, their published research. Then you have confidence in that person and in what they are saying. (C12)*	No direct link
	Peers	Academic ability	*My mates in college were very confident and very studious, so that always made me more confident. Surrounding yourself with people who do well also motivates you to do your best with regards to studying and learning. However, if you see others doing really well and you're struggling, it does dent your confidence. (C1)* *Seeing someone a lot better than you, I guess, could affect confidence a bit. But I don't think that's necessarily a bad thing. It is only a bad thing if you let it be a bad thing. It can open up your eyes to learning more about it. (C4)*	No direct link

				Vicarious experiences
		Observation	*You might observe a good concussion assessment, a really thorough one and realise, oh, I've missed a couple of bits there in my own assessments previously. And you start questioning, am I really good at this? So, in the moment that can negatively impact your confidence, but if you try to take the learning from that and look at it from a long-term perspective, it will help. (C5)* *Witnessing my peers act inappropriately, or not to the best of their standards, in a very sadistic way increased my confidence. I knew, OK in that situation I'm better than them, and that meant nothing to anyone, but myself. Them doing something wrong, only proved to myself how much I do know. (C6)*	Providing opportunities to observe peers delivering concussion-related skills, allows students to develop their own self-efficacy in those skills.
		Feedback	*Feedback from a peer would probably not have as big of an impact as from some place of authority, but it depends on who your peer is. If you really value their opinions and they are positively reinforcing you, that's great. But if it's someone who's constantly giving you praise, just trying to appease you, it doesn't give you that much of a boost and vice versa. If you know that someone's a negative person then similarly, their negative feedback is not going to have as much credence. (C5)* *Peers that have been educated alongside you might pick up things differently. So, they could do something slightly different, but it could work a little better. Or they could pick up a different aspect of something you didn't pick up, so watching them and working with them, correcting them, letting them correct you is beneficial. But having that support from a lecturer or from a clinician, to be like yes, keep going the way you're going, or guys, don't, you're teaching each other dangerous things. It is important to learn from your peers, but in terms of confidence, I think it comes from the lecturer's reassurance that what you are doing is correct. (C7)*	**Verbal persuasion** Feedback provided by peers helps during the process of self-efficacy development.
Work setting	**Structure and circumstanc**	Frequency of contact	*At an intercounty level you're seeing players a lot more often than you would be with your club players. So, I suppose, they have that trust in you. Whereas your club players or potentially like if you're just covering a random match on a weekend, they don't really know who you are, you haven't really that rapport. So,*	No direct link

es			*the amount of time you're spending with the team, it definitely has an impact. I'm definitely more confident going on to the pitch with them, compared to a game I'm covering on a once off basis, for somebody else. I would definitely be a little bit more cautious going on to the pitch with a team that I don't know. (C3)*	
			If you know your players really well, you're way more prepared to spot concussion. Otherwise, you're relying on other people, and you know if they're not educated on concussion and you're asking questions like, is he any different than usual? That's a very broad question to them. Is he usually emotional? Maybe they don't want to be discussing that with you, especially if they don't have trust in you. So, it comes down to your clinical impression. (C5)	
		Specificity of concussion-related situation	*The on-field assessment, the medical room assessment and then the clinical return to play, each environment is completely different. You know, if I'm going on to a pitch in front of 30,000 people, and you've got pressure from coaches that want to keep their players on the pitch, you've got players that want to stay on the pitch, so you have to be able to deal with the pressures and of that. There is a lot more coolness and calmness when running through the HIA assessment in the changing room and then return to play management is obviously a lot more relaxed, it's one to one, it's in a good environment. You're in a lot more control because you're just in a calm environment. Similarly, when it's a frantic game like an All Island final or World Cup final, it's going to be different doing that assessment pitch side than doing that assessment pitch side during a training match or training session out of season, when there's no pressure. (C11)*	No direct link
			I think the conditions or the environment that you are in are important for confidence. It can be challenging to do a valid concussion assessment in a busy dressing room. Having a quiet room, away from the team, is important. If I was in a room with a lot of distractions and background noise, I wouldn't be confident with my assessment, both in terms of how I'm affected when assessing that player, and how concentrated they are. (C12)	
		Medical team support	*The unfortunate thing with physios is that we often work alone, so we can't bounce off anybody else. When you're on work experience with another physio, you can pick their brain, but later you don't have that. And I think you need to surround yourself with other clinicians when you're working in sport, discussing*	**Vicarious experiences and verbal persuasion**

			situations you have had. If you're doing it alone, I don't think you are going to learn, and confidence will decrease. Probably, for me to reach the next level of confidence, I would need an experienced physio to say, listen, that's fine, you're doing good there with that. but let's improve that. (C9) *My confidence increased as a result of being involved in a team environment, because you have to explain your rationale to other team members, and you have the backing of a doctor, who is of the same opinion. That experience gives you confidence, as you are realising that you have the just explanation for your decision. (C12)*	An opportunity to observe other clinicians' delivery of concussion-related skills and receiving their feedback regarding performance, allows development of own self-efficacy in those skills.
		Local level availability of resources, support systems and referral options	*Sometimes players can take longer to recover, and these cases may affect your confidence. I had a player last year who suffered from a concussion. We followed some rehabilitation, the gradual return to play, he got back up to sprinting, but once he got back up to a higher level of activity, played training drills, he started having some setbacks. And while we still worked on rehabbing him, it affected my confidence a little bit. So, I felt that he needed a referral, and I referred him on. I just thought that was the best way for him going forward, and he did end up getting back to play. So, it was a good decision in the end. (C10)* *I think that's why these protocols are starting to be put in place, because it takes the decision nearly away from the clinician. If you're good at running the assessment, then the score takes care of everything, if it is below a certain threshold then they don't go back. And even clinically, with the return to play, if you were sending someone back and they have symptoms, you're essentially leaving yourself open to medical negligence. So, I think these extra criteria are the way to go because it just takes the pressure away from the clinician nearly. So I just stick to the return to play frameworks that I know of. I've the rugby one printed out and laminated in my clinic and I've the GA1 printed out and laminated in the clinic. So, I suppose, stick to the instructions of that, try and get them asymptomatic as recommended by the guidelines. If I have any doubts or I'm really struggling with the player and can't get their symptoms to improve, I just refer on to a concussion clinic, someone that's more specialised than me. (C11)*	No direct link

		Prevalence of concussion	*I feel pretty confident. I've done a lot of match cover in rugby over the last. three years, so I'm not too intimidated by it. A lot of people, especially early on in their career, avoid rugby, but if you don't cover rugby games, you're gonna come across less concussions. Experiencing an environment where concussions happen is a big thing. (C1)* *When I'm covering a rugby game, I am always thinking about concussion. Every single ruck, every single tackle. I'd be trying to be really tuned in because I'd be fearful that I might miss a concussion. Whereas in GAA, soccer, there's going to be less contact than in rugby. GAA would have a slightly higher risk of a concussion, but in soccer it's not as common to come across concussion, compared to rugby. (C10)*	No direct link
	Sport type and level	Concussion-related protocols and attitudes	*I think the levels matter. In higher levels, concussion is better known and understood. So, my word weighs a lot better with those teams, they will be more inclined to take advice from me. Whereas in lower levels there's not as much awareness around it, and it is a lot harder to get the point across about concussion. Confidence wise, I am happy enough diagnosing the player, but my main issue is the reasoning, explanation part to coaches or players, to get them to understand why they need to come off. Also, in rugby, at an amateur level, they brought in a new rule that if there was any sign of concussion, the player would have to be removed from play immediately. For me this made it a lot more difficult, because if you just want to clear concussion, just be on the safe side, they may remove the player regardless. I wish they could at least allow an assessment before making the removal. Whereas in GAA new rules came in, so you are a little bit more confident, as there is a 5-minute assessment break, similar to higher levels in rugby. You have the HIA protocol, it can be helpful. Previously in GAA it was a bit tougher because it was a yes or no decision on the pitch, and if you thought the player was concussed, the team was using up the substitute, but you might have been wrong. So, essentially, in sports where you can remove the player, assess them, I'm a lot more confident, whereas if you have to assess them quickly on the pitch, it's a lot tougher. I also find players a little bit*	No direct link

			more honest when they're off the pitch. When they're in the middle of it, they're not as inclined to tell you. (C10) *There's a stigma around concussion at certain levels of sport, I'm thinking of club level in GAA or junior level in rugby. Historically, if a player got a knock to the head, they could stand up, communicate with either the referee or the officials, and it was usually assumed they were OK, so they were let play on. In recent years, the safety aspect has gotten better, but depending on the setting, your assessment may not be as smooth as you'd like it to be. This negatively impacts confidence because I would like to, for example, partake in a head assessment and I might not be given time from the officials of the match. Once you get to that more elite level, players and officials are more aware of the severity of what a head assessment would be. But when you drop down to the lower levels, you are kind of left in a no man's land. (C5)* *When I work with Academy teams or youth teams, there's no chance taking. A suspected head injury? Take them off, completely. And that makes my job 10 times easier. Then also on the far side, the elite level sports and athletes that I work with, they know the severity of it, so managers and coaches don't want to take chances on potentially losing out a player to a long-term injury. So, it's kind of that middle murky grey area of club level, possibly on the older population side. The junior level or club level, the average team on the weekend, Sunday League I think is the terminology used. That's the kind of grey area that I would have the most problems with. (C6)*	
		Characteristics of the game	*In hurling would be a bit easier to run onto the field than rugby because hurling is more chaotic, it is kind of back and forward. You can lose the ball in split instances and the next thing the opposition has the ball. With rugby, the game is very linear. One team goes one way, then the other team gets the ball, and it goes the other way. So, I would say it's a lot harder to run onto the field in a game of rugby. When we have the ball and I need to assess the player on the field, I will certainly run onto the field, But I will hesitate. The ball could be going back to that player, or I could be getting in the way of the player. (C9)* *I always find rugby is a little bit tougher to manage with confidence. You can miss concussions, because with rucks, there are so many bodies and it's hard to*	No direct link

			actually tell if players are concussed or not, if they had a head contact. Spotting concussions is tougher because they're 40-50 metres away, there are heads and bodies going everywhere, big hits happen and typically they get up quite quickly. So, you are always watching players and just checking through their movements or how they're kind of communicating. Whereas in GAA you might have a specific instance. You see a big hit and then straight away you know, OK, this player may be confused. Whereas in rugby it's just every single play, so it's just very hard to manage from this kind of perspective. (C10)	
	Stakeholders	Athletes (attitudes and education level)	*When they're happy to come off, I'm fine, because I feel like I'm doing the right thing by them, whereas then when they react negatively to it, there's a natural aspect where you're like, have I made the right call? It does make you a little unsure. (C1)* *Higher level of athlete concussion education makes you a bit more confident, because you don't feel like you have to convince them of your decision. If someone sort of bites back and says no, I'm not concussed, but you're seeing different, then that can create a grey area. Whereas if someone is educated on concussion and sort of knows the signs and the protocol around head injuries, that does make things a lot easier. (C2)*	No direct link
		Coaches/Managers (attitudes and level of support)	*I have friends (clinicians) whose backroom staff and management are relatively old school and when they take players off for concussion they are nearly always questioned, sometimes belittled. Being questioned constantly is never going to be good for your confidence. And then that leads to a sense from everybody, from all the players, from all the staff that you are not good enough for this, that you're not adequate enough. Then the players start questioning you, and once this happens, you're fighting an uphill battle, and you're gonna start questioning yourself. (C1)* *Buy in or the education of coaching staff is important. Feeling like you're supported and not having friction when making a clinical decision on a head injury is very, very important and increases your confidence in making that decision. (C2)*	No direct link

			What affects confidence is people, managers coming in and trying to talk over you when you're running the SCAT5 test. And they are kind of asking, can he play on, can he play on? And you kind of think, just give me 2 minutes there. (C4)	
		External clinicians (pressure, observation, conflicting advice)	*Part of the challenge could be that the player is presenting to us on a Tuesday or a Wednesday, after being seen at the A&E Department, and the advice that they've gotten was inaccurate, in my opinion. The doctor in the hospital told them they can play again in a week's time, and I'm now trying to explain to them we need to diagnose deficits and put a rehab plan in place, before they go back to play. Obviously, physios are lower down the food chain than doctors, so trying to explain that their recovery might actually take longer is a bit of a challenge. And a lot of the times the player will want to go with what is the quickest return, instead of what's right. And although I'm confident in my ability to explain this to them, it is a challenge you nearly should not have to start from. I had a situation where I assessed the player and ruled her out of being available. The player went to an external doctor for another opinion. The doctor, who obviously was not adequately trained in concussion, cleared her to play. When you've been overruled, having laid your cards on the table, you naturally are going to question your own credibility among the backroom team, even though you know you made the right call. It affects your confidence in terms of how you feel you are trusted or perceived by the backroom team. However, if I was overruled by a peer, who I would have held in high esteem and who I would consider having good knowledge in concussion management, that would definitely knock my confidence. (C12)* *There's a lot of learnings you could take if you're observing someone, the protocols they use, their rehabilitation, how they approach different trajectories. I think it could help with your confidence because you're learning, it's giving you other ideas that you can use in future. But it could negatively affect your confidence, if you feel your treatment has been insufficient, particularly if you are watching someone similar to you, another therapist with limited experience. If it is someone higher up, a consultant specialising in concussion, you would probably take more learning from that. (C10)*	No direct link

| | | Audience/Spectators | *I think in this kind of work, your name goes a long way, and it doesn't matter what you do right, but if you do something wrong, people might talk, especially in the club. You don't want to be known as the guy missing concussions, you know? And if it's a star player going down, you're thinking, oh Jesus, I better do this right. (C4)*

If it was a final, there'd be more people, so you're a bit more anxious and stressed. And I think those feelings would negatively affect your confidence because you're in that mode of hyperexcitability, you're double questioning everything you're doing. You are nearly a little bit shaky, so that can affect the way you deal with things. And if you don't deal with concussion well during that game, your confidence will be a lot lower. When you come to your next final, you could be even more anxious because of what happened last time, and because it is the same group, it can negatively affect your confidence. (C7) | No direct link |
| | | Society and community (narrative about concussion) | *Concussion is such a specific and important injury. Especially now that there's a lot of headlights around it, if you're not dealing with it correctly, you could just lose confidence in it fully, because so many people are focusing on it. And then, you might just not deal with it and be like, OK, cut off concussion, I'm gonna refer you straight away. Just push it aside. I feel like that can be easily done, especially if you do lose confidence, that you might just not deal with it anymore. (C7)* | No direct link |

Appendix E

Overview of theme two: clinician, relevant quotes and link with general sources of self-efficacy.

Clinician				
Subtheme	**Code**	**Context**	**Quote**	**Link with the general self-efficacy sources**
Perceptions and beliefs	**Concussion-related**	Concussion complexity	*I think it's just the nature of concussion, the fact that they can show in any kind of way at any time. I'll never be 100% sure that if a player successfully passes the assessment, they do not have a mild concussion of some sort. (C4)* *I think that can affect confidence, because you understand that a lot of players will be OK with a physical test, they will have no signs of concussion, but when it comes down to symptoms, you will not know, unless the player reports them. So, you can ask, are you dizzy? Do you have a headache? And they can deny, but then when after a game they might come to you and say, OK, I have had a headache since the incident. Then you might think, I should have known better. That can knock off your confidence I feel. (C10)*	No direct link
		Concussion significance	*I suppose my awareness around concussion is where I get my confidence to take players off from, I'm not taking any risks, particularly with the severity of the second impact. (C3)* *Being able to say no is crucial. There are certain situations with other injuries that you can maybe bend the rules on. But with a concussion you cannot. There's a difference between tweaking a hamstring and dying. (C11)*	No direct link
		Awareness and trust in protocols and frameworks	*The protocols are there to protect players, so if you follow the protocols, you'll get a good percentage of right decisions. But from a selfish point of view, if you follow protocols, you can kind of say, I did what I was supposed to do, that's me covered if something does go wrong. They are definitely very important, as you're starting out, but they are not gospel, there are times you*	No direct link

252

			have to kind of step either side of the line. I also think there are always going to be holes in protocols and tests. There are always going to be players filtering through holes. So, you can never be 100% sure. But the awareness that it is the same stuff that doctors, physios, athletic therapists are learning, it's the same protocol, no matter who you are. This positively affects the confidence because it's kind of reassuring, this is it, there's no magic sauce to it. (C4)	
			I would be more confident in a protocol knowing, that for example, the English rugby union are doing it this way, that this is their pathway. Or if I went into another elite environment, let's say boxing, got to see their assessment, their return to play, I think that would be pivotal. (C11)	
	Self-related	Me as a clinician and learner	*While in education, everybody around you is making mistakes, you are still learning. When you're working, part of you feels like, ohh, I'm qualified now, I should know everything. And sometimes you feel like others expect you to know everything and expect you not to make mistakes. So negative feedback in your work environment is definitely gonna impact your confidence more than during education. (C1)*	No direct link
			I'm the clinician pitch side there, so the buck does stop with me. If there is a concussion or an issue post-concussion, that is my responsibility. If I do leave the player on and God forbid, something happens, I'm going to have to answer for that just as much as I'm going to have to answer why I'm taking them off in the 1st place. I also think that an open mindset is important for a clinician. Everything changes so quickly, so I suppose realising that there's no way you're going to know everything is a key. That there's definitely other people who are a little bit more experienced and a little bit more knowledgeable in certain areas, so you need to be able to learn from them. (C3)	
			No one does a perfect job every single time, there's always room for improvement but we will probably be always chasing perfection in whatever we do, whether it's playing our own sport, whether it's doing an assessment of	

			a patient or delivering a treatment. And we can always do a better job and we will always make some sort of mistakes, but it's trying to be better each time, I think that's the key. So, I would probably lose some confidence if I did a really poor job, but I think that's part of the process. Being not great at something and failing is a kick up the backside to improve. (C11)	
		My personal qualities	*I'm quite lucky that I am naturally stubborn. I suppose with certain people, that coach's pressure would definitely impact their confidence, especially as a young clinician, and they would let that player on. (C1)* *I'm a cautious individual and I am a little bit of a worrier as well. So, I like to be prepared when I'm covering a game, and it probably impacts my suspicion of head injury. I don't like to be worrying about a player, so I am very strict with removing them from the field. (C2)* *When I'm doing something, I never think it's perfect. So sometimes, I'd be looking to get approval, you know. I'd be asking questions, learning, then my confidence would increase. But the bar never stops going up for me. (C9)*	No direct link
	Dilemmas	Team vs player interest	*I think a physio's mistake is to follow the score of the game. They might need a particular player to stay all night because there's no more subs left, and then you're the bad cop if you take a player off. You know, and it did happen to me on one occasion, that I was assessing a player and the play continued, the referee did not stop the game. The other team got a try, and they won the game. I wasn't very popular after the game, but did I do something wrong? No, I didn't. But it did impact my confidence a small bit. I should have called the referee to stop the play, you know, I should have been more direct. But I didn't read the situation quickly enough. When the opposition team has the ball, and you want to assess a player, I suppose it is easier to stop the play, because the management team is behind you, but when I'm trying to stop the play when we have the ball and we're going forward, that's a lot harder. (C9)* *You have to stay impartial, but when you start to get to know players on a personal level, I think it could affect your decision making. You're invested in the team, you want it to win, it's a high-pressure game that can influence your decision making on the pitch. In my own club, it's harder for me to tell my*	No direct link

			friends that they're concussed, and they need to come off. (C10)	
		Job security vs player welfare	*When you work with teams, especially during championship in Gaelic, when there's not a lot of work with certain teams and then at a certain time of year, over the 8-12 weeks, there's lots of work. And especially if it's a handy job down the road, you kind of want to be called back. So, you don't want to be taking all their players off. There is an aspect of not wanting to be the bad guy, when the coach wants to play, the players want to play and you're the only one saying no. In these situations, I always proceed on the side of caution, I still have to clear the player. But again, there are some moments where I'm thinking, I only have a suspicion, he passed the sideline assessment, it's to hit the game on suspicion. And sometimes I'm kind of thinking, we'll let him play on, and if he gets another hit, he's off. In those moments, I'm kind of thinking in my head, I am not fully confident he's OK, but there was also no clear-cut symptom of concussion. So, you are trying to calculate things. You kind of assume in your head he's both concussed and not concussed. But it's more on the side of caution thing, that makes me think that way. I'm almost assuming he is, just for his sake, you know. (C4)*	No direct link
Personal history and past experiences	**Exposure to concussion**	During education	*Thankfully, during college days, we did get a lot of experience with GAA, rugby, soccer, which all are contact sports. I have seen multiple different types of concussions, and I am able to recognize them. This helped me be a lot more confident when assessing it. Practice and exposure are paramount, alongside good feedback. The more exposure to a certain technique, the more comfortable and confident you'll become with that technique. If I did not get a chance to practise, I would not feel like I could do it. Preparation leads to less anxiety and more confidence, because you know you're controlling the controllable. So, if you don't get that chance to do it in undergrad or postgrad, then you just kind of avoid it because you will not feel confident. (C5)* *Placements during my times as an undergrad were quite good. I would have witnessed some acute concussions, and I was helping to rehabilitate them. However, with COVID19 hitting, there was a period of two years where we*	No direct link

			didn't have hands-on experience. So, when I finished up, I was a little bit more nervous coming back into concussion management, because I was not doing it regularly. There would have been a two-year gap between learning it and implementing it. But after completing a few assessments clinically and seeing different cases, my confidence grew again. (C10)	
		During professional practice	*If I didn't assess any concussions for a few months and then one was dropped on my lap, my confidence would be affected a bit, just from not being exposed to it all the time. But again, I think it would be temporary, once you get another one under your belt, confidence would be back, I guess. (C4)* *Exposure is probably the most important thing. You can have all the knowledge, but if you are not going into practice, it is going to be difficult to be confident in delivering it. So, like the pitch-side, the more you do it, the more confident you get, the more cases you see, the more you understand how different people react to it. You are gonna be able to spot the signs and symptoms a little bit easier. When you first go out, you're aware you have to look out for a blank stare, but it's hard to know what it actually means. But then after you see more and more cases, it becomes more apparent, and your confidence grows. (C10)*	No direct link
	Quality of performanc e	Success in dealing with concussion	*I work at national level, with under 21s. I've been implementing protocols like SCAT or VOMS there with professional players, and my thinking is, if it's going right and I'm doing it well, at that setting, then I am confident I can do it at any setting. (C5)* *Especially with the earlier instances of dealing with head injuries, when you spotted something that indicated concussion, assessed the player and decided they needed to come off. There is this kind of excitement, and it does sound weird calling it this way, but it is almost a satisfaction in being able to diagnose it. Once you see it, your confidence does rise because now you know what all that theory was for. (C6)* *There was one incident where I had to very much control the situation. The player was down after a very serious chop-tackle, there was a lot of chaos going around and there were people trying to move him and get him up. I had*	**Mastery experience** Experiencing success in dealing with concussion facilitates development of clinician' self-efficacy

			to control the area very strictly. Once I found my words in that situation, it was a lot easier to manage people and their expectations. I feel like when you successfully manage a serious situation, it's easier to deal with smaller situations then, because you've done it once and then it kind of builds on from there. (C7)	
		Poor performance	*When you miss concussion or over-diagnose it, in the sense that you take a player off and they are actually fine, all week have no symptoms, you do naturally go, ohh I messed that one up and it does little bit affect your confidence. (C1)* *I think confidence is directly related to performance. So, you can know as much as you want to know about concussion, but if you're missing them, then you're not gonna be very confident in it. If I was to miss two in the next month, I would definitely drop confidence. My first or second experience with a suspected concussion was that a player came off, passed the SCAT5 perfectly, so I let him back, but the symptoms came on 10-15 minutes later. This experience made me doubt myself and highlighted how easy it is to miss concussion. But it also put SCAT5 into perspective and gave me confidence in the way that I knew there is only so much you can do, and you have to just follow the protocol. (C4)*	No direct link
		Reflection patterns	*Everything happens on the pitch so quickly, so often you're nearly just going back through it and making sure you kind of ticked all the checklists, and if you didn't, you're just thinking, next time I see him or I talk to him again, we want to go back to that. I don't think it's going to affect my confidence a huge amount. That's the beauty of reflection, you're able to apply that the next time. If I'm taking somebody off the pitch, it is because I prefer being on the safe side. That is always my mindset. Even if we later find out he did not have a concussion, I'm still thinking, well, I had the patients' best interest at heart and in that sense, I was definitely doing the right thing, the patient was coming first. (C3)* *I found that reflective practice has been really beneficial. So, you know, breaking down those cases that may have gone badly, trying to pick out a*	No direct link

			trend and then trying to work on that trend going forward. So, I think rather than saying, I'm a terrible clinician, I'm not good at this job, look at the positive aspects of your week. If you stick with the attitude, I'm no good, I don't know what I'm doing, that's only gonna reflect on your practice every day. It helps prevent things like stress and anxiety, if you can just learn from your mistakes, as opposed to dwelling on them. (C5) *The length of self-talk afterwards is important, the longer I dwell on a negative experience, the more my confidence probably dips. And it's very hard to flip out of that. It's much easier to kind of self-praise and say yeah, I did a great job, the manager loves me for making sure everyone's safe, blah blah blah. But, when it comes to the more serious stuff, negative self-talk probably stays with you longer, unfortunately. (C6)*	
	Sporting background	Own concussions	*I've had a few concussions, some nasty with symptoms for a few days and others where I've literally had a little bit of dizziness after the impact, a headache for half an hour and that's it. That does help your confidence, experiencing how they don't all present as one case. (C1)* *I think having had a concussion myself I have a good understanding that patients might not know how to properly describe their symptoms, and I can possibly relate to what the athlete is going through, instead of being completely driven by words on a page. They will not feel 100%, this symptom is very common when you read about concussion, but what does that mean? Now, having gone through it myself, not feeling 100% is like one of the most perfect descriptions of it. You just don't know what is wrong. You can't put your finger on it. You're not sick, or you're not angry, but you're not right. I think that experience has helped me a lot with both making a diagnosis, as well as dealing with patients themselves. (C6)*	No direct link
		Experiencing team dynamics	*I played a collision sport from the age of 9 to 33. I was surrounded by concussion, and then I worked as a physio, and I saw it again and again. Because of my experience as a player, having pretended that I was okay, on a number of occasions and knowing that management will probably try and push a player to stay on the field and gloss over it, I was switched on as a physio. (C8)* *I've been in the sporting industry the last 12 years, so that is definitely a*	No direct link

258

			factor. The thing is not to show weakness. I feel I don't have the expert knowledge on concussion, and I have loads of areas to improve on, but I have a lot more understanding than anyone else there. So, I do back myself up. (C9)	
		Building resilience	*From playing sports, you realise, you might lose one week, but then you go to training and you're working on things that you know you lost the game because of, and you get better at those, and you win the next game. And I suppose this is my attitude. Rather than just focusing on the downfall, learn from it. That's just the way I kind of look at a lot of situations. (C5)* *Because of the exposure to a high level of criticism in the public sphere, when I played rugby professionally, being criticised in pubs and restaurants, or in a newspaper or on a radio, you build resilience to very harsh criticism. Making big mistakes in front of a big crowd, at a younger age it did impact my confidence, and then my overall performance. But as I got older into my later twenties or early thirties, I saw other people around me who were better at dealing with mistakes. So, from observation of those people, I learned not to self-destruct or have huge self-doubt but be confident in your ability. You made a mistake, forget it and move on. (C8)*	No direct link
	Stress and emotions during performance	Physiological stress	*I think there's certainly an adrenaline type response when you're dealing with a patient with a head injury. If you don't control that elevation of your blood pressure and increase in your heart rate, it can lead to a brain fog, lack of clarity in your decisions and your thinking. I think that if you can manage and settle down those responses it certainly would give you confidence in the future. Whereas if you allowed those bodily reactions to take over, and you made a bit of a mess of the assessment, then you're going to be that little bit more nervous and less confident when a similar scenario comes up. (C2)* *I would say the physiological reactions would affect me more than emotional, because these you can internalise, so only you know that you are stressing. Whereas if your palms are sweaty and you're going red, then the patient knows you are stressed, you are embarrassed, and that sets off a cycle of even more stress. (C5)*	**Physiological and emotional bodily responses** Experiencing physiological and/or emotional stress while dealing with concussion impacts clinicians' self-efficacy level

		Emotional stress	*The fact that I'm confident enough going out onto the pitch, whatever I am going to see, is probably key to me being able to stay calm and have confidence to deal with it. If you need to calm yourself down first, and then have to calm the patient down, I think that makes everyone a little bit more panicked and definitely would reduce your confidence. (C3)* *If you realise that every time a concussion comes, you're flustered, and you've a million questions in your head, then you're gonna realise that you're not confident in that subject. So that can either drive you towards learning more about it or can drive you away from it. Being able to overcome these emotional reactions will reaffirm your belief in the power of reflection. You broke it down, worked on certain aspects, you're way more confident, less stressed doing concussion assessments. That's the way you are going to treat everything now, if you get stressed. So, it will impact you positively if you get over that stressful time, because you realise you're improving as a clinician and being more in tune with your emotions as well. (C5)*	
Action planning	**Work-related initiatives**	Assuring good rapport and authority	*Concussion is probably one of the few injuries that I am confident regarding decision-making. In my teams I've been able to develop protocols that've been quite clear to everyone on what needs to be done after concussion. You always come across a manager who wants their player back for next week. I find that the easiest way to deal with it is just to be specific in their return to play and honest, and if there is any blowback, you explain to them that if we return them to play too early, we're at risk of further injury to them, and having to take them off again. So, I suppose it's just making that very clear from the onset. (C3)* *I think you have to reinforce with the management and team an etiquette that there are certain things we can bend the rules on and there are certain things that are non-negotiable. If you have a good rapport with your medical team and coaching staff, they will respect your decision, but if you don't have it and don't go through these things, then they may try to pull the wool over your*	No direct link

			eyes a little bit, you know? (C11)	
		Pre-match preparation (self-talk and physical preparation)	*This happens in a split second but when I'm running to the pitch, I'm saying to myself, right, I saw their head do this and their neck do this. I can hear them screaming, When I get to them, it's all about them. That split-second self-talk positively affects my confidence. (C6)* *Having that checklist in your mind, to run through, helps. So, if you go on to a player, you go through everything and tick those off in your head, that can help ease your thought process, so that you don't miss anything. Essentially, you know you've covered all bases. And if they don't pass, you are confident to take them off and you have a reasoning behind it. (C10)*	No direct link
	Education-related initiatives	Formal and informal continuing professional development	*During that initial six-month period, being quite stressed as a new clinician and finding your feet, I would have done a lot of in-service learning around confidence. One of the things we spoke about was, if you're not confident with something, engage in it step by step. Start from something you know will work and build on from there. Once you become more used to it, you can start becoming more nuanced and you know a little bit more individualised. Preparation really leads to improvements in confidence because you have a template there. You feel comfortable and essentially that's what confidence is, it is just about feeling comfortable in what you're doing and knowing that it's right. (C5)* *Concussion obviously it's one of those serious things you can't just take a backseat on. The research and everything are constantly developing, so to maintain your confidence you need to keep refreshing your knowledge in the field. CPDs, as well as my own research, talks, lectures, podcasts from different specialists online. All that has helped immensely. (C6)* *Initially I had a lot of reflection after each concussion assessment, and I used to have a little diary and write down what I've done and what I should have*	No direct link

261

			done better. I think it helped my confidence because when I had it on a sheet of paper, what I can do better the next time, I focused on it, and I saw those small improvements because I documented them. I think it's important with concussion that you are constantly improving the way you're dealing with it. So, when I saw myself constantly improving the way I was managing and dealing with the patients, that helped my confidence going forward. (C7)	
		Seeking contact with other clinicians (discussions and feedback)	*When I moved to working as a freelance athletic therapist, I needed to kind of put on big boy's pants and make sure that any time that I'm second guessing myself or anytime I have a query, I'm learning through research, or I'm talking to more experienced people in my field that would have had those experiences. They may not have been there on the day with me, but their experiences can help. To this day I engage in shadowing in a clinic, and I don't believe I ever will stop. If I have the chance to work with someone more experienced than me, then I will always take that as a bonus. (C6)* *I get stressed when I don't have confidence in something or I'm unsure of something. I think you need to ask questions and ask them in different ways to understand. That is how I learn, I expose myself, my flaws, you know, but I learn from it. (C9)*	No direct link
		Seeking exposure (engaging in concussion prevalent sports)	*I was finding games and organising my own stuff outside of college, where I was exposed to concussion. I was able to put the theory into practice regularly, which I think blended together to make me more confident. (C1)* *It would be really on you, as a clinician, to drive that practice and to drive lots of exposure to concussion. So, you have to ask yourself a question, am I in this sport because I'm avoiding things like concussion or C spine injuries? Because unless you're working with certain sports, you're not gonna get that full exposure and confidence. (C5)*	No direct link

Appendix F – Semi-structured focus group guide

Study Title: Factors perceived to influence Irish clinicians' and athletic therapy students' self-efficacy in concussion assessment and management.

Aim: To explore the factors perceived to influence the Irish athletic therapy students' self-efficacy in concussion assessment and management, utilizing the Social Cognitive Theory triadic model of reciprocal determinism and general self-efficacy sources.

Opening Statement:

Thank you for joining me today for this focus group discussion. I would like to start by reviewing the study procedures with you. If you have any questions, please feel free to ask. The aim of this research is to explore the factors perceived to influence the Irish athletic therapy students' self-efficacy in concussion assessment and management. We are looking to explore the factors that make it harder or prevent you from becoming confident in concussion-related patient care and the factors that make it easier for you to develop that confidence.

During our discussion, I am interested in understanding your experience of developing confidence in concussion assessment and management and the factors that in your opinion had an impact on this process. I would like you to know that there are not right or wrong answers in this discussion, as I am interested specifically in your own individual perspective. Please answer the questions to the best of your ability, and feel free to ask for further clarification or prompts at any stage. Please remember that you are not required to discuss topics that are sensitive to you, so if you feel uncomfortable at any stage, you may refuse to answer any of the questions. You may also withdraw from the discussion at any time.

Can I have your verbal consent to proceed with the recording of the focus group?

Bridging question – As a part of your professional education you were taught to assess and manage concussion. Can you tell me whether assessment and management of concussed patients is challenging to you, and why it is or it is not?

Question Guide - Section 1
Questions based on triadic model of reciprocal determinism

Triadic reciprocal determinism factor	Question	Follow-up questions if not addressed in original answer
Environmental	Can you tell me what factors you think help you feel confident with concussion assessment and management skills?	Can you tell me about situations where you think the learning environment may positively influence your confidence?
Environmental	I want you to think about your own confidence when it comes to concussion assessment and management skills. Are there any factors you think have helped in the past or would help in the future for you to become more confident?	Can you tell me about situations where you think a lecturer can positively influence your confidence?
Environmental		Can you think of ways your peers may positively influence your confidence?
Behavioural/ Personal		Can you tell me about situations where you personally can positively influence your

		own confidence? What about the things you do or think about while learning?
		Now that we have discussed the learning environment, your lecturer and peers and how you personally influence your own confidence, are there any other factors you think are important to you when it comes to positive influence on your confidence with concussion assessment and management?
Environmental	Can you tell me what factors you think make you feel not confident in concussion assessment and management skills?	Can you tell me about situations where the learning environment may negatively influence your confidence?
Environmental	I want you to think about your own confidence when it comes to concussion assessment and management skills. Are there any factors you think made it harder for you in the past or would make it harder in the future to become confident?	Can you tell me about situations where you think a lecturer can negatively influence your confidence?
Environmental		Can you think of ways your peers may negatively influence your confidence?
Behavioural/ Personal		Can you tell me about situations where you personally can negatively influence your own confidence? I am referring again to the things you do or think about while learning?
		Are there any other factors you think are important to you when it comes to negative influence on your confidence with concussion assessment and management?

Prompts for acquiring further detail:
When you say _____, what do you mean by that?
Would you mind expanding on your thoughts on _____ more for me?
X made a really good point there, does anyone else have anything to add to that?
I can hear some really interesting thoughts/comments here. Would anyone like to add to this topic?
I can see this question is not straightforward for you. What is the first though that comes to your mind when you think about _____?

Question Guide - Section 2
Questions based on general self-efficacy sources.

Source of self-efficacy	Question	Follow-up questions if not addressed in original answer
Mastery experience	What do you think is the value of practice in the development of your confidence in concussion	Can you tell me about situations where you think practice could allow you to become more confident?

	assessment and management skills?	Can you tell me about situations where you think practice could lower your confidence?
	Thinking of your past experiences, what impact on your confidence had ability or inability to practice skills?	In your opinion, what conditions related to practice are important for developing confidence? Can you think of a way time of practice impacts confidence? Can you tell me what impact the location of practice has in your opinion? How do you think the presence of others during practice impacts your confidence? Is it a positive or a negative impact?
		What do you think would happen to your confidence in a skill if you did not have a chance to practice it?
Vicarious experience/Modelling	What is the value of observing others' performing skills in development of your own confidence in concussion assessment and management skills? Thinking of your past experiences, what impact on your confidence had ability or inability to observe others demonstrating a skill?	Can you tell me about situations where you think observation could allow you to become more confident?
		Can you tell me about situations where you think observation could lower your confidence?
		In your opinion, what conditions related to observation of others performing a skill are important for developing confidence? Can you tell me how important you think for your confidence is who demonstrates the skill? Can you think of a way time of observation can impact confidence? Can you tell me what impact the location of observation has in your opinion? Is it a positive or a negative impact?
		What do you think would happen to your confidence in a skill if you did not have a chance to observe its demonstration?
Verbal persuasion	What is the value of verbal encouragement from others in the development of your confidence in concussion-relevant skills?	Can you tell me about situations where you think verbal encouragement from someone would allow you to become more confident in a skill?

	Thinking of your past experiences, what impact on your confidence had presence or lack of verbal encouragement from others?	Can you tell me about situations where you think verbal encouragement from someone could lower your confidence?
		In your opinion, what conditions related to receiving verbal encouragement are important for developing confidence? Can you tell me how important you think for your confidence is who provides the encouragement? Can you think of a way time of encouragement impacts confidence? Can you tell me what impact has the environment in which you receive encouragement in your opinion? Is it a positive or a negative impact?
		What do you think would happen to your confidence in a skill if you did not receive verbal encouragement from anyone?
Physiological and emotional reactions	What is the value of your bodily physiological and emotional reactions in the development of your confidence in concussion-relevant skills? Thinking of your past experiences, what impact on your confidence had realizing and reflecting on your emotions or body reactions while practising?	Can you tell me about situations where you think realizing that your heartbeat increases or your hands get sweaty as you practice could impact your confidence in a skill?
		Can you tell me about situations where you think realizing your fear, anxiety or excitement as you practice could impact your confidence in a skill?
		Can you think of situations where this could make you more confident?
		Can you think of situations where this could lower your confidence?
		Which bodily reactions do you think have the greatest impact on your confidence? Is it a positive or a negative impact?

Prompts for acquiring further detail:
When you say _____, what do you mean by that?
Would you mind expanding on your thoughts on _____ more for me?
X made a really good point there, does anyone else have anything to add to that?
I can hear some really interesting thoughts/comments here. Would anyone like to add to this topic?
I can see this question is not straightforward for you. What is the first though that comes to your mind when you think about _____?

Concluding Statement:

I have now asked all the questions I had prepared for today. Is there anything you would like to add to the discussion? If anything, you said today makes you feel uncomfortable and you wish me to redact or remove it from the transcript please let me know. Moreover, if you have experienced any distress during the session or have any other concerns, please contact me at a time that suits you or make a contact with your GP. Thank you for your time and contribution to this research project.

Appendix G

Theme	Sub-theme	Codes	Context	Quote
Academic setting	Course overview	Syllabus content	Concussion-related	*I think because we're just kind of given the SCAT5 and we were told to go with that, whereas I'm hearing like different perspectives like you need to do like VOMS assessments and things like that. And we weren't familiarized with them much in college, I don't think. We did it briefly, but I think we could have done more on it to understand like why that's important. (FG4S3)* *I would say that we had. I like there was. We did run through the SCAT 5 at the time when we were learning it And ran through different assessments and how to do them on each other. We were shown how to do kind of the physiological like buffalo treadmill tests and stuff. We were walked through that and stuff. So I think, like the education side of things was quite like in depth. (FG5S1)* *I thought it was pretty in depth. I felt it could have been slightly longer. It was over the course of one semester that we had it, whereas I feel like it could have been a year long thing really going in depth just to how much emphasis has been placed on concussion now, and how much we're learning about it one semester module might not be enough, I think, sometimes. (FG5S2)*
			General workload	*I think for me, you know, it's just the level of other things that we have to do, particularly now being in our last semester in, in final year. There's so much else going on between thesis and everything else that goes with placement and case studies and all the rest of it like I would love to sit down and go back over. My concussion assessment on a more regular basis, as well as the loads of loads of other things like even basic anatomy. But I just feel like I don't have the time to actually sit down and do it. (FG8S3)* *I think our minds are so full at the minute with other huge aspects to our final year and I feel I'll actually finish up and only really see a blur and want to look back over so many things. And, but I suppose look, CPD is always there to refresh things. (FG8S1)*
		Delivery of concussion education	Variety of teaching methods	*Observing a lecturer I think it's a good part in learning about how to deal with concussion, but it's you need other aspects like you need to do it as well. You need to see it in writing. You know you need to see the evidence behind it, but it definitely plays a big part in it anyways because you can look and be like ohh I didn't realize it*

				Step by step progression of difficulty	*was done that way. I would have approached it differently, so I might ask them about that afterwards. (FG4S3)* *I think it depends on the person, because, like everyone learns differently like, I might learn better from doing it practically where somebody might learn better from watching somebody else does it and reflecting on them. So they know what to do in future. or else just throwing yourself in the deep end. So I think it just depends on the person. everyone's gonna learn differently anyway. (FG2S1)*
				Step by step progression of difficulty	*If we're doing it on classmates, you'd expect this standard then going out on the pitch, and it's gonna be either way worse, or it could be completely different on the pitch, you know. Also I think it will be important to keep it in smaller groups because some people do kind of get overwhelmed and anxious when there's so many people watching. And then they'll forget things. Or they won't ask questions where they have questions just because they're embarrassed. So smaller groups mainly. (FG4S3)* *Having an audience wouldn't help for me at all with learning pretty much anything. But uh, how to assess a concussion especially. Because it's hard enough thing to kind of introduce yourself to initially without, you know, being really nervous from having a group of people staring at you while you're doing it as well, maybe even for the first time. (FG8S3)* *The only other thing I would have added is, maybe give yourself that short time to do it in instead of if you have the hour, don't do it, you know, that's not realistic on pitch side. To have an hour or 45 min to do a SCAT6. So really shorten that down, really be able to speed through those questions and get them done as much as possible. And yeah, include that background noise, and maybe even like. do it in front of your class. So grab a patient and get 30 people to watch you. And you're put under that pressure. And you're put under everyone watching you and been like, okay, I need to be able to do this because they all know how to do it just as much as I do. So maybe that. But I suppose until you're out there on to the pitch. nothing is gonna 100% replicate it. (FG7S1)*
				Hands-on learning with opportunity of feedback	*And yeah, that's the way I learn. I and I also learn by doing, I think, more than like sitting down. And cause. II feel like with theory. There's a right in the wrong answer, and that's not always the way in practical sense, and it's not just black and white. So*

| | | | | | *practical settings definitely help me learn more and then ask and all the questions I think.*
I think myself like, you can do a lot of theory based learning and you could be the best, literally in the class. But I feel like a lot of my learning would come from being in practical situations, and asking loads and loads and loads of questions, and if I have done so, I always
and if I have done something, whether it's right or wrong. I always question it. Could I have done some? There's doing some differently, and I think, asking questions and getting feedback from like, I suppose, qualified people and people that have more experience.
(FG5S1)

I feel like in college you get so much theory and like this is what you look out for. Like there's so much kind of like overload in theory. But then when it comes to like the heat of the moment, like when you're on the spot and I player goes down, it's kind of that information. It's almost like you go blank and like rather than like I think what we would really rather do some more practical stuff on it in college, like maybe not so theory focused because like in the moment when you're kind of nervous, if it's your first ever concussion, like you're running out and you're like ohh my God. (FG4S1) |
| | | | | Realistic scenarios | *Like a real life. Like I know it's really hard to like replicate a real life scenario in the classroom, but you need like, I would have loved to have done something like the patient is on the ground and you need to go over to them and assess them that way, not just be sitting in a chair right beside someone reading off a sheet. Like I said, I would have liked to have had to not like run over to them, but go over to them, approach them in a way, and then like, maybe not even have the sheet on me and do it that way because a lot of the time when you're out in the, you don't have the sheet on you need to do what you can remember off the sheet. So it would have been nice to do something like that. And then like even have another student being like, what's wrong with him? Is he OK? Can he come back out because a lot of the time, that's what the scenario was like on a pitch. t would be nice to have done something like make it make it as stressful as possible. t's quite daunting going out onto the pitch, but like being able to*

if there was a class where you went out to the pitch and because like, you're so used to being in a classroom, where as if you were like, kind of like in the mindset of, like, hey, we're out in the side of pitch or out in the side of an Astro and you practice outside, like running on and it's a class where you bring in your kit bag, whatever. |

271

					And then get to actually assess in that environment that you will be in, because I find like I'm very much like based on like memory and like that practical learning.

And then get to actually assess in that environment that you will be in, because I find like I'm very much like based on like memory and like that practical learning.
And I feel like the classroom is obviously so different to the clinic and I feel like it would make it feel more fast paced in class if it was on the pitch or even on the Astro, or even if it was like in the athletics arena or something.

I don't know if it will feasible but actually getting someone in that has a concussion as well, and doing the tests on them and see what way
they react. I don't know. I think if you were if we actually went out and tried to get people that are concussed, I know that's hard to be done. But like just working on real life scenarios kind of might do. And because it's all well and good when I'm asking FG5S2 questions like where you're you're not doing them properly. Really, I'd say in class, you're kind of just going through one of the mill. But when you're put in a maybe the situation where you don't know the person. You have to be a bit more professional, and then they actually do have a concussion. So I think that might might be a bit beneficial. If you kind of had mock kind of case based studies. (FG5S1)

I definitely think the only way to get more confidence is to be just doing it with real life. People that have real life injuries like. Obviously like it's, it's in terms of like doing it in students led clinics or rehab classes like there are people that are actually coming with with injuries to us, or with concussion, or whatever, and I think to a certain extent, you can mimic it in in practical classes with your peers, I think, until you're trying to get real life people with actual injuries, II think. that's where you really I feel progress and then, when you reflect on that, you can progress even further and definitely, gain more confidence by doing it, doing it on like with with real people. And then realize scenarios (FG7S2)

Time provided	*definitely will be nice. If there was a couple more weeks, I think given in the curriculum to concussion management because like it is obviously such a serious injury. (FG8S3)*
	I think if we had something like that every month just to kind of recap and refresh on stuff like that, I think that would be really helpful just to see it first hand and because like it's easy to learn off what symptoms and stuff to look out for and and kind of know like questions and stuff. But then when you see it like you might approach it differently

			depending on the person. So I think like doing it a bit more in the college, like once a month or something would help a lot. Like a practical class. Kind of on just. Like pitch side safety and things like that. (FG1S1)
		Preparation for transition to placement	*Like I think I'm even just for like that first match and when we covered in the college like I think we were so nervous running on because we didn't really know what we were doing like we we never had an introduction into pitch side placement even if we were to talking about it, we never actually got to like be told OK, this is what you do when someone goes down and especially for a different sports like the main sport that I cover covered on placement with soccer and I never initially knew that and the ref has to actually call you on and you're only allowed to overrule that ref if you think it's a serious head injury and like if I like, I never knew that and only for the managers telling me that like I probably would have run without ref calling me. And little things like that for each sport, like every sport is different than just kind of knowing what you are expected to do. (FG1S3)* *Being in that environment before potentially seeing all the responsibilities put upon yourself to say, observing a medical staff get the opportunity to be in that environment without having all that pressure. So you know what that feels like, you can, you can imagine, like, okay, this is actually what's like. how can I go through my process of dealing with things in this environment before actually having to do it. So with the medical team. with a very, very busy match. Lots of say fans, lots of voices. It's loud, just experiencing that beforehand would be helpful. (FG5S2)* *I think for me the biggest thing will be maybe in college to have that kind of pitch side experience, like a class where it's outside and you're actually you're psychologically making yourself feel familiar with that situation with that environment. Whereas when you're going from a classroom, which is like kind of a safe space straight out into the middle of a game, it's terrifying.* *So I feel like that practical experience and real life situation and kind of scenario would definitely help improve my confidence going out into the pitch. (FG4S1)*
	Educator	Professional profile	*I would like to observe someone who has a lot of experience in that field. Like I would much prefer to observe like A to say someone who's been doing it for 10 years over someone who's been doing it for a year. Alright, like another student thing that like, that's what I'd prefer. And I think that it would increase my confidence to watch someone who was more experienced in it. (FG3S1)* *I think it's important for your confidence when, like, you're get to get the knowledge of someone who's an experienced clinician in the field, like they have a lot of like tricks and stuff that you can be able to like. No, this is actually a good way to do it and so forth, rather than a student who's also quite fresh like ourselves. And*

			it's almost like they're doing their best. And it's like they still have a lot more and learning to be done rather than someone who's been in the field for many years *(FG3S2)*
			I think if I observe somebody and then I learn afterwards that their credentials weren't actually that good, my confidence would drop thnm because I'm very gullible. *So I'll just believe what they say, like I'll just trust what they say because I had originally thought they were really good, but then if I learned that their credentials weren't actually that good then I'd suffer a bit. (FG4S3)*
			you'd be more confident, listening and observing someone who is well versed in the concussion, if he was dealt with concussions in the past compared to someone who hasn't if you have someone who has been playing with or being a coach to the Rugby team or a therapist with the Rugby team for 20 years, and they've seen, you know, 50 concussions, a hundred concussions compared to someone who seen none, Then I'd feel more confident listening to the opinions of the person who has seen those concussion. (FG6S1)
		Role modelling	*I even think from like a psychology point of view, like looking at someone else, doing it before you. It's like, well, if they can do it, I can do it like I'm not the only one that's going to be doing this.* *So I think as well like watching someone else doing that. What kind of reinforce: A. What you've learned But B. reinforced that like, OK, look like reinforce it a little bit of confidence like watching someone else doing it. The only thing is you might copy them exactly and if it's not exactly as their case presented, it might have a negative effect like later on. (FG4S1)*
			t the beginning, it's there's definitely value in observng your lecturer because obviously, it's a practical practical environment you have to work in. So it's good to have theory, but you have to observe someone doing it, and you have to observe someone dealing with different situations before you can start to gain the confidence to do it yourself. So I think it's very valuable to have that kind of observation period. (FG5S2)
			I think it definitely depends on how often you're observing, like, if you've seen something once, or you've seen it 10 or 15 times. Obviously your confidence is gonna increase if you've seen it 10 or 15 times, rather than seeing it just once. And so if you the more you see it, I suppose, or the more you observe the more confident you're gonna be in carrying out stuff. (FG7S2)
		Feedback	Delivery style / phrasing	*I think negative feedback is better when they say oh, you did this well, but you could have done this a bit better by kind of constructive criticism in a way. But I feel like if you're trying to learn something and someone says no, that's wrong. Like it just kind of shuts you down a bit and makes you like overthink. Everything. So I feel like we're going back to what you said about like a situation where your confidence is kind of knocked. I think it's very important for like people that you're learning from to not be condescending and not like act like they there know it all or like they are better than you in any way. And I feel like sometimes in any education like there's always gonna*

				be that one person. that like doesn't overly show you properly and then that can be sometimes why people lack confidence. (FG1S4)
				I think constructive criticism definitely like for me, is the way that I would kind of like, learn the most and like. So my confidence from the one, OK, like I did this well, but like I know I also have to go back and like and go back over a certain thing because, you know, someone has told me, you know, just kind of need to, like, work on that a bit more, which I think is a good thing. Like I I like being told what I've done wrong, so I feel like I definitely learn from every mistake I make and I take feedback on board. (FG1S3)
				I think feedback's really important, for getting confidence with stuff. Because if somebody's going to you afterwards, they'll be like, right. You did that well. but you forgot to do this. so depend what way they kind of say it. If they say it in like a constructive way. Then, yeah, you're going to boost your confidence like. But then, if they're like no, you were so bad, did that wrong, and that wrong, and that wrong. Then you're going to end up feeling really low about yourself. And you're not gonna have any confidence. So I think it just depends on what way they kind of approach you with the feedback. (FG2S1)
				Something like constructive criticism. Saying you did this. Well, you could improve on this. I think that would be quite helpful because sometimes it's it's nice to hear that kind of thing, not just being told that you're doing it well, like it's nice to hear where you could improve on without tearing you down because it is like it is difficult to do, like it's not an easy thing. So you do need to build up your confidence. But not like build it up too much if that makes sense. So like, I think constructive criticism would be helpful, but I don't think like negative remarks or anything like that about it would be would increase your confidence to all. the way it delivered is really important. Like I, I sometimes don't take criticism that well it. But it all depends on the way the person sends it to me to how I take it. So if they were, if they were to just say all the negative things I did, I'd be like, oh, well, thanks. There goes my confidence, but if they were to include something like positive that I did and something negative it would, it wouldn't affect my confidence as much. (FG3S1)

275

| | | | | Environment and relationships | *I think it does like if you're called out in front of like your peers, or in front of, like the team that you're working with, then that would definitely like knock your confidence. whereas, like, if it is said kind of privately to you it would be better. (FG2S3)*

I also have one more thing there. I also think when and where they give you feedback is important. If they do it in front of the whole class, and they are saying this was terrible, my confidence would be all the way down, and I'd feel so embarrassed, and I'd never want to do it again, whereas if they pulled you aside and they go to know what I actually think you could improve on this. I would appreciate it a lot more, and like that. My confidence will be knocked for a little bit. But then it would go back up. But that whole like group setting where there's loads of people there, and they're just pinpointing you on how bad you did something. Yeah, my confidence will be destroyed. (FG7S1)

I think it depends on the environment. If you feel you can trust the other people around you, or you've experienced those people, you know who they are. You have a little bit more trust in them. you'll be okay taking feedback because that environment you feel is safe versus a very different environment. Say, if you're new to it, or it is more hostile, just general getting criticism. You'll you'll feel worse, and confidence will get worse. I feel. (FG5S2) |
| | | | | Facilitating improvement | *I definitely would take feedback from the lecturer before I listen to people in the class just before just cause they have more experience and they're like qualified, obviously and and yeah, definitely would matter how they say it to me. Like if they said kind of in a the tell me what I done wrong with the said in a positive way and tell me how I could fix it or they like give you praise for doing something well and say like well if you had to do this in real life, you'd be grand, you know, like that type of thing like that would really be helpful with confidence I think. (FG4S2)*

your lectures and teachers and all, could really increase your confidence doing that as well, letting you just practice because practice makes perfect, like especially in this kind of environment, you need to practice doing it and giving you good tips like useful real life tips would come in handy as well, like, you know. (FG3S1) |

276

					the way that it's portrayed like, I feel like if someone was like. you're doing that completely wrong, like don't do that. And then just that was the feedback I got. That's all my confidence gone because I don't know what I'm doing wrong like. Whereas if someone was like, right, okay, so this step, you're actually doing this really wrong. But this is what you could do to make it better. Then that gives me confidence, because I'm like, okay, now I know what I am doing wrong, but I know how I can fix it as well. And so someone was giving me feedback, and they were just like, You're completely wrong. Didn't tell me why or how I could fix it. That would definitely bring down my confidence because I don't know where to go from that. (FG5S1) - understandable feedback

For, for me personally, feedback is really important because there is obviously a very practical element to our our profession. It's not just learning off anatomy, you're sticking your head in the laptop like you have to actually go out and do stuff with your hands. And I do that and if I do it on my own, I'll I'll often find myself kind of wondering, like, did I do that right? Could I have done this better? Could have done that better, but I feel a lot more confident in the technique I used if I have the supervisor there to tell me, like, OK, this was brilliant, but this on the other hand, you probably could have done a little bit better. Or you could change this that sort of a thing. So and obviously with something as important as concussion, if I'm doing something in the assessment wrong, I definitely want to be told so. (FG8S3)

| Timing | *I would say under time, and like. It's best to have it straight away when it happens. Then you can remember. Oh, well, I didn't do that rather than if they tell me a month later. I'm kind of like I don't care. That was a month ago like this does not matter any more, but I think it would help if they said if you forgot this. I'm like, Oh, yeah. you're right, and I'll remember next time, and then your confidence will go up. Cause. Okay, you forgot one thing, but you're going to remember now. (FG2S2)*

Not receveing any feedback, in short term. You'd have a boost thinking you're correct up until the point where either you, you yourself realized you're doing things wrong for this period of time, or someone else, or some event shows you're doing something wrong. and then so that short term boost the confidence completely crashes. I feel a lot worse than that short, initially feeling you're wrong, but then your confidence will improve because you feel you're doing something correct. That'd be the reverse of you having very very strong dip in confidence when you realize for such a long period. You've been doing something wrong. (FG5S2) |
|---|---|

277

		Mentoring and emotional support	*I think what would be a good idea to have a talk with us about gaining confidence. Because I feel like we're thrown in the deep end a bit. We also weren't taught how to deal with like teams and like club managers and everything like that, or like coaches and stuff like we were never taught about how to deal if someone is like mistreating you or like not listening to what you're saying. teaching them how to like put up with a bad manager or like not to take like, you know, bad behavior from them. (FG1S4)* *When I was coming on to placement last year, I was told by the physio who I was taking over from, you know, don't pass heat to what the manager is saying at the end of the day, if you think a player is injured, you're the one that has to tell them to come off and like, don't be listening to them. They can kind of knock it angry because they can be really passionate about the game and just start kind of taking that out on you. If they want their player to continue to play but you think it's not something, you take them off and just kind of don't take personally what they're saying to you. So, I was glad he told be, I was confident enough then. If I didn't know that beforehand, I probably could be, like really intimidated and my confidence could probably be knocked. But this was my experience for all college placements before, yet we did not learned how to deal with it in college, I only just learned that on placement. (FG1S3)* *When you're coming out and you're just a student physio, usually you're dealing with like male coaches like in their 40s and 50s. So I think you need to know how to also stand up to coaches, but keep professional as well. I think we just need to be taught how to deal with others in those situations. (FG1S1)* *Especially if they're keeper has gone down with the concussion, they're kind of just trying to play it down a bit and you have to stand your ground. It would be like really helpful to be talked about in in college. Just how to like deal with like managers who are kind of angry and like one want their key players to stay on the pitch. (FG1S2)* *hearing from someone who's done it before, say, yeah, I was there. This is what happened, and I just said, okay, I'm gonna take the safe option and just play it safe I think that's like important to hear in terms of your own, confidence that. (FG6S1)*
	Peers	Observation of peer performance	*if I was watching someone else do the concussion test. And they're doing everything off. And I'm thinking, oh, I forgot to do this. I never did do that kind of thinking. Oh, I don't really know anything about concussions, and the confidence would be knocked then. But, like FG2S1 says you think. And then. okay, I need to remember to do this next time. and if you did do it next time, then the confidence would be up. While In the moment. If you're watching someone do 10 things that you forgot, your confidence would be knocked. (FG2S2)* *Like just say they did something that I didn't do. It might make me think. Ohh I didn't. I think of that and it would like, affect my confidence a little bit. But then again on the other, on the other hand, if they went out and didn't do something right, it would. This sounds terrible. Increase my confidence in myself a bit because I know*

			that I would do like a better job, that's not a good way to put it, but that I'm able to do it at a higher standard than they can. That would increase my confidence a little bit. Does that make sense? (FG3S1)
			Peer observation I think it would impact it. I think it might impact negatively, depend, well, it depends on your own confidence in yourself, I think if you weren't very confident in assessments, or maybe you haven't done your due diligence in learning. Then. seeing your peers being able to do things more confidently, might make you a little bit more reserved or less sure. But in the same way. I think that when people who have gone through the same education as you are confidently diagnosing concussions and getting it right it would give you confidence in yourself too. You would be like, okay, I've learned exactly what they've done learned, I'm in the same spot, I'll be ok. (FG6S1)
			I suppose if you're kind of like watching another peer do an assessment. And yeah, like that, if you were kind of like oh, I would have done this differently. But maybe what they're doing is better. And then you you might kind of doubt yourself. that would maybe make me lose confidence, but then I kind of also take it as an opportunity to look at them and see how they're doing it and like, try and learn from them. That makes sense. (FG7S2)
			I think if I saw a peer.do something, and they were better at it than me, I would lose confidence. Just because we've had the same time to practice it. And I look at them, and they're miles ahead, and they're so much better my confidence would drop, seeing that. Probably because I put a lot of pressure on myself. But, I would compare myself to my peers quite a lot. So if I felt I wasn't up to scratch your standard as the rest of everyone, I would feel, my confidence would be really low. And it would just doubt me in all aspects of the course. Not just what we're doing at that moment. (FG7S1)
	Peer feedback	Delivery style	I also think it depends on the peer like some people are really competitive and they would point out if you're making a mistake whereas other people like they wouldn't care. They wouldn't even notice, so peers can have different impact on you. (FG4S1)
			think it depends on how the feedback is given to you.
			Like I know when our like groups in the class, like the groups that you're in would be saying, oh, this is how like I learned it in another class or just showing you things that they've like researched outside of the class. So I think it's how the feedbacks delivered to you where they're not making you feel kind of little for not knowing if they're kind of bringing up with them. So I think that's important on how it's delivered. (FG1S1)
			If it was one of my classmates giving me feedback that I'd feel like they're judging me and kind of like knocking me down, it would affect me more negatively than if a lecturer said this. Like oh, how how did you not think of that? Like almost making me feel stupid. So I think it depends on the peers in the class as well. Like some people come across as, it's like constructive criticism and it's intentional and all they want to

				do is help you. Where's other people come across as the feedback is like you're not as good as me. Like they're just being like over competitive. So I think it's how they deliver it as well. *Like some people are really friendly and really approachable.* *And like if they give me feedback, I would go ahead and ask them more questions on the feedback, whereas other people might give me feedback in the class or whatever, and I'd immediately like go into a shell and then just not say single two words and then I eat myself up over that like I take it really personally. And so I think it's how the feedback is delivered then as well. (FG4S1)*
			Relationship and academic ability	*I think it has a lot to do with whoever's giving you the feedback in the sense like what your relationship is with that person, because I feel like when it comes to, like, different personalities and different traits, some people get on more than others. And whether or not you have a good relationship with the person who's giving you the critique, because I feel like sometimes, like, if you don't necessarily get on with the person or like your way of thinking is not necessarily always aligned, there may have been a bit more like the criticism or like constructive criticism might be taken differently to whether with someone you've been friends with for years and like, you could tell each other everything. I feel like when they give you criticism, you might be like I feel like you might interpret it differently or like not analyze it as much as someone like more of an outsider saying it to you that you don't really have, like, a personal relationship with. (FG3S2)* *Yeah, I would value it. But in my opinion it would be valuable in terms of. Like there's always people in the class who are better than you, and then getting their opinions would be probably more valuable, whereas if there's people, you know are. they might not put as much effort into learning, or if they're at the same level as yourself. Then maybe you wouldn't value it as much, and you wouldn't be as confident in the information. and then you'd still go and double check it, but You'd always have to check the information they're giving you to make sure that it's right. I don't think it's a good idea to take just from your peers, anyway. Information, unless you go check yourself, cause they could be wrong. Same, I could be wrong, you know. I'm still in college and still learning. So there's a high chance that they could be wrong, just as*

				wrong as I am, so that'd be my only issue with confidence towards it. I wouldn't be as confident compared to some one who has been doing the job for 10 years. (FG6S1)
		Learning support		*I feel like like I think you're always gonna hope that they have the same similar idea on how you should be doing it. And I suppose you also need to have the confidence that if you see something that they're not, you don't think they are correctly doing it correctly, that you should probably either go and assist them or just ask them for like, I don't think you should stand by either. If something happens that not necessarily was your player to act like, go over and assist. If they need (FG3S2)* *your peers can really like influence your confidence levels and doing this kind of thing like they could really increase it by letting you practice doing your concussion assessment on them and like take it in turns. All of that kind of thing. your friends, can like really increase your confidence at times like you would you see them more than you see your lectures. You're in class with hem every day, so like having them have confidence in you would increase your confidence in yourself. That makes sense. Like if you're practicing on them all the time. If they are like you're doing a good job. You're getting the assessment right. You're ticking all the boxes that would like make me more confident going out into the pitch to assess someone for concussion. (FG3S1)* *Yeah, I think that increases my confidence as well. And like knowing they know something that I should know, then I can quickly go and like, OK, I need to focus on that and I can learn that. And I find it easy like to talk to anyone and just ask them, like, can you show me how to do this? If ever, like you know, practice it for exams. Like, I feel like we're going to come together and kind of doing the on each other and if one person, you know, learn to differently, we can kind of like show each other a few different ways of, like, doing something like depending on what it is. And I find I I learned quite well of Other people in my class. (FG1S3)* *I feel like it can, like, impact you in a good way if like you can learn from each other and learn from other people's experiences. I feel like then you can might be able to be like ohh like that's a good way to look at it. Or that's a good like bit of information that like you can take on board or you can also be like, oh, I didn't know that I could. I should probably go over that and so I feel like as long as you don't like, say, to yourself, oh, like I should have known that or like almost like self doubt yourself in it. I feel like it can be a positive thing as long as it's not someone like correcting. If you're every move or correcting everything you're doing, because then that can like negatively impact how you like go about it and feel like a bit kind of like cautious probably about how you're doing stuff. But I feel like there's two sides to it, but I think learning from other people is always a good thing. If it's in the right way, if that makes sense. (FG3S2)*
Clinical placement	Environment and set-up	Sport type and level	Protocol differences	*I'm with the soccer and it's sometimes challenging to know when you have to kind of overrule the ref and like not wanting to step of his toes, because I feel like he's the one that has to tell you to come on, but you are allowed to run on if you do think it is a*

281

serious head injury, but it's kind of hard to judge that when you're just on the sideline. If the players on the other side of the pitch so, I can kind of have my confidence to say OK, like I can run on, if I assess him and it is not serious will then at least I kind of took the approach to make sure the player was OK first and just having that confidence like within like the club or within yourself to just know when is appropriate to run on and kind of overrule that ref, if he's telling you not come on. But it can't be quite daunting at the start. (FG1S3)

in the Rugby you've got the IRFU graduated return to play program. And so as in like, it's the same program across all of Ireland, essentially for a concussion. whereas in Gaelic, probably just all have got a head to head, I'll see how I am in a few days. There isn't really like protocols. Say that they're like Gaelic Association has out for the club, so I suppose, treating it like you could. It could depend on the coach as well like you have one coach, and they'd be happy for you to follow the 21 days or the 23 days depended on how bad it really is, and your confidence would be fine with that, because you're being listened to, and then you could have another coach, and they'd be like, oh, no, he's fine to play in 3 days, and then you're like your confidence is just kind of like knocked down to the ground. Then you're like, you're not listening to me. (FG2S3)

I just kind of say, probably.if there was like the way rugby has, like a protocol. That's the whole country follows. If, like all the different sports organizations, or even just the clubs themselves, kinda like there was somebody that educated the players and other coaches managers about concussion, and explained to them like right if we suspect concussion. These are the steps that will be followed kinda like, FG2S3 said, like the visual to kind of show them. Just so, even if it did happen then they'd be like they could think back in that thing, or the managers wouldn't be like, Oh, yeah, like. they're just potentially had this. And they're meant to go through all the stages and they didn't so they can hardly go straight to play already, like it might just kinda make it a bit clearer for everyone else, so that they know where you're coming from. And they're not questioning you so then you feel a bit more comfortable going through the whole process with it. (FG2S1)

Yeah, there's definitely a lack of protocols in amateur sport and like non professional sport like just in general, every clinician you'll meet on site, the pitch has their own thing that they do. So like a standardized one would be very helpful and like a tick the box so you know exactly what you're doing. Everybody does the same thing. Would be really helpful and once you run through that whole protocol, you're confident to say

282

				I've done a complete and thorough assessment of this player and I can then move on to your decision of what the next steps are going to be. *(FG3S1)*
				with rugby actually, now that you're saying it, there's such a strict protocol there that like it, the only decision on like you is, whether to take them off pitch or not. It's literally they're getting off the pitch. They're having a HIA, and if they don't pass they're not going on, and it's not like all that pressure is on you to take them off the pitch, cause. There's just a strict protocol there, I think, when there, like, when there is, as I say and like when you have steps, the set procedure that you're doing, you probably would feel more confident (FG5S1)
				The variety of protocols makes me second guess myself, because even look at them like the IRFU have a 21 day ticket laid out protocol. Then you look at world rugbys and it's much less laid out. It's 48 hours rest at start and then seven stages, minimum 24 hours between each one, and it's much less controled than even the IRFU, which makes you think like what's going on here. Then the GA have a seven day protocol minimum. So it kind of makes you think what is actually the best and where should we look for the best information regarding a protocol? (FG8S2)
				I'm on placement with a with a soccer team and for the life of me I haven't been able to find a protocol for the FAI in the same way that the IRFU would have, or the GAA would have now. Obviously. Maybe I'll just wasn't looking in the right place, but the absence of that in my experience so far has definitely played into the confidence that I've had around it. (FG8S3)
			Concussion awareness and attitude differences	*In Gaelic if a player get a knock to the head they might be less likely to come off or to listen to your advice. whereas in Rugby, because concussion is more prevalent, I suppose, and there's more research done about it in Rugby. And they are actually more aware of those and they'll be more honest with it. whether they're experiencing like symptoms or not. working with the 2 like the Rugby and the football. I definitely be more confident in like diagnosing and treat concussion in the Rugby just because it is more understood, and I suppose there is more awareness about it. (FG2S3)*
				Like I think especially with contact sports, there's more like more players and more aware of the fact that they could get concussed to an extent that they're more used to the whole process of it, whereas like individual sports or not as like very like because like rugby hurling, there's a lot more contact than like the likes of like running or sprinting and athletics. So it's different I think. (FG3S2)

| | | | | *The Rugby ice hockey, American football players understand that they're a higher risk. So they they can more easily verbalize a change. And they're like, okay, I know concussions are more common in my sport. I know this is how they usually present, so they can notice that change a little bit easier versus say, a figure skater, a gymnast a swimmer. (FG5S2)*
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in Rugby I worked with males, and they don't like the word head injury, and they don't like the word concussion, so they nearly brush it off. You're trying to do. Say the Maddox questions with them in a roundabout way that they're not suspecting that you're doing a head injury or HIA on them. Cause a lot of them. If if I ask them if they're dizzy or not nauseous, they kind of answer that. But then I'm like any head pain like they're straight into like panic mode. No, no, I'm fine. There's no concussion. So I find Rugby players are very difficult to diagnose concussion, because they mask their symptoms a lot more. they knew the timeframe out of sport if they were diagnosed with it.
 (FG7S1)

I have been working a bit more with rugby players at the minute and I definitely find that if I was to compare the level of seriousness that's given to concussion in both sports, I think in rugby it's definitely taken a lot more seriously and for me working pitch side then I have so much understanding from coaches when I make the call on concussion, we are in mutual agreement that the player is coming off with a whiff of a concussion, whereas in GAA there isn't so much information around it. And so therefore, the coaches don't see the serious as much. And then there's kind of a, I suppose, a disagreement then between taking the player off or leaving them on the pitch. (FG8S1)

I have predominantly worked with male GAA teams and I have kind of found that. Yeah, maybe. Like, if I suspect the concussion, they're more like reluctant to maybe admit to it, or kind of like, come off for an assessment like that. They're they're like, no, no, I'm fine. I'm I'm fine, and you're like literally like trying to have to drag them off. (FG7S2)

I also think as well like you mentioned status before, like if you're working with like this C team in soccer, they couldn't give a holy huh what happens to them. They're like it. Just give me a bit of magic water and like I'll be grand. Whereas like if it's like the senior first rugby team and they're coming up to like a cup final or something, they're gonna like, I think second guess you all the time because they want to make sure

284

| | | | | | *they're 110% for that game. So I think it completely depends on how seriously they take their sports, how seriously they take their health and fitness, and how seriously like or like what status they have at the game. Are they like on like the best team or are they the team that's just a bit of fun and a bit of like like banter? (FG4S1)*

Junior A with the lower level teams, they usually listen to you. It's when you get to the senior levels is when they don't listen to you, probably because the senior levels they take it (game) serious, more serious than the junior junior C teams. Maybe when you see, they just don't want to risk it as much. Maybe they have.
jobs, or whatever. I think even the players might find like at a senior level. Okay, they might get the call up to say, like county or stuff like that, or with rugby in AIL (All Ireland league) or if they're playing a junior match, and they play really well than they could get the call up to the senior team. I think there's probably that stake, whereas, like football anywhere like, junior, it's more people who enjoy the sport. but aren't too fussed about progressing and developing on to my bigger and better teams. So I'd say they're probably more cautious. Okay, like, I have to go and actually work my 9 to 5. I'm not gonna be a professional. Clear Whereas senior. They probably are more unlikely to see it like that. So they push themselves further, not just with concussion But we're any other injuries as well. They try and play on and just keep going really. (FG2S2) |
| | | | | Concussion incidence | *And I think it matters as well like what pitch side placement that you have like, obviously rugby, you're gonna see loads of injuries. You're gonna get to loads of things, so that would boost your confidence because you'll be doing more and practicing more. But like if you're with like soccer, where there's kind of only foot injuries or, like, does not many serious injuries really like you're not getting that exposure. So you wouldn't if you then go to rugby club, maybe yourself to work, you're not gonna be as confident then because you don't have that experience in that environment. (FG4S2)*

I think it depends as well on the sport like as if I said earlier, like if I was to go into a rugby situation, I haven't covered a rugby match yet and I feel like if I was to go into that environment, I'd probably like.
I would be like shivering with the nerves, like waiting for some massive injury because, like, rugby's known to just be so injury prone, whereas like going into the likes of like a soccer game where like realistically like you're not going to see anything like absolutely like catastrophic. (FG4S1) |

				I think it depends on what sports you interact with. Say, as far those that Have a higher incidence. Rugby ice hockey, American football. If you've exposures to those sports you'll get a little bit more confidence. (FG5S2)
		Type of exposure	Degree of pressure	*Like when everything happens all at the once, it's so mentally exhausting that by the time a concussion comes around when you need to be so sharp and focused. You're kind of like ohh my God. Here we go again and it's like trying to actually get the mental kind of like fatigue out of your brain, if that makes sense and like, then start focusing again. (FG4S1)* *For a lot of the say Gaelic games. you'd be in the dressing room with the team, whether they'd be male or female, and you'd be in the shower area. So most of the time the whole team can see you while you're assessing a patient. And although I might be confident in my skills when you've 30 players staring at you, assessing one patient, it does begin to make you doubt, or even just get a bit nervous on the spot, being like. Oh, I'm not sure what to do next if something unexpected pops up, whereas if you're in a clinic setting, and it's just you and the patient, or even one more person. I feel like I'd be a bit more at ease. And then I have time to kind of go through everything like, or also when there's a team, and that, you see, there's a line of people that want to see the physio before game or before training. And you've like, Oh, my God! If we need 20 min to get through 10 people, how am I gonna do this? That would kind of make me doubt my skills or not give a sufficient exam to the patient. So whether I did enough, I'd be questioning myself then afterwards. (FG7S1)* *Yeah, I suppose there's a bit more pressure. Because the final call is down to me at the end of the day, and if I make the wrong decision, if it's a final or a semi final, it's big match, and I'm pulling one of their important players. I suppose it puts pressure on me. but at the end of the day I need to stand by my decision. If I think it's not right for a player to participate in the match. (FG7S1)* *Particular match like with a match, we've had a couple matches where we had good crowds at them and kind of the crowd noise on the field and obviously every looking in the match is still going on around you and obviously with a head injury they often stopped the match. So for concussion and help a little bit, then you still have, everyone would say all the players, referee everyone looking at you trying to get a sense of what's going on, pressure from management. So I definitely feel like that would lower your confidence, like the chaos definitely makes everything less controlled, than you would want for concussion assessment. I guess so. (FG8S2)*

286

| | | | | Environmental distractions | *when you're out externally or on placement, you've got various distractions like you could have people coming in and out of change rooms. You're you're trying to do a proper assessment on them, and they're getting distracted by oh, I need to call my mom's waiting outside and things like that. And so I think this was doing outside in the real world is really where it tests your competence. (FG2S3)*

You do like your SCAT5 and all like, it's really hard to do that on the side of a pitch, especially when there's, like loads of people all around you and they're like, can he go back on, can he go back on? He's fine. And you're like, I need to look at him. It's really hard to do that on the side of the pitch. It's really hard to do it like to go through your own. Like what you're supposed to do with the concussed person when there's someone in your ear being like keys. Can you go back on? He's fine or the player himself is looking at you and his eyes are like God all over the place and you're like, he's fine. I'm like, let me do my thing. Let me do my thing and leave me do my job without you telling me he's OK, you know, because I feel like that does happen, sometimes. people asking can he go back on and we do need a couple of minutes to do a concussion assessment, of like peace and quiet and not all this distraction like you need the injured player to focus on you, not everyone around him. Would be a lot easier to do your assessment and do it right in a quiet environment, away from the noises and like just match the match in general because they get crazy sometimes. It would be a lot easier to do the assessment. (FG3S1)

You can't do a thorough examination on a pitch or in the middle of a game. I don't think you definitely need a quiet room. Where there's no distractions, and you can sit down and you can think. And you can make sure you're doing everything right. And that environment is important. You. Also, you do also need to have a certain level of confidence in your on the pitch care for the case of someone does have what looks like a head injury or a contact that looks like a head injury. And you can run over. And you have 5 questions you can ask. And you know. Okay, well, there's likelihood of having an injury like you need to be confident that as well. But for the full assessments, diagnosis. I think a quiet room. away from distraction, where it's either you and the athlete, and then maybe another person to help, or just you to to you to deal with the situation. That's probably the best environment (FG6S1)

For me, in terms of the environment affecting my confidence and I'm lucky to have fairly good facilities where I am on my placement, but has not been always like that. when we did some concussion assessments last year just because of the volume of |

287

					players that were there and the volume of treatment that was happening. I wasn't always able to do it today like 1 to one and a room. There's there could be a lot going on, say in the physio room or in the rehab room where there's a couple of other people being treated for different injuries. There's a conversation happening. Uh, the other side of the room, there's people coming in, in and out of dressing rooms outside in the hall. And just that environment of being kind of very busy and noisy and and people being around, it's maybe not the best I would say in terms of like allow me to just sit down and focus on assessing the patient and that would maybe affect my confidence in terms of did I assess this player in the best way that I could have done or did I miss something? Or forget something because I was rushing there because there was so much distraction around. (FG8S3)
				Concussion-related responsibilities	*Well, I've never got to kind of carry out the whole concussion assessment like the aftercare or the steps you'd take, like two or three days post concussion. And because when it's teams like you're just covering for and then you don't really get to see those players again.* *So I kind of get the initial assessment and kind of like the Maddox questions, and then I wouldn't get anything else after that. So I think I need to see a bit more of how to like finish a whole concussion assessment to kind of put my confidence up a bit more. (FG1S1)*
				Frequency of contact with the team	*I've worked with certain management before. and once you develop a relationship with them, and they find that they can trust you. They let you make all the calls they come to you when they ask you whether it's a head injury, hamstring strain, whatever it is they come to me and they go. Can't she play, can she? Not? I want a Yes or no. I'm not gonna go behind your back, and I'm gonna play the player, anyway, even though you said no. So I find that can take time. Those teams that you just kind of pop in and out of, and you just cover every now and then. They don't really trust the the physio on the day. I don't think to make decisions, whereas those that I've worked with for a whole season would be very confident in. Okay, whatever FG7S1 says or whatever the Physio says. that's what we're gonna go with. And we're just gonna have to trust that she's making the right decision. (FG7S1)* *it can have an effect where you know. If you do, if you're if you're really close to the team, you've been working with them for a while, you know the athletes, and it's say there's a big game coming up, or it's a championship match. You don't want to let them down by telling them that they have to stay off. So I don't think it's a matter of confidence is just more of a matter of the like emotional relationship. You have them*

288

				and not wanting to let them down, you know. Yeah, you have a sense of. and you want them to do well, and you want them to perform, and you are there to help them do that, and you don't wanna let them down but I don't think it should affect confidence in terms of diagnosis. (FG6S1)
		Cooperation and authority		*When you look at like the younger players, even some of the guys who were under fourteens and they're real like tough guys like, yeah, like, kind of grunting and they kind of like grunt at you and like, not really like at me or whatever. They wouldn't give me much. Where's then? As soon as I supervisor comes in the next day and he assesses them, they'd say so much more and it's like information they never told me and it's like, they're like a different person. So I think a lot of the time it actually can be male versus female therapist working with a male versus female sport and I I yeah, I just. Yeah, I think as well it also depends on sport like I feel, yeah, that's my opinion. (FG4S1)* *Maybe with younger patients it might be a bit more. I don't know why I would feel like more.* *I don't know. I feel like cause, as we said, it's so subjective that maybe they won't be able to* *portray how they're feeling. And there's like these hidden like symptoms that we're not seeing with younger people. (FG5S1)*
	Patients		Sex and age	*I think with males players it can be more challenging than females, they don't always listen, if you're doing, recall for words or recall for numbers. They don't always listen to it, but it doesn't necessarily mean they have concussion if they can't recall it, they just kind of seem a bit sidetracked and their mind is elsewhere. Not as in like concussion but they're just like, Oh, I'm thinking about what I'm gonna do afterwards, or like, who else is in this room with me, or and they're not really listening to what you were saying. Some males are fine, but those that kind of like lack attention to detail, maybe, or kind of something like that. They tend to find it difficult to recall where it's in sentences, because SCAT5 and SCAT6 can be very long. So to keep their attention on something for 20 min. They're kind of like, righ? I'm done. Let me go. (FG7S1)* *I think as well because we were working with people under the age of 18, most of the time like because it was the Academy.* *So there was the odd kind of 19 or 20 year old, but usually it was under 18. So I don't know. I just feel I relate to them a lot more and I can understand them a lot more and they aren't as sure of what we're doing. So they're not judging us. And whereas in*

					certain adult environments, like I'm with another club now and it's a rugby club, all these men and I know damn well that they're judging me. So in that area, my confidence is going down. (FG4S3)
					I think umm, if it's an all male environment it can be quite hard seen as where all female here and I don't know like they they don't trust females in sport as much. I don't think and and they don't trust our knowledge and everything. So then you're kind of like, oh, crap, I I better just do what they're saying in order for them to like me. But that's not necessarily the case. You need to do other stuff, but you don't want to because you feel like you're being judged even more than you already are. It kind of would go down because I just feel like I'm giving in to them, whereas I should be a bit more authoritative. *But it's just hard when it's a male environment and you're the only female there. You know, getting them to trust you because they can very easily just bully you into things.(FG4S3)* *Kind off, sometimes they kind of feel like, they are the same age as us, so they don't really want to listen to somebody saying to them not to play. (FG2S1)*
				Concussion-related knowledge	*It's a it's very much a double edged sword, if the athlete was educated, they will know how to verbalize to you like that they are concussed, but they also know how to verbalize that they're not concussed, like they wanna show their not concussed, say the correct things every time, even though they know themselves they aren't right, even in the case of if you have baseline testing at the start of pre season to check everything, they'll purposely do worse than that. So when they do get concussed, it'll match up, whereas obviously that's not the correct way to approach it, but for an athlete, especially for a paid athlete. It is their income. So yeah, I do. I do think there's negative and positives for patient education regarding concussion. I feel you have to be a lot more firm. Confidence-wise. You have to. You have to be confident you're making the right decisions. You have to be firm with the athlete, saying. I know there's something wrong with you, and you might be telling me something else. But if I know there's an issue here, you're coming off, so I feel you have to be extra confidence in that situation with athletes who are slightly more educated surrounding the issue (FG5S2)* *I suppose I always it is hard, I think, that they should be educated about it, because I feel like, if they were educated about it. They would understand the dangers of it. And how serious of an injury it is like, it's not just like pulling, hamstring itself, just like doing something small like this is your brain we're talking about. And I suppose, like education sometimes scares people like about like the actual realities of the effects of*

290

| | | | | | concussions can have on your long term, and even if it's not right now, when you're playing your sport when you're older. And so
I do think it is important that they're educated about it, and hopefully, if they're educated enough, they wouldn't lie about them in the baseline, that they'd want to be caught if they had a concussion and taken out. And I suppose then, if they did have more education. you probably will be more confident, and being like right well, I think you should be taken out, because this that and you can kind of explain it more in depth. Why, you think why you think they're concussed and why you think they should be removed from play, and if they have more of an understanding, they're with more willing to accept it, I presume. (FG5S1)

More educated players are more honest about their symptoms with therapists, and they are more. I suppose, wary of the second impact syndrome as well. So I think those are really just the points. I would think, and that would like increase confidence in athletic therapists. (FG2S3) |
| | | | | Type of event | Yes, training would definitely make a difference because I feel like they're more likely to listen to you during training, because they're not in middle of the game. They're not as like hyped up and stuff. And they'd be like, Okay, yeah, not fair enough. It's a concussion. Probably I need to actually watch myself, or I'm gonna not be able to play any games at all, whereas if they're in a game. All they wanna do is get through the game. So they're going to do anything to do that (FG2S1)

Yeah, I'd agree with that that. Like, if it's a training or a challenge game, there's never a problem. Then when you get to League and championship. That's when the problem begins. When you get to semifinals and finals, they don't. They don't listen to you (FG2S2)

Well, you know, if it's an important game and you're doing a concussion assessment, there can be a little resistance because they don't want to come off. If it is an important match, and it might gone under. You're delaying the match, or you might hammering momentum, but with a player being injured, you know you've you have so many eyes on you that you're maybe not as confident yourself, even if you're completely correct. But you're second guessing yourself, because the stakes are so much higher. (FG5S2)

I suppose when you're in, when something's on the line, as in like winning a game, or whatever you're kind of feeling, bit a bit more pressure on yourselves, especially when you're making the call, whether the player can play or not. I think when there's |

291

					responsibility on you kind of do lose a bit of confidence. You do doubt yourself. you do say, are you just being over cautious and not letting them play on? Or is this the right thing to do? You kind of start doubting yourself just when there's more on the line, I suppose. (FG5S1)
				Trust and rapport	*I think, yeah, that's very important. It plays into the the rapport with the patient as well, you know, if you have really bad rapport, doesn't matter how good you are doing things sometimes like it's just, it's it's not gonna work. And it's it's just not gonna be a nice situation, and they're not gonna like you. Then I might come back to you. Might. They might might not be willing to give you the information. They might not be willing to talk to you. They might. They don't want you to do the test, and they want someone else to do. So. be willing to ask them what their opinions are, and how they feel, or what their goals are, and getting that feedback is is really important as well. for your own confidence in knowing that. Okay about this person is happy to let me help them. (FG6S1)* *I would say. If you know the player. they'd usually listen to you. They'd trust you rather than if I went to a game, didn't know anyone. they just wouldn't really listen to you. So I say, confidence is higher with people that you know, they players that you know well. (FG2S2)* *I think, though in some cases like the team I know is like, it's a small area. So you know everyone, and possibly they are not gonna listen to you because they know you, they're like, oh I can play thorugh it, like it's not serious i'm, okay, like it's not gonna affect me. (FG2S1)*
				Attitude towards concussion	*if certain players, if I'm taking them off and like, I know, that don't want to come off. That's where kind of is like should I leave them on should I not. You kind of start doubting yourself. (FG5S1)* *I think it can be challenging depending on how like managers and players think that they feel like they don't take your word for someone like wanting to remove someone from the pitch. So I think a lot of the time even players are like, I'm fine. I'm fine. Even I had one person in the summer that had a bump instantly on her head and she kind of refused to come off the pitch, and so I took her off the pitch anyway. But then, like, you feel like they're kind of giving out to you for it. So I think they don't listen to like your your knowledge on this. (FG1S1)*

				when a concussion happened, maybe if someone a head injury happens like, if they don't want to come off, even if they do, like that night, you're thinking, oh, why did I do this? Did I do this right? when they asked here's nothing wrong with me like, Why are you taking me off. you kind of think? You are king of tinking did I ask everything. Did I check everything? Should I have taken them off? So your confidence gets hit that night. and then you go read everything again for next time. And then maybe the same thing will happen. Again. (FG2S2) *Yeah, I'd agree with that with players like some players would have some idea that they get a hit to the head they should come off, and they'll say it to yo like, oh, I got hit to the head. I feel fine, but maybe I should come off. and then other place be like I'm fine. I feel I might have a headache, but I'm playing on, and they won't listen to you. if they agree what you're you're like. okay, yeah, I'm doing something right like even the players themselves. If they say maybe something's not right. And I'm thinking the same thing like the confidence, Obviously higher, I think I'm doing the right thing then. But then, if a player challenges saying. I feel fine. what's the problem? I'm thinking, oh, maybe they are fine. Maybe I'm wrong, and then your confidence would be down. (FG2S2)* *I know how serious the concussion can be, whereas the average Joe doesn't, and if I tell them. Okay, you need to go home when you can't drive tonight, and you can't drink alcohol, and you can't do this, and I know they're going off home when they're gonna drive home, and they're gonna go out on a night out. My confidence if I was responsible for rehabbing, that patient would be quite low. Because I know, I'm already off to rocky start. It wouldn't necessarily beat my confidence in dealing with other patients, but my confidence in rehabbing this one sufficiently probably would. (FG7S1)*
		Relationship	Familiarity with/of behaviours and personalities	*I think it's important to know your team like if you like. I had one main team for the year and then I covered like a few random teams around the county, but I think with my own team, with some player went down, you kind of know, oh, this player is one that will tend to lie down for a few minutes when there's nothing wrong with them. So you know who not to run out to, whereas then you're covering other teams. You could be going on like as soon as you see someone fall and when it's not needed. So I think knowing like each player and how they kind of act on the pitch when if they're trying to waste time where they're trying to get free. I think that's important as well. And just so you're not running in and out like and kind of having stopped halfway and come back off the pitch. (FG1S1)*

				you could have somebody on the team that you'd be comfortable talking to, and you'd know their personalities like funny and like it could be they could be cracking jokes with you. and say, if they got like, I had an incident where a lad got a knock to the head, and I just knew he was like it was a messer. and he was kind of messing with me for the first 2 questions, and then he said it to me. He was like, No, I'm actually okay. I this then got me second guessing myself I was like. is that just his personality? Or is that his way of going about saying he's okay to not get brought off? Whereas if you had a person then that, like you didn't know as well. and they were kind. They had the same personality. But you didn't know that. Would you like treat them differently just because you didn't know that that was their personality or not. That could kind of knock your confidence. Then you'd be second guessing yourself. (FG2S3) *I feel like I would agree with FG3S1 in that sense that when you have a relation, a previous relationship with a player, it's easier to tell whether they're a bit like not the normal selves, and then also when you have a relationship with the player, they can also there's bit more like trust there that they know that what you're saying is probably correct and that they probably should listen to you rather than just someone that you've never worked with and they'd be like who are you and why do you say I can't play like so? (FG3S2)* *I think if you're with a team for their trainings and their match situations, you get to know the players. and although you mightn't get to know what their baseline score is. You'll get to know, say memory how good they are with that, what they're like on a day to day. Do they experience headaches, dizziness stuff like that? And I feel like you'll get to know the players, so you'll have a bit of a better understanding if they're acting different after a head collision. But that kind of relationship with the patients, I think, is, or the athletes is really important. (FG7S1)*
			Ease and comfort	*If you're in like, you're the team that you're covering all the time and you know all the players, you feel more comfortable to deliver techniques you are not fully confident in. (FG1S2)*
		Attitude towards the AT student	Respect and authority	*Some athletes might come in and they're like, oh, no, I'm waiting for the head of medical or whatever. And it's like, well, am I not good enough? Like, do you not think like I'm good enough for like ohh I'm coming in to see him tonight. Like I completely get it because some of these players could have been like international they could have been playing with the Irish team and like 100% get it.* *But then at the same time, like even just for them to come in and be like, ohh no look like. Yeah. No, I really value your opinions, good job. Whatever. Like I feel like*

294

| | | | | | something like that would boost your confidence just a little bit. Whereas when they kind of keep falling back like the head medical, it's like I'm giving you this advice, but I don't even think it's registering. I just think you're going like I don't even know what she's doing so. (FG4S1)

I find that as well, more with the older players on the team that would come down and be like, oh, I'm waiting for so. And so I'm like, oh, he's not coming tonight. And it's like they're disappointed. (FG4S2)

I think if I felt intimidated, intimidated by the players. And I could hear them saying, stuff behind my back, or to management about physio didn't make the right call, or that was stupid. What she did. I'd kind of start to doubt myself, even if it was the right decision. (FG7S1)

I think I'd be similar as well. It'd be just if you if you maybe overheard something that would ha! It hasn't happened me, either, but if if there was a scenario it probably would be that you have to hear someone talking, saying, Oh, that wasn't a good call, or the physio didn't do a great job here. Or I didn't have a good experience that would probably be the only thing that would. They make me intimidated or feel like I wasn't making the right decision. (FG7S2)

A while ago and I had one guy with like a really bad concussion and he like, was getting sick and everything and they like really listened to me. And like value my opinion. That definitely improved my confidence, and since then I've worked with the camogie team and the college, and there was a lot of concussions with that. So I feel like I've been listening to there as well. (FG1S4) |
| | | | | Appreciation | I think if you like to see player that next day, maybe if it's, you know, a team that you do regularly after you assess them and you know you told them everything to do and all the access to take and then they're OK the next day from like what you like told them to do given them their advice. And they like thank you for it as well. I feel like even if getting a simple thanks from players or even a text or someone off, or it can be like all thanks for that, it really helps. Like, I feel like that would make you feel a lot better about yourself and confident in the knowledge that you actually do have, even if you thought the start them off or why. I'm going to know what I'm doing and I feel like afterwards because anything back. OK, I actually did do something right. And you know, I helped someone out in one way, even if it was only small. (FG1S3) |

				for them to come in and be like, ohh no look like. Yeah. No, I really value your opinions, good job. Whatever. *Like I feel like something like that would boost your confidence just a little bit. (FG4S1)*
Other stakeholders	Team manager/coach		Support and authority	*I think some cases like the managers will listen to you when you're like, oh, I think there's a potential head injury, but sometimes nearly they would be like, Oh, are you sure they have to come off because this like, Oh, that's our best player. We aren't gonna win the match if they're not on the pitch. So sometimes I think you might be second guessing yourself like. (FG2S1)* *A manager wouldn't help your confidence as such if he was like, you can go, he's fine. You know, whereas if your manager was more like sit there, you need to be assessed, it would really help your confidence more. (FG3S1)* *I think it's more like if they're used to a male head of like medical or head physio and then you come along and then they ask your opinion, and there was sometimes you can literally see it in their eyes. They're kind of like, do you even know what you're talking about. (FG4S1)* *you can never prepare enough for a manager, especially as like a young female having a like an older male coming up to you giving out. You saying why did you take off my player? Like he's fine. Like in that moment, like your confidence, like you immediately start second guessing yourself. (FG4S1)* *Yeah, they're definitely hard to deal with sometimes cause coaches. Yeah, some coaches are great. They're very aware they have player health on the on the top of their list they look after athletes. But then some of the coaches are more based on the performance of the athletes, or you know. if it's their star athlete that you're trying to say has concussion. And you're telling them okay, they cannot pay. You know, there is going to be pushback from that. and you will hear ah is only a headache. It was only like Bang, you know, it wasn't. It? Wasn't that bad, or they're fine, they can. They're okay. They feel fine. They can play. But you have to be able to put your foot down and say, no, they can't play and let them know that. So that can be challenging. definitely challenging. And as far as confidence with it. Yeah, it can be a bit intimidating, dealing with the coach. (FG6S1)*

296

| | | | | | *My confidence on diagnosing a head injury doesn't really change, but my relationship with the player or with the management does. If I told management that I suspected a head injury, and they ignored it. And I said, I think the player should come off, and they're like, No, no, that's our best player. We're gonna keep them on. My confidence in diagnosing a head. Injury doesn't really change. But I'm also then like, if I'm working for that team again. I'm reluctant to say it, because I know they're not going to do anything about it. But it also makes me more nervous on the sideline, knowing that there is someone on the pitch that has a potential head injury, and then I get a bit worried if something else might happen, or it might progress to say, brain bleed if it was bad or second impact syndrome stuff like that. (FG7S1)*

I think I'm more confident now than I that I was like going into placement and but still left is like a really big like man screaming at you to tell you to keep their player on the pitch It's a bit daunting, I think I'll be able to stand my ground, but like it's still playing inside, I'm like, Oh my God. (FG1S2)

Yeah. Oh, I think when managers like step in and they're on your side, kinda they can see that the player isn't well, and that's possible concussion. I think that does boost your confidence because it kinda clarifies in like my head that okay, I'm not just seeing things that I want to be seen, or that I'm more cautious of, because it's a potential concussion, but that others are actually seeing it as well. And then if they go back to training, and they try to go like back to training too early, And the manager steps in, and they're like, no, you haven't followed the proper return to pay protocol. I think that, like boost your confidence as well, because you can see that there is trust there between you and the management, and there is mutual respect then I as well, I suppose. but they respect that your decision was right, and that they're following it through from start to finish. (FG2S3) |
| | | | | Appreciation and good feedback | *After like a very high-pressured situation even on the pitch to be able to have the coaches to be like you know you did amazing like you did good job like we're glad you were there for that. I feel like that would like really increase your confidence. (FG3S2)*

I was asked to do my placement that I was at the moment because I did well on my placement last year. So I was like, well, I did a good job. Then I was asked to be here. I didn't just be like, can I come with you? I was specifically asked like I was chosen to be here, so that would give me that would kind of increase my confidence. Knowing, I should be here. I'm allowed to take up the space. I'm here because I'm good at what I do, so it kind of increases it a bit. doing it like that. (FG3S1) |

		Supervising clinician	Facilitation of real-life learning	*I feel like they shouldn't be giving you the negative feedback while you're still doing the assessment. I feel like that's probably one point that I just either beforehand being like, just remember to do this, this and this or like after the assessment then go inside and say we need to go back in and do this, this and this. Or like redo this bit rather than while you're there in the moment doing it, I feel like you need to take a step away from the patient and give the feedback. Don't give the thing while you're still working with the patient. Cause then I feel like the relationship and the trust between you and the patient can be like inflicted. (FG3S2)* *I feel like there's nothing worse than almost like being told in front of a patient that you're doing something wrong, or that you should not be doing it. Or almost being like. Why are you doing that? You're like, having not done this yet or being, like almost like critiquing every move you make in front of the patient. Because I feel like even the patient then won't feel as safe with you doing the assessment on them. So I don't think that's a good environment and that will always I feel like impact your confidence then for the next time you go into a room with that person and like how they perceive you then from that time onwards. (FG3S2)* *I was on placement with a concussion specialist. I found that before placement, not that I did have little knowledge, but I definitely didn't have a lot of confidence. But seeing the tests being done and the aftercare and being with him we seen so many different types of concussion, my confidence definitely grew from that. (FG1S3)* *If you notice that your supervisor has a lack of confidence in you, you kind of fall into a subject to that, and you kind of let it in and feel as though you're not enough to do what you're doing. And yeah, I definitely agree with that point he made. (FG8S1)*
			Support in professional confidence growth	*The first things taught to me on placement was like it's OK to make mistakes. We all do it in our everyday lives. You don't need to know everything, and that you're constantly learning stuff everyday, especially like in a working environment, dealing with people and all their different injuries. So like that definitely changed my mindset, but before I went on placement, I was definitely like I need to know everything and I can't not know the answer. And if I didn't know the answer, I'd go home and I'd learn all about it. So that I'd know the answer for the next time. I suppose it's good to do that in a sense, but I won't beat myself up as much for making mistakes as I used to so. (FG3S1)*

				Hearing from someone who's done it before, say, yeah, I was there. This is what happened, and I just said, okay, I'm gonna take the safe option and just play it safe I think that's like important to hear in terms of your own, confidence that. Maybe, you know. Cause there's sometimes there's a bit of an expectation that okay, you're going to placement. You need to know this stuff. And then, if you hear from people who have. you know they've worked there, that the first few times they didn't feel comfortable doing it, or they didn't know it very well, or they didn't feel like they knew very well, but they still had to deal with the situation and try to do their best. I think that would be beneficial to hear. (FG6S1) *I think like myself and FG4S3 were at the same placement and I think we were both blessed at how like our supervisor was. So kind of like confidence boosting, he kept, like telling us like that we need to be more confident, like we actually know so much more than we think. And I remember the conversations that we used to have with him, we'd come back and we'd be like, oh, my God, he thinks were amazing and which definitely boosts our confidence. (FG4S1)*
		Peers	Informal peer-learning	*Me and FG2S3, if we seen a patient in clinic or in placement, would be like, Oh, okay, like a patient came down with a concussion. And I did this this and this she'd be telling me so then I'd have it in my head like oh, she did that! And or she saw a patient with this. So that's a possibility, too. You kinda like nearly real life case studies, even though you're not there. You kind of get the rundown of it. You kinda learn from them and it would boost your confidence because you kind of have it in your head. Then for next time, like you are learning from different people like real life experiences. And you're gonna remember, like key points like, Oh, I've never thought about that before, and that's gonna be the first thing you think of next time. Or I forgot. I always forget to do this. But you were just explaining how you did all that. So I'm gonna remember to that now, in future. (FG2S1)* *I think it's very valuable, just because. you know you, someone can approach something in a different way. You would usually approach it, or think about something in a different way, you'd think about it. So it's useful, just for in that case, to kinda combine what you're thinking of this, talk this out. Say, maybe I'd approach this slightly differently. That person approach something slightly differently. Come together, figure out the best way to do something. (FG5S2)* *we run a student like clinic in XXX, so like, we see patients once a week, and we kind of have them. and we go through rehab and stuff, and we have rehab clinic, too. So you're kind of just meeting and chatting to other people and seeing how they do things*

299

				differently, and I suppose, like making the mistakes and just kind of reflecting like. makes you better. (FG7S2)
			Shared decision-making	*when we're on, when we're on the same level with someone. It's not like someone is leading you. It's you're working together. So I suppose it does take a bit more pressure on you. You're able to talk a bit more about it about the case, get different inputs and then make a decision. It definitely will build your confidence because you're not alone making this the decision. I think I would like to work by myself to be honest. It is nice having people to fall back on. but, as I said before, this is that kind of a fake confidence that you're like. Well, I know how to manage with that, but it's only when that person's there I feel like your true confidence and your true ability just come out when you're by yourself in a situation where you've no one else to back on so. Yes, I think at the start it is really beneficial, like at the start of your career or degree. to have people there to learn from, to bounce off, to fall back on. But I think to to gauge a full, true reflection of how confident you are in doing a concussion assessment you need to be by yourself, with no one else helping you, basically, or no one else to blame, I suppose. (FG5S1)* *I think it's useful to a degree. if there's too many people, there's too many opinions sometimes. And you just get caught up in the weeds. I think sometimes of how people would approach things when they all have high efficacy. They're all correct in their own way. But* *having to deal with that many opinions sometimes can be hard. I think up until a certain point, I guess it depends on the person in the situation of having other people with you can be helpful, but up until a certain point. (FG5S2)* *I was in placement I was with a third year, or I was on my own and not that the environment was bad, but maybe the initial, the first few times dealing with a head injury, my confidence would have been low. You know it's my first few times doing it on a real life situation. If there was someone there who had a little bit more knowledge, or was a bit more educated, or was more experience then? I think it would have been a nicer environment to deal with it, because I'm not second guessing what I'm doing. I'm not worrying if the decisions I make, are gonna have bad outcomes on the athlete or the team. So I think that would be the ideal environment to have*

			someone there that can. you know, help you? For the first few times you deal with concussion. (FG6S1) *I think if it's someone that is like a peer in your class, I think sometimes it can be easier on my confidence if there's someone there, because I may be really good at one part but really not as confident in another aspect, whereas they might be great in that. So we'll complement each other really well, and when the patient goes home I'll be like we did a really good job today, whereas if I was by myself and I came across the topic or the area that I wasn't very confident in. I wouldn't feel great, and my confidence would be pretty low after that. (FG7S1)*
		Other clinicians	*I think it's like easy to and think like as a student you don't know enough. Especially, I suppose if you're covering the team and the other team has a therapist that you can tell it's been doing it for years, it kind of can be a bit like, uh, daunting, like run out on the pitch thinking like they're going to judge, like everything that I'm going to do. (FG1S2)* *If I knew I was observed by someone with more experience I would second guess myself, even though the knowledge would all be there. I would doubt what I'm doing or what I'm saying, just because they have that more knowledge. That bit more than I do. So I'd be afraid. Oh, they saw something that I did that was wrong, or stuff like that. (FG7S1)*
Student	Personal attributes	General confidence, resilience and mental health	*I guess it goes back to just general self confidence. If you if you're kind of insecure and someone says something very different to you, you might be like, Okay, well, guess I'm wrong, and you'll just completely follow them instead of potentially meshing the views. like you've thought this way for a reason, more than likely, you're 4th year, towards the end of a degree. you've you're doing something right. So you're whatever the way you've approached and thought of something is, there's good evidence in there, whereas if you're insecure and you don't have much confidence, you might scrap it all away and not believe in yourself and just follow what someone else says. (FG5S2)* *I think if you were like if you had low confidence, you'd be thinking like ohh, ****.* *Like maybe I shouldn't have taken them off pitch. And then the manager is annoyed at you,But then I think if you were really confident in assessing for concussion and you were like, yeah, they, they need to come off or even any injury like they need to come off and the manager kind of challenged you, you'd stick to your guns and you be like, you know, I made the right decision.* *Like they need to come off and maybe the manager would respect you more for that. And but I definitely think whether you have like low confidence or high confidence would affect how you deal with that situation. (FG4S2)*

			I think your general confidence affects how you are as an AT or clinician. You're not going to be really like low confidence person, and then just go into your work and be highly confident in your assessment. And if you you've done, say something wrong, There's 2 ways you can go about. I suppose it is self confidence to not just confidence in your ability as a clinician. I feel like it I know it might knock your confidence. But in another way it might be like, well, I'm gonna double check this for the next one, so I might give more confidence in like the next one to be more in depth or like, try and fix what you're doing. But it might cause people to retract and like kind of avoid also, if they were the second AT there, or there were the second medical staff, to take step back when there is another concussion. I know if you had. if you made a wrong choice in the last one. it's about resilience for the next one to go back. and getting that confidence again. *(FG5S1)* *I think as well, if you're like a if you're just if you have anxiety. If you're really anxious person, or maybe you're struggling with mental health issues like mistakes can be catastrophes for you, do you know? I think it also depends, like on a person's mental state, really. (FG4S2)*
		Awareness, interpretation of stress and coping mechanisms	*It would be weird if you weren't stressed at certain point like it just shows that like you're actually like, interested in what you're doing and like you want to do better. I feel like stress like is gonna come along with it regardless, and I feel like it's a good thing. But knowing how to control it is also important, like and. If you're getting too stressed or like I feel like maybe you have, maybe you could take a step back and like reevaluate the situation. (FG1S4)* *I think it's kind of normal to be stressed if, like there's a lot, lot of things going on like lot of people get injured at the same time or it's a really big injury like anyone would be stressed. And I think it's just important to know that and just kind of work through it and just do as best you can and like take time to know that you know the stuff and just try approach it calmly. (FG1S2)*
			I feel like sometimes a bit of stress is a good thing because that's almost like almost like you're adrenaline will kick in to be able to like kind of like take a step back, realize you're stressed and then go and just do it in the sense that, like, it has to be done, just take a second to yourself and then be like, no, let's just do the best you can in this situation. (FG3S2) *I think it's important to like obviously recognize whenever you're feeling anxious or stressed. But and like, it's also important to have ways to calm yourself down. Especially when you're in, say, when you're on the pitch side like I know myself. Like I tried to do a lot of like positive self talk and stuff like, you know, when I I am feeling like low confidence before going doing a pitch pitch side game like I'd be like no, I've*

Stress management skills

				done this before like I'm OK everything went well last time, you know and like like FG4S3 said earlier like deep breaths. As long as you have ways to calm yourself down, then I think it's OK. But like, if these feelings are new to you because of what you're doing, then you maybe you wouldn't have strategies to kind of overcome them. And I don't think by realizing them, I've come more confident, but like being able to like control them and make them go away, that would make me feel more confident because then you're back in the zone. (FG4S2)
				I think for me, realizing the anxiety is not necessarily a bad thing. I think then it's easier to rationalize as to why you're feeling it. And then you could. start to work through those those emotions of okay, this thing is happening and my anxiety levels have increased. But if you realize that you know, they looked at like in the moment like, Okay, I, this is why I'm feeling anxious. I can deal with those reasons. And if you kind of go through the process of okay, I feel this way. But I know why, and I know how to fix those reasons why. So I should not be as anxious as I am. So I don't think, if you address it in a healthy way the anxiety will affect your confidence. But that taken. If you don't address it in a healthy way that will affect your conference very badly. So I guess it is a double edge sword, I think for me, realizing the anxiety is not necessarily a bad thing. I think then it's easier to rationalize as to why you're feeling it. And then you could. start to work through those those emotions of okay, this thing is happening and my anxiety levels have increased. But if you realize that you know, they looked at like in the moment like, Okay, I, this is why I'm feeling anxious. I can deal with those reasons. And if you kind of go through the process of okay, I feel this way. But I know why, and I know how to fix those reasons why. So I should not be as anxious as I am. So I don't think, if you address it in a healthy way the anxiety will affect your confidence. But that taken. If you don't address it in a healthy way that will affect your conference very badly. So I guess it is a double edge sword. those reactions results psychologically like, if your anxiety happens, then you'll start higher, like heartbeat. You'll start sweating. So if your confidence is low going into it, I feel you're more likely to have those reactions where, if you've really high confidence, you might get a little bit just due to the situation, but it won't be as bad. (FG5S2)
			Confidence as a stress modifier	*Sometimes stress can get to you because you're just not feeling comfortable in the situation. I think they kind of go par on par, like if your confidence down, your anxiety is up, and then that starts happening. I think my confidence will be down before I start worrying. I think if I have lack of confidence, that's when I'm worrying, I don't know anything. I feel like when you're more happy or like in a better mood going into*

				things, you're more comfortable in situations, and it gives your brain more time to think, and you have less anxiety, and you're have more of a structure in your head. I know what I'm doing, your confidence definitely will be way up. (FG5S1) *I could imagine myself in a few years maybe being in some sort of state of flow where I'm not worried about my skills and I feel confident in them and it's just oh, it's concussion, OK, here we go. I know I have to do this, this, this and I'm not worried or anxious. I'm just going through the steps and completely confident in my abilities to do them. (FG8S3)* *I thrive under pressure. I love, like most people don't but for m Knowing I have the information in my head. I thrive under that, going into it and not having the information.I it'd be jittery. I'd be sweating. I'd be heart racing. I'd be shaking. But the majority of time I go into places or exams or scenarios, and I know what I'm doing, and II just love it so like my confidence coming out of that would be high (FG7S1)*
		Mindset	Approach to learning	*I think it's something you kind of have to work on yourself. Like no matter how much training you do like and for the first time you run out on the pitch is gonna be daunting. Like so, I think you just have to keep doing it and keep practicing yourself like, and just grow in yourself as an athletic therapist. (FG1S2)* *Maybe just being like a bit of a perfectionist as well, like just wanting to better yourself. Umm yeah, I also don't really like criticism easier. Like I'd rather not people tell me like I did something wrong, but like I'd rather learn from myself and then try and make it better.* *If it makes sense. (FG1S4)* *I think it's like if you don't know something like, it doesn't mean you don't know anything in every single area like we're all lacking knowledge in different areas. And like, that's completely normal and everyone's still learning. Like, no matter how many years like you've been in it and and I just keep, I think like some people, I just think they think ohh, I don't know this that means I don't know anything like I'm not where I should be like. Well, maybe just a bit more down and frustrated. Instead of thinking positively about it and like, OK, I can go and I can learn this and I can increase my knowledge in turn will increase my confidence. Then for the future and I'll do better again. (FG1S3)* *Yeah, I think you need to view it as like, well, I'm. I'm still only a student, so it's OK to make mistakes. I'm here on placement. It's where I'm supposed to learn. So like, that's*

					probably like the best way to look at it at the moment. But then, as you like, graduate, it's like I'm I'm only how many years out of college like I'm still learning, like everybody's still learning. *So it's OK to forget, like you could have your, like positive self talk and then revise over what you've missed or and like how to do an assessment in general and practice it so that you're more confident for the next time. (FG3S1)*
				Reflection and self-talk	*I feel like, maybe if I'm not so good in one area, I know that I'm better in another area if that makes sense so. And I think kind of like looking at, not just like the overall like assessment treatment rehab like. Look at each kind of different area. I'm kind of like saying, well, I know I'm good at this. That that probably helps me in terms of like with with other peers or like is why, why I don't maybe get as knocked when I see something, someone doing something differently. (FG7S2)* *In some cases you might spend a wee bit too much time thinking and then the things that you felt comfortable and confident, doing you like. Oh. was that right? Did I judge it properly? Was I did I write? Ask the right things? Did I check everything properly? Did I do that wrong? Maybe I didn't need to do that. And you just start doubting what you're doing, and then questioning, like everything you tested for and explain to them and all that. So yeah, you'd get nervous then about doing it again. Because you think you make more mistakes than you might have made. (FG2S1)* *I think it's a good way to be able to kind of like decompress and reflect on what happened to the whether or not you might have missed something. You then know if to make sure you do it the next time, or you can actually give yourself a pat on the back and be like I think I actually did that OK, nd being able to say, actually no, I'm getting better. I'm getting more confident in my own ability and then also the importance of reflection is that if there was something that say you forgot or you think you could have done a better job at, you can go and like look over your notes or go back get more information on the topic or whether or not you saw something that you've never seen before and you want it kind of being able to reflect upon yourself and your ability and try and do better for the next time. (FG3S2)* *I think sometimes reflection can also make you feel worse because you you might look back at something and be like ohh I did it this way previously and I still haven't changed. So I'm screwed like I'm not learning anything here, and then you're just self reflecting and self deprecating and everything then. So it's kind of, it can be kind of sabotaging sometimes and but it it really depends on the scenario. (FG4S3)*

				I definitely think I agree with you for like self talk in a positive way. Even if you feel like it doesn't work for you like there's no point in thinking negative in your mind. Because then you're only going to doubt yourself. *If you at least try to reinforce it in a positive way in your mind, it then might come across some way in what you're actually going to do. (FG4S1)*
			Hormone-related mood fluctuations in females	*I think it comes down to mindfulness, you know, and like breathing techniques and stuff. And you know, trying to just focus on the good things as well. And then once you kind of distance yourself from that mistake, you're able to reflect on it better then. Like once you take a step back and focus on the good things and everything like that, then you're able to look at it and be like, OK, that was actually really good that I did that there because now I've learned from it. But yeah, it really depends on your mood how long it will take. You know, like if it's the time of the month, then you make a mistake. Then you could be like a week until you recover from it just because of the hormones. (FG4S3)*
		Proactivity	Pre-match preparation	*I definitely will look over. Say, for example, in the SCAT5, it has a section on the red flags that you ask a patient just straight after an injury, or straight after a head contact. So going over there, making sure they're fresh in your head. Thought you know about it, and you can ask them quickly, and you can make sure you're not gonna get them wrong or forget any. That's important. As well. Then, knowing as well that the rest of the testing you have in your in your in your head. Anyway, you're thinking about it, you know about it, and you've looked over, and you're sure that you're familiar with it, even if it's been a while since you've looked at. I think that's really important beforehand. that'd be the main things I do kind of just relooking over the education I've been given or relooking over any any sort of information around concussion and immediate assessment of concussion. That's kind of what I do. (FG6S1)* *I double check my kit bag has everything I'll need in it.* *Especially like if I'm doing, if I like my doing some kind of concussion assessment and I have my little torch and all that I use to like look at the eyes and everything, that's like a really good tool to have, like, you know, cause on the side it's kind of difficult, and then like it sounds stupid run over in your in your head, all these different little signs and symptoms of a concussion and how to approach it and how best to deal with someone you think might have concussion and like and even through the basics like how. To decide if they need to come off and get assessed to that kind of thing and go from there. Practice. basically, before I go ahead. (FG3S1)*

					I always like to do as well. Is like go over to the opposition as well and see if they have anyone like us there as well to see if there's like even if something did happen that we both know what each of us like to do in those situations. And there's an understanding like so. It's not like when we both run onto the pitch, we're both kind of like ohh like, who are you? It's kind of nice to have an understanding between both sides of the field. What you preferred to be doing, especially when it comes to concussion and management and like serious injury. (FG3S2)
					Prep. Everything. Make sure everything I need in an assessment, following an assessment. If I need help from anyone or to follow treatment. I make sure whoever I need knows, and they're prepared as well. Say, I just have my SCAT5 whatever like pen, whatever equipment I might need. Just so I know if anything happens, I'm ready to go. I'm not fumbling, looking for something, so that'll help my confidence. (FG5S2)
				Active distancing from pressure	*Pitch side. You can get a lot of like parents and stuff shouting in, like, not just at the referees, but even like on therapists coming on to the field. So I think it's important to kind of block everyone else that doesn't have the same kind of knowledge. (FG1S1)*
					I think you need to have like that assurance in yourself that it's OK to like take those 5 minutes if you need those 5 minutes like at the end of the day, the person you're treating comes first, then the parent of so and so on the sideline giving it to you. Like the feelings of and the pressure and the environment, like the patient needs to come first rather than the outside pressure and the confidence within yourself should be like, no, I'm doing my job. Let me do my job. (FG3S2)
					I feel like again, like what FG1S2 was saying, like just realizing that no one's actually looking at you. Like just focusing on yourself and like, look, having a look right? Like even if you're in the moment, you feel self conscious that like people are looking at you look around and you know what that like. No ones actually looking on. If they are, they're not gonna know. If you do something wrong and like. Just like gaining the confidence that like you're just doing your best, like, and if someone's judging you, that's their own problem like. (FG1S4)
					I definitely learn from every mistake I make and I take feedback on board, but I wouldn't kind of only take it from like the people who I know have more knowledge than me. Well, the same knowledge or more and not really like managers or people like that, who kind of think that they know more than you. (FG1S3)

			Effort to ascertain cooperation	*You have to have a conversation with them where you sit down. You say, Okay, in the event of a concussion this is what I'm going to do. This is what I'm going to expect. If I don't have that. Then I'm going to have to say they can't play. That's for their benefit. That's for coaches benefit from my own benefit. It's for best of everybody. It doesn't matter if it's a championship match, it doesn't matter if it's the star player or whatever they just. If that's the situation you need to lay those sort of boundaries first. instead of doing it post injury. And they're saying, Oh, but it's only a small match, or it's it's only a little bang, whatever like, you need to say, okay, no. We've got this conversation, it can't happen. (FG6S1)* *I, personally. Just go back to the it's the graduate return to play. You can kind of download it as Pdf. And follow the steps. And that way. I suppose you provide the coaches, and then the athlete, as well with a visual as to where they actually are and where they're going to progress to, and then like the exit. Exit criteria as well, I suppose so, then I suppose that helps my confidence. Just so they can see where I'm coming from. and I it. I think it makes it more understandable for them that I'm not just pulling these. exercises, or you have to reach this before you can move on. out of like thin air. It's actually been proven in studies. And I think that helps me. (FG2S3)* *I think there should be maybe a a talk at the start, like whenever your season and basically being like, look if this happens, I'm given the green light or the red line, that's all it's happening. You're gonna have to find another player. If there is, if I'm taking someone off, they're not playing. And at the end of the day you kind of just have to say that you're sending off for the player and player welfare. and that you want to best for the player and and not you don't care if the team wins or loses basically and I know that's a different objective than what the managers are about but you are there to help the the players and keep the players safe. (FG5S1)*
			Structured approach to learning and practice / self-awareness	*I always like I find myself, anyway, going down rabbit holes, trying to find information and information and information, and you almost kind of feel like you're just going in circles. And then maybe you don't actually know as much as you think you do. That's kind of some sort of issue I have sometimes, with my confidence in terms of any sort of injury, not even just concussion. so yeah, I think it's it's a bit of a double edged sword, you know. You can get given just the right amount of information. and that maybe can just get you by. But then in my own head, anyway, I'm thinking of. Okay, what happens if this situation occurs and what happens if that situation occurs? And then you're trying to find that information and this information. And then you're thinking about all these other scenarios. And then you're trying to figure out exactly what to do. And then you kind of just feel like, Okay, well, I don't know what to do with this, and I don't know what to do with that instead of just*

308

				working on the original information you're given? So yeah, it's kind of that kind of cycling on. (FG6S1) *I think for me I'm very strategic in my learning like I need everything to be in a specific order that I do things like I need to write things down. I need to have pictures, then I need to observe it and listen to it, and then I need to do it myself and then I can revise back on my notes and everything will make more sense. So if I get all that done, like if I'm learning a specific topic and I get all that done, then my confidence is sky high because I'm happy.* *I'm confident I know it, but if I miss out on one or two of those pieces of learning then my confidence is way down.* *It's just my it's just the way my brain works. Like I haven't ticked all the boxes to learning something so I am not as confident then. (FG4S3)* *if you had some kind a checklist for yourself like like this happened. This happened. They got hit to the head, they have a headache, then the next week they're at this stage, and you can actually show them and tick it off yourself saying, What stage are they at. So you're not just kind of making it up, you are picking on the spot. What's right And what's wrong. (FG2S2)*
			Assuring exposure	*I found that like putting myself into so many different scenarios with like teams, younger populations, older populations, different sports. It just made me more confident in knowing how to deal with different injuries. In different sports, because they're all dealt with differently, and I think just experience. And over time your confidence just kind of it. It increases. (FG7S1)*
	Beliefs	Self-related	Knowledge and preparedness	*It probaby depends on ow much you're actually like studied it. Like if you've sat down and gone through the whole SCAT6 and studied all the questions on it, then you might be a little confident to give it a go. (FG1S2)* *You should have like Set foundations. but you kind of not stick by. But you're you, do you? You follow them? And then I suppose you have the building blocks of the evidence and the protocols that are changing constantly. As FG2S1 said, we're the rest was initially the treatment for it. and that was for like 2 weeks, whereas now is, I*

					think, on day 3, your return into exercise essentially. And then you're just building up from there, based on the patient symptoms and signs, I suppose. (FG2S3) *I feel maybe let's say if it was like an in an environment or like a situation where maybe you hadn't fully prepared for it and it kind of caught you off guard, then you might be able to be like actually, I don't think I did that great or I wasn't expecting to be there and having to deal with that and that might negatively impact my confidence in that sense. (FG3S2)* *I think it would be positive, because you know the repercussions kind of, and you know well, like, if you have all the knowledge like in your assessment. Then you're gonna be like able to assess them better. You're able to explain why they need to take 21 days out, or why they need to take 3 months out, or whatever whatever stage they're at. And I think if you know your reasoning, then you're gonna be more confident in delivering it to do the patients, I suppose. (FG7S2)*
				Responsibilities of a student-clinician	*I feel like, well, we were like before we went on placement, there was a lot of like I think almost like pressure put on ourselves to know everything and that like, I feel like once you go out that you're actually like, it's actually OK if you don't know, like no ones expecting you to have the answer. It's just whether or not you can manage the situation and try and do the best for your patient at that time. I think that's the main lesson I got from coming back off placement. That's like it's OK that you don't know the answer there and then as long as you can go back, take a step back, look back on what your notes and everything and try and come up with a solution so that when you meet the patient, the next time you have a better idea. I don't think. from my experience, the patients don't expect you either to have a definite diagnosis for them. Either it's more just whether or not you can actually even help them a little bit that day to hopefully then eventually it'll all kind of come together. (FG3S2)* *I feel like as the student clinician you are responsible in a way for how that patient like in that moment the patient isn't like to their best like functional capacity. So they can't make all the decisions on their behalf or know what's best for them at That moment in time and like you as the clinician, have the most knowledge probably there and then, you know, more than the coach knows or the parent or the fellow player like you need to advocate for your patient to be like, no, I need to do this. This has to be done. This is why you have me here. Like, if you're not gonna let me do what I meant to be doing, then I shouldn't, like, be here. So I feel like that's a part of our role as a clinician, like especially pitch side. (FG3S2)*

310

				I think so. It's it's a fine line of balancing performance, cause you're like a coach, and you wanna improve. help, improve people. And then also reducing the likelihood of injury or any sort of harm, I think the harm definitely and reducing injury, is definitely at the top of the list for athletic therapists you know. We're there to help. And the rehab injuries reduce the chance of re injury if there is an injury limit the symptoms. So I think that's definitely on the top, and that's what I would try to do as a clinician is put. If someone is injured, put their performance secondary, deal with their injury, reduce the harm, and then after that, then you can work on, bring the performance back and increasing it. But I think the main thing to worry about is definitely the the level of harm that's done. So that would be my mission. (FG6S1) *I feel like as the student clinician you are responsible in a way for how that patient like in that moment the patient isn't like to their best like functional capacity. So they can't make all the decisions on their behalf or know what's best for them at That moment in time and like you as the clinician, have the most knowledge probably there and then, you know, more than the coach knows or the parent or the fellow player like you need to advocate for your patient to be like, no, I need to do this. This has to be done. This is why you have me here. Like, if you're not gonna let me do what I meant to be doing, then I shouldn't, like, be here. So I feel like that's a part of our role as a clinician, like especially pitch side. (FG3S2)*
		Concussion-related	Awareness of concussion significance	*Umm, I personally don't think the symptoms would affect my confidence because I kind of know like it's better to be safe than sorry. Like if someone is even just like complaining of like a banging headache after getting a blow to the head and after a few seconds like or a few minutes it's not easing. I'm not going to be looking out for, well, do you feel dizzy and everything as well? I'm just gonna, like, look you off the pitch, like, and I'll do an assessment. So I feel like the signs and symptoms wouldn't affect my confidence. I'm just type person that like I'd rather be safe than sorry and then I can take them off and do a more thorough assessment. Umm. Rather than like being on the pitch, thinking about all the different symptoms, I should be looking out for. (FG4S1)* *It is one of those injuries that is very detrimental to a player, especially if they've had a few concussions in the past. So I think if get like early education on concussion, being on placement and getting something wrong, I think, would definitely negatively impact people's confidence for a longer period of time. I think it would take a long time, then to feel comfortable, saying, Okay, yeah, I'm more like I can deal with concussion, or I can assess concussion effectively. (FG6S1)*

311

				Awareness of concussion variability	*you kind of learn like the common symptoms.* *And then when you actually see it, then first hand on the pitch like they could be having different symptoms that like you kind of you don't know if they're definitely related to that or not and you kind of worry then just in case there's something else going on.* *But I think the most of them that we did learn in college, like I have seen as well in person, but then there's just one or two, maybe different ones that maybe we haven't touched on like as much, just more like the common basics symptoms you might get. (FG1S3)* *I want to keep it all in mind, but if you have a patient that has, you've seen them get hit to the head or your knee to the head, and they have not no symptoms at all. You kinda think, you know, like missing things. The confidence gets hit then, cause you kind of thinking am I missing a whole section of symptoms that I'm just not seeing But the same thing once you kind of keep an open mind like FG2S1 said. You go. You tell them if you see this, if you feel dizzy, feel sick like all that. it's not too bad. You're kind of ticking it off then. But I suppose, like there's lots of different symptoms, and every patient's kind of different that you see. So suppose. It can knock your confidence down. If they have symptoms that you never seen, if they have no symptoms at all, he'd be second guessing. (FG2S2)* *you're gonna be given the ideal situation. This is what you're expecting to do. But it doesn't happen like that all the time. and I think it's those kind of those situations where your confidence is lowered because it's not exactly black and white. and you don't know which way to go. (FG6S1)*
				Awareness of symptom subjectivity	*I don't know. I feel like with concussion. It's kind of hard to tell because like you only have the things you can see, like you don't know, like they could be like having symptoms that they can't really describe or like they can be downplaying their symptoms and stuff. (FG1S4)* *I think. it's a hard thing to actually diagnose. So that's why we have the SCAT5, and it gives us tests. And it gives us clear testing. But even that comes with a nuance like I said, if an athlete knows that they're getting a baseline done for their SCAT5, they could forge the results, for example, say with a balance test, pretend they've bad balance, or pretend they poor memory than they do, and then, when you come to your subsequent tests after an injury, then they could have similar scores. And then it's hard for you to know. (FG6S1)*

		Team-related	*I think it's important to know when you're going on to pitch to treat the player and they kind of don't know what you're doing, right? What you're doing wrong, so only you know afterwards what you've done right and what you've done wrong. So I think like fearing what other people think when they don't actually know what you've done wrong, I think and like you can't really get like disappointed in yourself because they don't know if you've actually done something wrong. Only you know it. (FG1S1)* *I think like for players and managers like a lot of them are lacking that like information like, I feel like no one really knows that much about concussion. I feel like it's kind of now studies are being done and I feel like, you know, even just information like that is so vital. How long someone's gonna recover from, but like, like players don't know that managers don't know that. And I feel like I don't know. I think they should be informed, but it's kind of hard for us when we're only, like maybe students telling that, they might not believe so. I don't know. I just think they need to understand that as well, but it's vital that they come off.* *(FG1S3)*
Experiences	Exposure	Controlled environment	*I think definitely, it's almost like a stepping stone in class. So I think if you do it in class, you're kind of making a step to be able to do on placement. So yeah, it's almost like that stepping stone. If you're going straight into placement, it's a big jump. You'll you'll definitely forget things. And your confidence will it be affected. It's good to kind of get that base in class that you kinda, okay Well, I do know what I'm doing when the real thing comes rather than just going blind kind of not having the clue, your confidence would be low. (FG2S2)* *I think they're both important, like you need to know the the base is in the classroom like you need to learn what you're actually doing and how to do it. But then it's also really important to go out and do placement. So you actually put in the the skills that you learn in the classroom to like a test and seeing if you can actually use them in the real world. So I think they're both important for your confidence. (FG1S2)* *I think that would be easier because when you're doing it on a team like it could be a bit like daunting if you know a player does have a lot of symptoms and maybe not sure if you're doing it correctly. But I think if you do it first on someone a bit more comfortable with or even see someone else doing it and sit in and observe, I think that could increase your confidence a bit more before you go out and do it yourself on players. (FG1S3)*
		Real-life situations	*I think I think you know you do it like in the classroom is just not the same as going out with a real patient, like, say, if we're doing on each other. you know, it's probably*

					not a concussion. We are just trying to remember you from the book. But then, when you're in an actual Pitch or placement. You have actually seen the concussion. You've seen the symptoms actually happen. so I think yeah, you can do it a hundred times in the classroom. But your confidence is only gonna get so high (high to a certain level) (FG2S2)
					I also think like you can do all the practice in the world. But like when you go onto the pitch like, it's still gonna be a bit of like, if this is an actual patient like this. Like, I feel like it's like it has to just go from like, straight on being like just try and do your best at this point. Like, I feel like everything kind of like you might have had an idea of what you should be doing kind of goes out the window and it's more just like you're put into the situation. So I feel like you can do a lot of preparation, but until you got experience in doing it, it's kind of like that's when your confidence actually can get better at it. (FG3S2)
					I think, when we were learning it in the classroom. because you're doing it on dummies or people that don't actually have concussions. You're like, oh, this is so easy. I have this. I'll nail this. So so then, after that, your confidence is high, because you think, okay. this is so easy. You read a few questions off a piece of paper. I got this. And then it comes to actually real life scenario, and you're put in front of someone with a concussion that may mightn't be that cooperative that might be unconscious. And you're like, Oh, no, there's actually a lot more to this than I thought there was in the classroom. so my confidence would go down. However, the more I see, like FG7S2 said it would become easier. My confidence would go up, and I'd be like, Okay, that's grand. I've seen this before. I know what to do. (FG7S1)
				Unexpected events	*I think maybe as well like if you learn at a certain way in college and then it doesn't present like that on the pitch, then I think that would really lower my confidence because like it's so fast paced being in the side of a pitch that like you're kind of looking for what you're used to. But if it's something that you're not used to, that would really affect my confidence and I would then kind of like a second guess myself and then doubt myself because like it's like not what I've learned or like again like that, like not what I'm used to. That's what, maybe what would lower my confidence. (FG4S1)*
					if something unexpected comes up. or I haven't seen something like this before. My confidence would go straight back to the start again. and then you're slowly building it back up again, and hopefully it will reach that point where it will stay up. But you're gonna have moments that you're like unexpected moments, and I think mine would be

					a bit like all over the place. If say for Rugby, it was 21 days out and you are on day. say 14, and they're not back running because of how bad their symptoms are. My confidence would probably be dropped a little bit, because I'm like, Oh, no! Am I doing something wrong? Even though it could be just the patient experiencing really bad symptoms. That's just how they are. But I'd question myself being just thinking, did I do something wrong with at start? Did I start them too early? kind of stuff like that? (FG7S1)
				Quality of performance	*Like obviously at the time when you make a mistake, it's not great, but then when you learn how to fix it and how to actually do it properly, it does give you that little boost of confidence that you would need to feel OK to assess or to treat again. (FG4S2)* *There was one case where we had an athlete, and he actually lost consciousness. I suppose, during that incident it was all adrenaline adrenaline. That was kind of kicks in just dealing with it. I suppose if you had asked me then my confidence probably would have been low did I deal with everything correctly. Was, is he okay? But then, I suppose, after that, incident, I feel like my confidence is at a high now, where, if something like that was to happen again. I know I'm able to deal with it and react to it adequately. (FG2S3)* *Yeah, I think if it happens that someone gets a head injury and that. you kind of said no, play on, they are fine. And then all of a sudden they're getting sick. they obviously have some kind of head injury. You know there is something wrong. And you're thinking. oh, I thought they were okay, like I sent them back on, like You would be thinking about this for a while, the next concussion you'd be panicking, and you'd be lacking confidence then. (FG2S2)* *If it went well, I'd be more confident. Because You've got it right. but it's still a situation of you know. Not everything is black and white, you know, everybody's a little bit different. So every assessment is going to be a little bit different. I suppose the more you do, the more you get right the more confident you can be. But I haven't seen enough I think, to say that I would be a hundred percent confident from just thinking oh I got it right the last time.* *(FG6S1)* *After making a mistake, I think I'd be like second guessing things that I've done and then I'd be probably thinking of like, say, concussions that I have assessed previously, but like God, I wonder how they're doing now (players). Did I do it properly? And I probably think back to times where I assessed someone and think like I didn't do it*

				right and then I wouldn't be as confident assessing concussions in the future, if I realized I wasn't doing it properly. (FG4S2)
		Sporting background	Familiarity with pitch-side environment	*I think as well, like it does depend on the sport and also like what you're comfortable with, like if you've grown up with like playing like soccer or Gaelic like, whatever, your whole life, it's an environment you're already comfortable in. Whereas if you're someone that maybe hasn't come from a sporting background, or if you're someone that has done a sport like swimming or tennis or something like that, you're not used to being in that kind of pitch side environment. You're still used to sports, but you're not.* *Use that pitch side. Really fast paced environment.* *I think it also like it really depends on like what you're used to. (FG4S1)* *I'm lucky enough that I am like I'm a field based athlete. So I'm used to the chaos on a pitch, to be honest, and so I don't think personally it would affect my confidence going on to a pitch and being in that situation at the minute like all the time. (FG5S1)*
			Concussion-related history	*think being involved in sport myself and seeing the impact of say for example, a concussion like I've seen a friend of mine that has been quite badly affected by a concussion. So I know the risks, I suppose, of not standing up for that player and allowing them to just play. I suppose you have to have compassion and certain amount of and emotion towards the players you know and to know that there are people at the end of the day sport isn't the be all end all, and and health comes first. (FG8S1)* *I did suffer a couple of concussions. Or, well, maybe five or six. Growing up playing, hurling and Gaelic football, and there wouldn't necessarily been a physio or a doctor on the sideline to pull me aside and do an assessment or tell the manager like look he needs to come out.* *So I suppose having that experience, uh would make me a bit stronger on standing up for someone if I think, yeah, they have had a concussion or they have some symptoms and could potentially have a concussion. And I think they need to come out and I'd be quite strong on saying that to their manager and pulling them out again. (FG8S3)*
			Familiarity with team dynamics and resilience to pressure	*I'm involved in a lot of sports myself. So I have a lot of dealings with like managers and communication that way. So I personally won't feel too under pressure by management. I feel like sport definitely is something that either builds up or takes down your confidence. But it definitely builds resilience. (FG5S1)*

				I have a strong basis in sport. So I might have developed that from kind of playing so many sports. And I agree with FG5S1, you get get a sense of resilience and confidence when you're when you know you're good at something, and you know you can perform, you can translate that to other aspects of your life. So I know I can perform at my sports, so I know I can probably perform really well dealing with this high pressure situation, because I've done it so many other times in so many different other ways. (FG5S2)
				I can take feedback in a a big group or a smaller group, cause I played a lot of sport and a lot of it is done in the team-based approach and that like, you're in front of 20 or 25, whatever, girls, and they're listening to you getting criticized. But I think if it is like beneficial to you and they are telling you how you can improve and get better, it won't lessen my confidence more in comparison to doing it one on one. If that makes sense. (FG5S1)