# Return to play following a sports-related concussion – what is the experience of general practitioners and physiotherapists managing this in primary care?

A qualitative study in New Zealand

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**Abstract**

**Background:** A concussion is a mild form of traumatic brain injury (TBI), with sports-related concussion (SRC) making up around a quarter (21-30%) of all concussions. Current guideline recommendations for SRC include advice to facilitate a gradual return to recreational and sporting activity, termed return-to-play (RTP). RTP following SRC too soon can increase the risk of other injuries or prolong recovery. The consideration of a safe RTP is a unique characteristic of SRC management that a healthcare professional (HCP) needs to integrate into their care. In New Zealand, the Accident Compensation Corporation (ACC) recommends that the GP clear a person as having recovered sufficiently before they can RTP. Given that around 90% of SRC injuries are managed in primary care, healthcare providers such as General Practitioners (GPs) and physiotherapists, have the role of managing RTP following a SRC. However, there is limited understanding of the experiences and perceptions of GPs and physiotherapists in managing RTP or their attitudes about supporting each other to deliver RTP. This thesis aimed to explore the experience and perceptions of GPs and physiotherapists delivering RTP for SRC in New Zealand.

**Methods:** A cross-sectional qualitative study was conducted using open-ended interviews among four GPs and five physiotherapists to explore participants' perspectives on RTP. Convenience sampling was used to recruit participants with at least 2 years of primary care SRC experience in New Zealand. Interview transcripts were thematically analysed using a data-driven approach to generate a framework representing participants' experiences and perceptions of delivering RTP for a SRC.

**Results:** Three themes were identified: (1) "What RTP means to me", describes how participants assess recovery, how they build a therapeutic relationship that is contextual to the person, and ensure early education to minimise loss to follow-up during the RTP; (2) "What influences how well I can help someone with RTP", describes the factors influencing RTP which

are related to professional practice, the patient, and the health system; (3) “How the context and my connections influence how I provide RTP support”, describes participants perceptions of the need for local clinician-led community education, and the need for interdisciplinary communication to be better supported.

Participants described the management of SRC RTP as challenging to perform well. A key barrier to supporting RTP was current resourcing within general practice, with limitations of clinical time to safely discern recovery or develop therapeutic relationships with the person and supporting stakeholders, alongside health workforce challenges, particularly rurally. Both GPs and physiotherapists were positive about working with each other, sharing responsibility on aspects of SRC such as diagnosis, referral to multi-disciplinary teams (MDT), and ensuring safe RTP decision-making.

**Conclusion:** Management of RTP is influenced by the context in which it is delivered and to whom. Support for an increase in knowledge about how to discern recovery for RTP is required. Sharing roles in the management of RTP was acceptable to GPs and physiotherapists but support is also needed to facilitate better interdisciplinary communication. Addressing these needs could improve outcomes for people undergoing RTP.

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## Glossary

**Table 1.**

*Glossary of terms*

| Term | Definition |
|---|---|
| ACC | Accident Compensation Corporation |
| ACRM | American Congress of Rehabilitation Medicine |
| AUT | Auckland University of Technology |
| BIST | Brain Injury Screening Tool |
| BPPV | Benign paroxysmal positional vertigo |
| CISG | Concussion in Sport Group |
| CMP | Concussion management pathway |
| CT | Computed Tomography |
| CTE | Chronic traumatic encephalopathy |
| ED | Emergency department |
| GP | General Practitioner |
| GPs | General Practitioners |
| GRTP | Graduated return to play |
| HCP | Health Care Professional |
| HCPs | Health Care Professionals |
| MDT | Multi-disciplinary team |
| MRI | Magnetic Resonance Imaging |
| PCS | Persistent concussion symptoms |
| PTSD | Post-traumatic stress disorder |
| RTP | Return to play |
| SCAT6 | Sport Concussion Assessment Tool 6 |
| SCOAT6 | Sport Concussion Office Assessment Tool 6 |
| SRC | Sport-related concussion |
| mTBI | Mild Traumatic Brain Injury |
| TBI | Traumatic brain injury |
| USA | United States of America |

**Attestation of Authorship**

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except when explicitly defined in the acknowledgements). Nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.

Colin Hancock

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**Overview of the thesis structure**

Chapter 1 provides the background and rationale for this thesis: what SRC is, why SRC is an issue both globally and within New Zealand, how SRC is managed and where RTP fits in this management process, particularly in New Zealand.

Chapter 2 is a literature review focused on RTP, the current understanding of how to discern recovery to consider RTP, and literature pertinent to New Zealand settings concerning RTP.

Chapter 3 describes how this thesis addresses the research question using a qualitative research methodology; the procedure for recruitment, data collection and data analysis.

Chapter 4 reports the results derived from the thematic data analysis, describing three main themes exploring GPs' and physiotherapists' experiences of delivering RTP for concussion.

Chapter 5 will discuss the key findings, implications, study limitations, and recommendations for future research.

# Chapter 1: Introduction

## 1.1 Research Aim

This thesis aims to explore the experience and perceptions of GPs and physiotherapists delivering return-to-play (RTP) for SRC in Aotearoa/New Zealand**,** including their attitudes to working with each other, barriers and enablers to delivering RTP, and suggestions for improvement.

This chapter begins by describing SRC in the context of this thesis, followed by a background and rationale for undertaking this research.

## 1.2 Definition

A traumatic brain injury (TBI) is defined as an injury to the brain as a result of a blow, shake, or jolting force to the head or body or a penetrating injury to the head itself, which may display structural evidence of brain pathology using imaging technology, that results in an alteration of brain function (Carroll et al., 2004). A TBI can be described as severe, moderate, or mild, with a concussion being described as a mild form of TBI (Silverberg & Iverson, 2021). TBI severity is historically related to clinical features such as length of loss of consciousness and post-traumatic amnesia following injury. Mild severity has been defined as a loss of consciousness of less than 30 minutes and disorientation of less than 24 hours (Tenovuo et al., 2021). However, with conventional brain imaging (CT and MRI) another level of diagnostic criteria has been created to further define what constitutes mild compared to moderate/ severe TBI (Sharp & Jenkins, 2015; Tenovuo et al., 2021). For example, the Mayo TBI classification system considers the presence of structural pathological changes within the brain including bleeding as consistent with moderate or severe brain injury (Sharp & Jenkins, 2015). In the case of concussion injury, no structural damage is observed, but signs and symptoms of brain injury are present (Patricios, Schneider, Dvorak, et al., 2023).

Recently, two internationally prominent concussion guideline groups, the American Congress of Rehabilitation Medicine (ACRM) and Concussion in Sport Group (CISG) attempted to align their position statements defining concussion (Davis, Patricios, Schneider, et al., 2023). The groups agreed that the terms “mild traumatic brain injury” (mTBI) and “concussion” are interchangeable terms that describe the same phenomenon (Patricios, Schneider, Dvorak, et al., 2023; Silverberg et al., 2023). However, how the two groups defined concussions differed in terms of diagnostic certainty. On one hand, the CISG definition states that a concussion is plausible without objectively observable clinical signs, but with the presence of symptoms alone. On the other hand, the ACRM definition requires objective signs to confirm concussion and until this time, the person is deemed to have a suspected concussion (Davis, Patricios, Schneider, et al., 2023). This may create confusion for clinicians in confirming a diagnosis of concussion as much will depend on the guideline protocol used; people who meet the ACRM diagnostic criteria for suspected concussion may meet the criteria for concussion according to the CISG definition. Given that this thesis focuses on RTP following a SRC, hereinafter the CISG definition for concussion will be adopted (shortened here for brevity):

> *Sport-related concussion is a traumatic brain injury caused by a direct blow to the head, neck or body resulting in an impulsive force being transmitted to the brain that occurs in sports and exercise-related activities... Symptoms and signs may present immediately, or evolve over minutes or hours, and commonly resolve within days, but may be prolonged. No abnormality is seen on standard structural neuroimaging studies (CT or MRI T1-weighted and T2-weighted images) ... Sport-related concussion results in a range of clinical symptoms and signs that may or may not involve loss of consciousness. The clinical symptoms and signs of concussion cannot be explained solely by (but may occur concomitantly with) drug, alcohol or medication use, other injuries (such as cervical injuries, peripheral vestibular dysfunction) or other comorbidities (such as psychological factors or coexisting medical conditions).*
> (Patricios, Schneider, Dvorak, et al., 2023, p. 697)

The main difference between a SRC and a non-SRC is the added complexity of the RTP aspect of function after recovery which can involve the return to activity with an added risk of falls and collisions (Patricios, Schneider, Dvorak, et al., 2023).

### 1.3 Pathophysiology

The generally accepted cause of concussion is related to axonal damage caused by the trauma to the brain tissue, leading to the inability of neurons to function normally (Johnson et al., 2013; Shi et al., 2016). The trauma leads to an inability of these axons to efficiently create action potentials in what is termed a metabolic energy crisis of the axonal cell (Banks & Domínguez, 2019; Giza & Hovda, 2014). Following the primary injury, the cell's ability to heal itself, restore physiological ion balance across its cell membrane, and resume the ability to produce action potentials requires significant energy consumption. This increased demand for energy is occurring at a time of reduced energy supply due to physiologically mediated vasoconstriction that accompanies head trauma and the increased demands for energy across the entire brain as basic brain functions are rerouted to accommodate for the dysfunctional axons (Shi et al., 2016). The limited supply of energy, yet increased demand, leads to catabolic and oxidative stress, excitotoxicity, neuro-inflammation, and the potential for cell death (Hiskens et al., 2021). Limiting the energy requirements of the brain in the acute stage of the injury is the therapeutic purpose behind an initial 48 hours of physical and cognitive rest suggested in guidelines (Patricios, Schneider, Dvorak, et al., 2023; Silverberg et al., 2020). Failure to rest acutely, limiting the demand for energy consumption by the brain promotes secondary stress to axons, prolonging symptom presentation, and may lead to chronic non-resolution of symptoms (Asken et al., 2018; Charek et al., 2020; Eagle et al., 2022; Elbin et al., 2016; Wait et al., 2023).

### 1.4 Symptomology

Signs and symptoms of concussion injury can be categorised as physical, sensory, cognitive, or psychological. All these symptoms and signs can be a result of neurophysiological dysfunction within the brain. The physical symptoms of concussion that could appear acutely include a brief loss of consciousness, nausea, dizziness or loss of balance, headache, fatigue, or problems with speech (Schneider et al., 2023). Sensory symptoms of concussion could include

blurred vision, ringing in the ears (tinnitus), altered taste or smell, and sensitivity to light or sound. Cognitive symptoms include disorientation, memory or concentration deficits, and fatigability. Psychological symptoms include mood changes or mood swings, irritability, anxiety and/or depression (Beauchamp et al., 2021). Several of the concussion symptoms can overlap between categories (Haider et al., 2020; Matuszak et al., 2016) and are also present in non-concussed individuals in day-to-day life (Alla et al., 2012; Cosgrave et al., 2023; Voormolen et al., 2019). In addition, symptoms of cervical spine injuries and benign paroxysmal positional vertigo (BPPV) can co-present as a result of the traumatic incident and with concussion-like symptoms including headache, dizziness, disequilibrium, nausea, and fatigue (Babula et al., 2023; McCormick & Kolar, 2023) and can be present in non-concussed persons (Alla et al., 2012; Cosgrave et al., 2023; Voormolen et al., 2019). The consideration of these differential diagnoses is also an important consideration, making discerning the source of symptoms to make an accurate diagnosis and ascertain recovery difficult for treating clinicians.

### 1.6 Global incidence and causes

In 2019, over 27 million new TBI injuries were identified globally with an incidence of 346/100,000 person-years (Guan et al., 2023); however, this is likely a significant underestimation of the true incidence due to data coming mainly from hospital medical records across countries. For example, in 2013, TBIs in the USA led to approximately 2.8 million people presenting to an emergency department (ED) (Taylor et al., 2017). Further to this TBI is thought to comprise 16% of all visits to the ED in the USA (Roby et al., 2024). However, these statistics likely underestimate the true TBI incidence in the USA as they do not include people who received outpatient care or those who were seen at a government facility such as within the USA military or veteran affairs hospitals (Faul et al., 2010). Expert opinion suggests the true incidence may be nearly double the official global incidence estimate, with between 50-60 million new TBIs each year (Maas et al., 2022).

The leading causes of TBI globally are falls, pedestrian road injuries, motor vehicle road injuries, and conflict and terrorism (Guan et al., 2023). Theadom, Mahon, et al. (2020) performed a systematic review investigating the proportion of sports-related TBIs across all severities and found the proportion to vary across studies from 1.2% to 30.3%, with an incidence of between 3.5 and 31.5/100,000 person-years. A meta-analysis of studies by Harmon et al. (2019) considered the incidence of SRC across several high-risk contact sports in the USA, reported that within a single season, 2-15% of all athletes will sustain a SRC. Concussion comprises 90% of all TBI injuries globally (Maas et al., 2022).

### 1.6.1 New Zealand context

In New Zealand, the incidence of TBI is 790/100,000 person-years, with around 95% of all TBI injuries being mild, with an incidence of 749/100,000 person-years (Feigin et al., 2013). This is higher than global estimates of TBI incidence which is 346/100,000 person-years (Guan et al., 2023); this may relate to both better systems for recording TBI incidence in New Zealand (Accident Compensation Corporation, 2024) and significantly underestimated global incidence due to variations in the way TBI is recorded across countries (Maas et al., 2022). In New Zealand, 21% of all TBIs are estimated to be sport-related with 97.6% being of mild severity level i.e. SRC (Theadom et al., 2014).

The incidence of TBI also varies by ethnicity. Lagolago et al. (2015) reported that the incidence of TBI among Polynesian people in New Zealand was 1,242/100,000 person-years, compared to 842/100,000 for New Zealand Europeans. Other studies also support higher TBI incidence among Māori peoples (Barker-Collo et al., 2009).

The Accident Compensation Corporation (ACC), New Zealand's state-owned tax-funded no-fault accident insurance and compensation scheme, has published data collected between 2014 and 2024 on the mechanisms that commonly cause concussion injury. These figures are summarised in Figure 1. Falls were observed to have caused 48% of concussions (74,984), and collisions/being knocked over by an object were causative in 20% (50,623) of concussions.

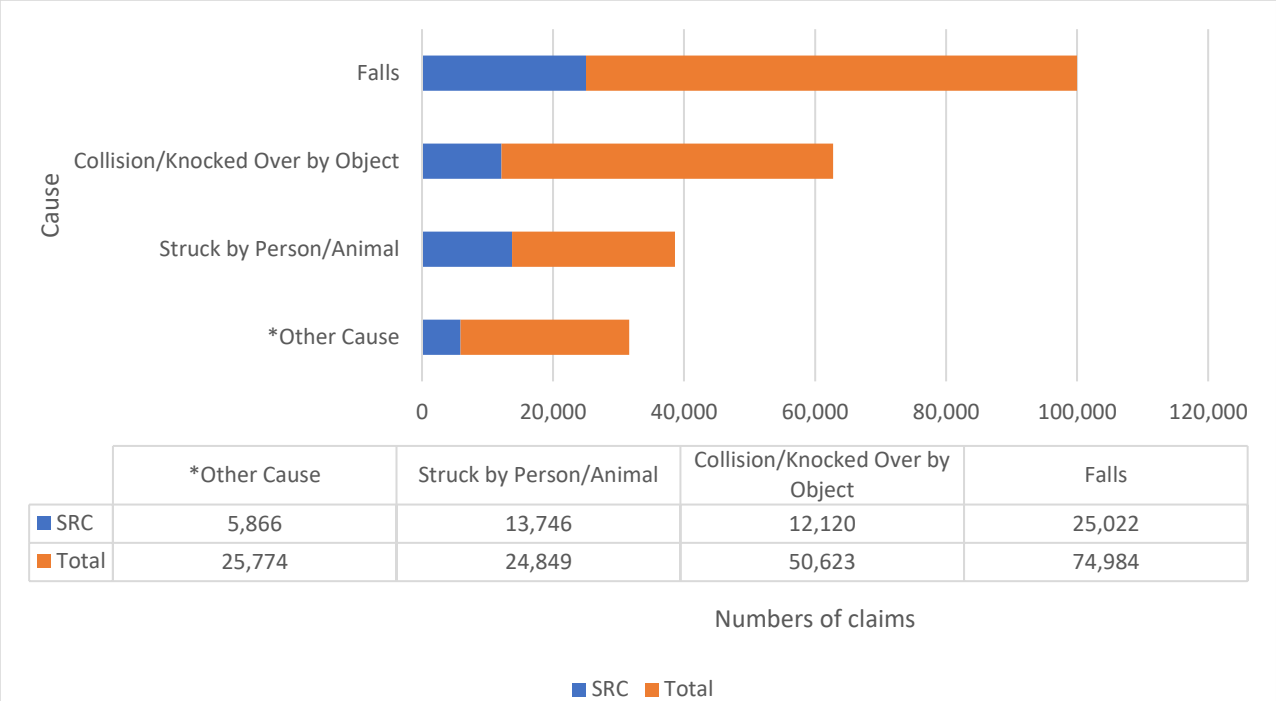
Being struck by a person or animal was responsible for 15% (24,849) of concussions, and other causes comprised the remaining 16% (25,774) of concussion injuries (Accident Compensation Corporation, 2024). These results broadly align with those by Feigin et al. (2013), that report the causes of TBI injury in New Zealand resulted from falls (38%), mechanical forces (21%), driving-related accidents (20%), and assaults (17%).

In the same 10-year period reported by ACC, SRC contributed to 55% (13,746) of concussions from being struck by an animal or person, 39% (12,120) of concussions from collisions/knocked over by an object, 33% (25,022) of fall-related concussions, and 23% (5,866) of other cause concussions, and overall contributed to 25.4% of the total number of concussion injuries (Accident Compensation Corporation, 2024).

It is estimated that TBIs cost the global economy around US$400 billion each year making it one of the leading causes of disability in the World (Maas et al., 2022). In 2015, TBI cost New Zealand NZ$83 million (Accident Compensation Corporation, 2017). The average annual cost of managing SRC between 2019 to 2023 in New Zealand was NZ$64 million with a combined spend of NZ$266 million for SRC (Accident Compensation Corporation, 2023b).

**Figure 1:**

*Causes Of All Recorded TBI In New Zealand 2012-2022* (Accident Compensation Corporation, 2024)



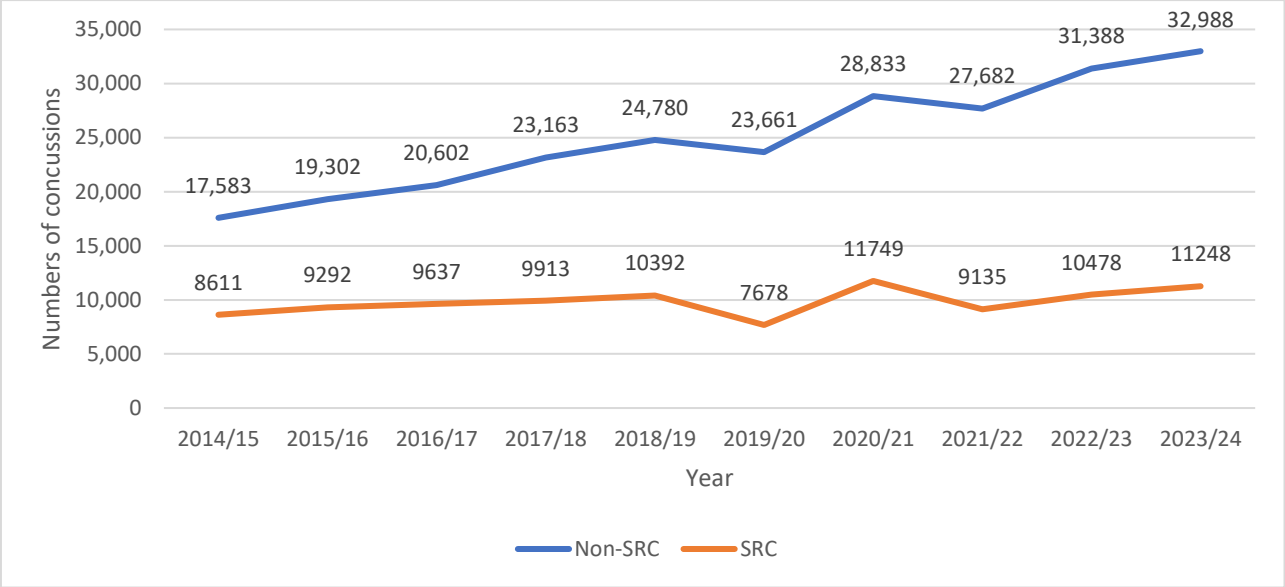

| | *Other Cause | Struck by Person/Animal | Collision/Knocked Over by Object | Falls |
|---|---|---|---|---|
| SRC | 5,866 | 13,746 | 12,120 | 25,022 |
| Total | 25,774 | 24,849 | 50,623 | 74,984 |

**Other causes include lifting/carrying/strain, loss of control of vehicle, object coming loose/shifting, puncture, pushed or pulled, struck by held tool/implement, or working on property.*

During the 2023-2024 financial year, ACC accepted 11,248 claims for SRC. There were steady increases in reporting of SRC, from 2014 with a slight COVID-19-related dip in 2020 shown in Figure 2 (Accident Compensation Corporation, 2024).

**Figure 2:**

*ACC claims for concussion from recreational compared to non-recreational activities 2014-2024 (Accident Compensation Corporation, 2024).*




The reasons for this increase in the last 10 years may be an outcome of improved public health messaging and public health literacy leading to improved reporting (Salmon, McGowan, et al., 2020). Similar increases in reporting of concussions have been demonstrated in Australia by Thomas et al. (2024) who found the incidence of concussion injuries within Western Australian emergency departments over 16 years increased by 163% between 2002 and 2018. The authors suggested increases in public awareness around concussion, improved clinician knowledge and confidence in making a diagnosis, improved clarity and emphasis on correct medical coding and documentation, and increased use of allied health support to perform assessments using time-intensive concussion assessment tools may be factors associated with increased numbers of concussion reports.

### 1.6.2 Unreported injury

One issue in accurately understanding the incidence of concussion is the significant under-reporting and under-recognizing of concussion injury. In a systematic review, Kerr et al. (2014) found non-disclosure of concussions in athletes varied between 35-62% across 30

studies. Unreported injury is due to several reasons such as general public health literacy regarding concussions (O'Reilly et al., 2020; Salmon, McGowan, et al., 2020), the immediate availability or access to healthcare support (Echlin et al., 2012; O'Reilly et al., 2020), the degree of symptoms and signs at the time (O'Reilly et al., 2020; Thorne et al., 2022), with those less likely to seek help having a lower level of education, previous mental health conditions, or a history of concussion (Thorne et al., 2022) or having concerns about cost, medical care expertise, knowledge or ability to help and consequences for work, or sports participation (O'Reilly et al., 2020). In New Zealand, ACC estimates that 30% of people will not report their concussion (Accident Compensation Corporation, 2023b). However, ACC's policies that require a medical professional to make an official diagnosis of concussion (Poloai et al., 2023), or the subsequent incorrect coding of the concussion by the primary care doctor (Bastos Gottgtroy et al., 2022; Theadom et al., 2014), shortages in the New Zealand GP workforce (Andrew, 2024; Betty et al., 2023) and difficulties people experience in accessing services due to cost (MOH, 2023c), may add to the underreporting of SRC. The implications of this underreporting of SRC means many people will go without appropriate management of their recovery, including ensuring a safe RTP; this has implications for the risk of both persistent concussion symptoms (PCS) and recurrence of the injury, and further increasing the burden of chronic ill health within New Zealand. Consequently, it is likely Accident Compensation Corporation (2017) data on TBI is a significant underestimation of the true injury burden.

### 1.7 Risk factors for SRC and TBI

Risk factors can be placed under two broad categories which include people's activities and demographic factors associated with concussion injury. Given that falls, collisions, or being struck are the most common causes of concussion, activities with a heightened risk of these occurring will increase the risk of a concussion injury. Non-sport-related risk factors include activities involving vehicles, which cause the highest amount of TBI amongst those 15–64 years old (Feigin et al., 2013), followed by domestic abuse, child abuse, and assaults (Accident

Compensation Corporation, 2017, 2022). In New Zealand, sports with a higher risk of falls or collisions include rugby (30%), cycling (9%), and equestrian sports (12%), which contribute to the majority of SRC injuries (Theadom et al., 2014).

Demographic factors associated with a history of concussion include age of less than 30 years, male sex, and ethnicity (Accident Compensation Corporation, 2022). Although non-SRC injuries in New Zealand have a nearly equal number of injuries between sexes, males are more than as likely to sustain a SRC than females and this is particularly the case for Māori (the culturally indigenous population of New Zealand) men who have a 23% greater risk than non-Māori males (Accident Compensation Corporation, 2017, 2022). Males of Pacific descent are similarly at higher risk (Lagolago et al., 2015).

In New Zealand, the Māori population has experienced poorer health outcomes compared to non-Māori (MOJ, 2019b). This is a longstanding consequence of historical colonization and the resultant social disadvantage for Māori (Goodyear-Smith & Ashton, 2019; MOJ, 2019a, 2019b); this occurred despite guarantees that Māori would be afforded the same rights and privileges as other New Zealanders laid out in New Zealand's founding document, the Treaty of Waitangi (Te Tiriti o Waitangi). A focus of resources on Māori health is an attempt to address these inequities and uphold the values behind the Treaty (MOH, 2019). By improving Māori health, the overall health of the New Zealand population is likely to improve due to reduced strain on the healthcare system, improvement in overall societal well-being, and participation in the workforce with consequent benefits to the economy (MOH, 2023b).

### 1.8 Use of guidelines for concussion by HCPs in NZ

Despite established processes for managing SRC in New Zealand published by ACC (Accident Compensation Corporation, 2023b), it appears the use of concussion guidelines by HCPs is not universal. Derbyshire et al. (2021) surveyed 96 New Zealand-based clinicians regarding their preferences for concussion guideline use and found multiple barriers to the use of concussion guidelines such as insufficient time, resources, and support to translate the

guideline into practice (20%), the inability to adapt the guideline to individual patient's needs (16%), and guidelines where impractical to use (6%). Clinicians suggested the most likely reason for using a particular guideline was its clarity of information (44%), level of evidence for the guideline (38%), practical design of the guideline for use (28%), and ease by which the guideline could be found (24%). More experienced clinicians were more likely to use concussion guidelines. Adding to the confusion, there are various non-standardized guidelines (Piedade et al., 2021) relating to various sports and organizations that are often different from one another or at times non-existent, making for confusing recovery navigation for not only the HCP but the general public (Scullion & Heron, 2022).

### 1.9 Why are the Concussion in Sport Group (CISG) guidelines important to this thesis?

Many guidelines (clinical practice guidelines) for managing concussion have been developed which describe recommendations for how to define, diagnose, and manage concussion (Silverberg et al., 2020). Guidelines provide evidence-based recommendations about how to clinically manage a condition, such as concussion. Recommendations are informed by the strength of evidence about a particular topic (e.g., benefit and harm profile of exercise rehabilitation for RTP) and expert opinion (e.g., strongly recommended, recommended, not recommended). Guidelines help users to drive evidence into policy and practice in their local setting (Frémont et al., 2015; Frémont & Schneider, 2019; Patricios, Schneider, Dvorak, et al., 2023). The CISG guideline is important in the context of this thesis as it underpins concussion policy directives on how SRC should be managed for community stakeholders in New Zealand (Accident Compensation Corporation, 2023b).

#### 1.9.1 The difference between guidelines and policies.

Guidelines are intended to support clinicians and policymakers to make evidence-informed decisions. Guidelines provide evidence-based recommendations for 'what' to do in clinical practice (e.g., diagnosis, management and follow-up care). Recommendations are informed by the quality of evidence about specific questions (e.g., evidence synthesis about

the benefits and harms of exercise based on Systematic Reviews and meta-analyses) and expert opinion. As such guidelines are designed to allow for professional judgment and adaptation to individual patient circumstances and are flexible enough to incorporate local or contextual factors.

Policy broadly falls into two categories – 'soft' and 'hard'. Soft policies typically involve behaviour change campaigns that are not compulsory (e.g., education, diet and exercise recommendations). 'Hard' policy is less flexible because they are mandatory and generally leave little scope for adaptation, especially in clinical practice. Hard policy is enforceable, often with penalties for non-compliance, whether in the form of legal consequences, disciplinary action, or other sanctions. For example, the Health Practitioners Competency Assurance Act 2003 (law) is designed to protect members of the public from the risk of serious or permanent harm (e.g., use of harmful surgical devices). Hard policy is often established by government bodies, healthcare organizations, or institutions to ensure specific practices, standards, or behaviours are upheld and come with non-compliance penalties. (Institute of Medicine Committee on Standards for Developing Trustworthy Clinical Practice, 2011).

Translating guidelines into policy and practice is challenging for policymakers such as ACC since best practice guidance needs to incorporate local or contextual factors which are often not captured by guidelines (e.g., workforce and health system constraints), and further need to be adopted by end-users such as GPs, physiotherapists and other stakeholders such as sporting organisations (Accident Compensation Corporation, 2023b).

As ACC is the major funding stakeholder in ensuring the delivery and efficiency of New Zealand's healthcare services to those with accident-related injuries such as concussion injuries, the insurer creates policy documents regarding how SRC is managed, including how SRC should be diagnosed and how recovery for RTP should be undertaken. ACC policy documents are influential in guiding community stakeholders such as clinicians and sporting organisations in how they manage SRC (Accident Compensation Corporation, 2023b;

Derbyshire et al., 2021; Equestrian Sports New Zealand, 2020; New Zealand Football, 2018; New Zealand Rugby, 2024; New Zealand Rugby League, 2024). ACC's funding extends to providing earnings-related income for the injured person while they are recovering from their injuries until they return to work. Much of this administrative compliance required by ACC for maintaining a person's income during their off-work recovery, such as providing a formal diagnosis for SRC, and medical off-work/ return-to-work certificates, is managed by the primary care medical workforce (GP services). Further to this, GPs are the key HCP in the provision of referral to MDT care and RTP clearance certificates (Accident Compensation Corporation, 2017, 2023b).

In this context, ACC 'hard' policy requires that for patients with SRC to access services they must receive a concussion diagnosis and seek medical clearance specifically from medical doctors prior to return to play. ACC 'soft' policy provides national guidance on the overarching principles involved in SRC diagnosis and recovery, underpinned by the CISG.

### 1.10 The SRC management pathway

The CISG guidelines outline 13 "R"-related words to describe the management principles of SRC which are further summarized in Table 2.

These principles of SRC management are embedded in the flowchart in Figure 3 describing the overarching steps within the recovery management pathway culminating in the RTP. Further discussion about this pathway will be reviewed in Chapter 2, however, it is important to note that the recovery pathway based on CISG principles involves multiple steps of care before RTP can be managed in a safe efficient manner and is typically implemented by HCPs in primary care.

**Table 2:**

*Principles Of SRC Management* (Patricios, Schneider, Dvorak, et al., 2023)

| Principle | Brief description |
|---|---|
| Recognise | Understanding of the definition of SRC, and pathophysiological cause of signs and symptoms. |
| Reduce | Initiatives for SRC prevention that will mitigate the burden of injury, risk of recurrent injury, and potential for persisting symptoms. |
| Remove | On recognition of a suspected concussion, the person is removed from risk of further harm. Assessed by a HCP competent on SRC. Use of SCAT6. |
| Rest (and exercise) | Initial minimum 24hrs of rest from physical and cognitive activity, before adding gentle physiological exercise to assist recovery. |
| Re-evaluate | Review of symptom progression 72hrs or more after injury to ensure symptoms are reducing. Use of SCOAT6. |
| Refer | Referral to a HCP experienced in management of SRC for ongoing management of recovery. Referral to a MDT team if PCS continue beyond the expected recovery timeframe. |
| Recover | Targeted interventions to modifiable concussion-related injuries and symptoms. |
| Return-to-learn | Gradual return to school (or work) related activity following a progressively challenging level of cognitive demands. |
| Return-to-sport | Gradual return to play-related activity with a final medical determination of satisfactory recovery to safely start at-risk activity again. |
| Reconsider and Residual effects | Ongoing scientific consideration and evaluation of the possible long-term effects of repeated SRC episodes on long-term health of an individual. |
| Retire | Guidance on how to evaluate and consider a need to medically retire from high-risk recreational activity to preserve long-term brain health. |
| Refine | Continuous re-evaluation of how SRC is managed to incorporate new evidence-based research into practice. |

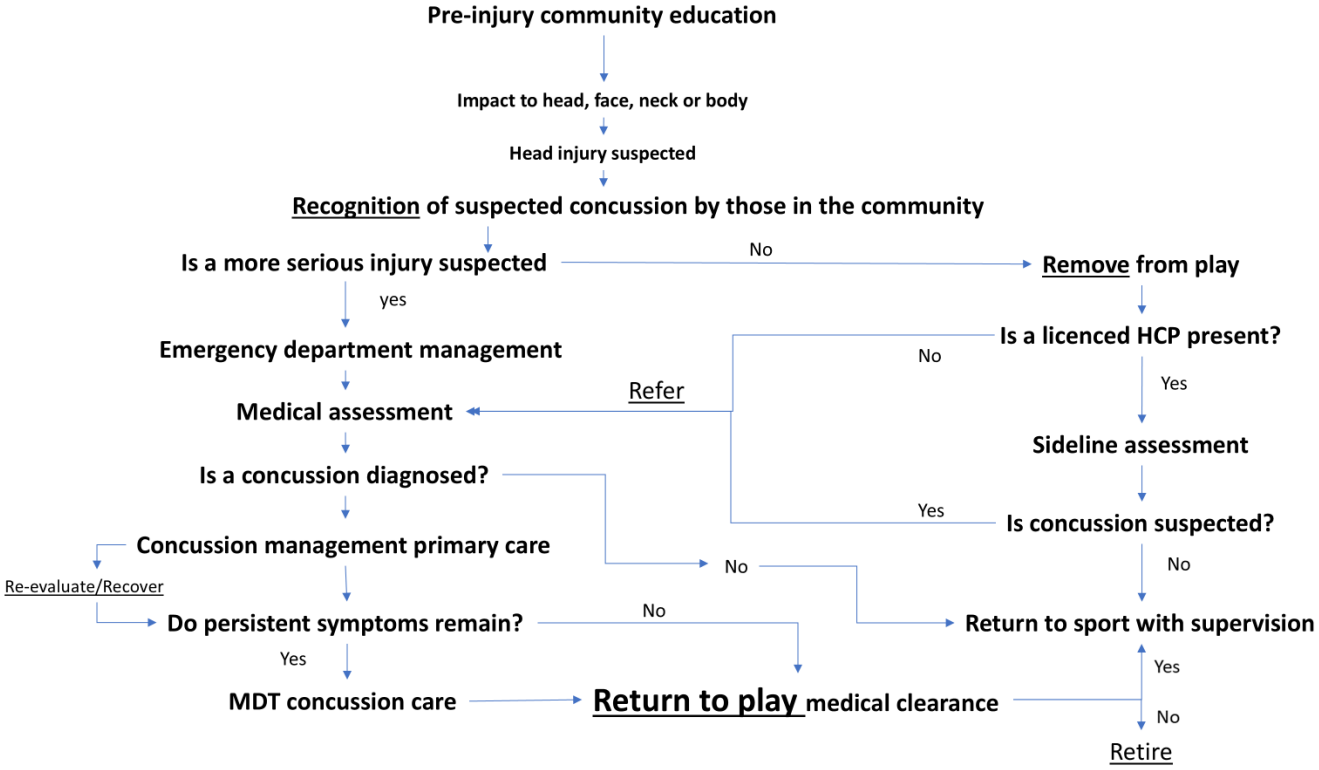
Two key HCPs involved in delivering RTP are GPs and physiotherapists. Currently, according to ACC policy, GPs are critical to a concussion diagnosis, which is the entry-point for commencing RTP processes, and medical clearance, which is ideally sought before RTP. Physiotherapists are also key stakeholders involved in RTP – helping to assess, treat as needed, and track the recovery of an injured person leading up to and after receiving medical clearance to RTP. While both stakeholders are broadly engaged in SRC management (Reid et al., 2020; Salmon et al., 2022; Salmon, Badenhorst, et al., 2023; Stuart et al., 2022), it is unclear what their experiences of RTP are nor their thoughts about what is needed to deliver RTP well. An in-

depth exploration of GPs and physiotherapists' experiences of RTP is important to understand how to promote a safe RTP following a SRC and is the focus of this thesis.

**Figure 3:**

*Concussion Management Principles Flowchart (Parachute, 2017).*

*This figure shows key principles that lead to a formal RTP – recognise, remove, refer, re-evaluate and recover. A full RTP is characterised by medical clearance before RTP.*



### 1.11 Summary

This introduction has outlined the definition of TBI, where concussion relates to these injuries, and how SRC relates to all concussions. The RTP is an added component of recovery that must be considered for SRC. Elements of concussion injury have been described, including its incidence, causes, risk factors, and the effects of unreported injuries on our understanding of the burden of these injuries. This introduction has outlined the importance of the CISG guidelines to how ACC creates policy on how SRC should be managed in New Zealand. RTP management is mainly performed using primary care HCPs such as GPs and physiotherapists.

Chapter 2 provides a more detailed literature review of the existing evidence on RTP following SRC, how HCPs such as GPs and physiotherapists discern recovery, and how they manage RTP in a New Zealand healthcare setting using available guidelines and resources. This will demonstrate why gaining a clearer understanding of the experiences of GPs and physiotherapists providing this service of RTP management is important. This research is important to help clinicians understand the experiences of other HCP colleagues with SRC and RTP. This research will also describe valuable insights for policymakers to consider when updating policy and processes regarding the management of SRC, including the RTP, to suit the unique sociocultural needs of the New Zealand primary healthcare setting.

### 1.12 Research Aim

This project is a qualitative study that aims to explore the experience and perceptions of GPs and physiotherapists delivering RTP care for SRC in New Zealand**,** including their attitude to working with each other, identifying common barriers and enablers to success, while gathering their ideas for areas where health professionals and communities could be better supported.

# Chapter 2: Literature Review

The purpose of this chapter is to describe the principles of the management SRC in the context of RTP and the challenges of delivering RTP in the New Zealand context. To achieve this a narrative review approach was used. A narrative review is recommended when there is a need to not only summarise existing research on a subject but to provide interpretation and critique to deepen understanding (Greenhalgh et al., 2018). To support the narrative review, a structured search of scholarly databases was conducted to help focus the retrieval of relevant evidence and ensure the literature was comprehensibly covered. Consequently, this review intended to explore the key topics relevant to RTP rather than systematically identify and evaluate the quality of evidence about RTP. A record of the structured search is reported in Appendix 1.

## 2.1 Guidelines on SRC management

The CISG guidelines outline 14 principles of SRC management which are briefly outlined in Table 2. In this section on CISG guidelines, I will briefly describe these principles in the context of their impact on the RTP.

### 2.1.1 Recognize, Remove, and Refer

Recognition that a suspected SRC may have occurred, removal from danger, and referral to a HCP for diagnosis and management are critical to the subsequent recovery and efficient RTP. For example, Charek et al. (2020) showed a delay in removal from play after injury for as much as 15 minutes can extend the time to RTP by over 25 days. Further to this, early presentation to a HCP has been associated with a faster resolution of symptoms and a more efficient RTP (Bunt et al., 2023; Pratile et al., 2022).

The initial recognition of concussion and understanding of the subsequent management of SRC appears challenging for the public. The benefit of having a knowledgeable member of team management, such as a team physiotherapist or trainer, for the identification

of suspected concussion and subsequent recovery to RTP, has been described by Costa et al. (2024) and Bretzin et al. (2024). Petrie et al. (2024) performed a qualitative study of 24 rugby players' experiences of SRC who described the benefit of sideline healthcare support for recognition of SRC and management advice. The participants also acknowledged this was not possible for most sports teams, which commonly meant relying on unskilled volunteer support, whose knowledge and responses to a concussion did not always reflect current concussion guidance. Salmon, Chua, et al. (2023) interviewed 155 New Zealand-based rugby stakeholders and found many understood the role of the team medic, GP, or physiotherapist in concussion management. However, there was a lack of role clarity and communication in SRC management which led to a confused and inefficient management of concussion. These findings aligned with those by Clacy et al. (2017) in which most stakeholders within various aspects of a rugby community in Australia were able to identify a suspected concussion. Similarly, many respondents were unsure of whose responsibility it was to manage the injury afterwards; only team medics accepted some responsibility for management.

Public knowledge and health literacy regarding SRC are important for a person to know what to do when they suspect a concussion (Echemendia, Ahmed, et al., 2023; Feiss et al., 2020; Haarbauer-Krupa et al., 2021; Hickling et al., 2020; Salmon, McGowan, et al., 2020). However, evidence suggests that public health messaging should target community-specific SRC knowledge gaps and be delivered on an ongoing basis to achieve effect (Churton et al., 2020; Theadom, Reid, et al., 2020).

Having healthcare assistance within a sports team environment is useful for the recognition of suspected SRC and subsequent management of recovery to RTP. However, the systematic provision of this is limited for most. Engaging the broader community to identify a suspected SRC, act appropriately to support the removal from play, and refer to a HCP is a solution to this problem but requires ongoing efforts to improve public knowledge regarding SRC.

### 2.1.2 Clinical diagnosis

The requirement for a competent HCP to be involved in the early phase of SRC diagnosis is important for ruling out conditions that would require investigation using imaging, including worsening neurological conditions, signs of a significant neck injury, or another distracting injury (Silverberg et al., 2023).

Gaining a formal diagnosis from a medical professional has been recommended by previous iterations of CISG guidelines (McCrory et al., 2017) which have subsequently been adopted and referenced by ACC in New Zealand in the formulation of their policy on who should diagnose concussion injury (Accident Compensation Corporation, 2018). In a recent change in rhetoric, the 2023 CISG consensus statement suggests non-medically qualified HCPs could formally diagnose concussions (Patricios, Schneider, Dvorak, et al., 2023). The CISG defines a HCP to be;

> *… healthcare professional involved in the care of athletes at risk of SRC or who have sustained a suspected SRC at any level of sport (ie, recreational to professional).* (Patricios et al., 2023; pg695).

The guideline further defines a HCP as a clinician experienced with a multimodal assessment of concussion that includes physical, cognitive, and psychological aspects of the injury, and suggests a suitable HCP;

> *… may include sports medicine physicians, athletic trainers/therapists, physiotherapists, occupational therapists, sports chiropractors, neurologists, neurosurgeons, neuropsychologists, ophthalmologists, optometrists, physiatrists, psychologists and psychiatrists.* (Patricios, Schneider, Dvorak, et al., 2023, p. 701).

However, the CISG guideline stipulates that on recognition of a suspected SRC during play, removal of the person from the field should be immediate and that they be referred for medical oversight to ensure adequate recovery has been achieved before a RTP (Patricios, Schneider, Dvorak, et al., 2023, p. 703).

The 2023 ACC policy statement in response to the updated CISG guidelines continues to maintain a medical professional is required for the formal diagnosis of concussion (Accident

Compensation Corporation, 2023b). The ACC guidelines, in turn, inform the protocols prominent New Zealand sporting organisations adopt for the diagnosis and management of concussion (Equestrian Sports New Zealand, 2020; New Zealand Football, 2018; New Zealand Rugby, 2024; New Zealand Rugby League, 2024).

Determination of a SRC diagnosis is challenging for HCPs due to the co-presentation of other injuries associated with SRC such as cervical injuries (Cheever et al., 2021) and vestibular dysfunction (Babula et al., 2023; McCormick & Kolar, 2023), alongside pre-existing symptoms already present in the non-concussed population (Cosgrave et al., 2023; Voormolen et al., 2019). As such, CISG has developed tools for use in practice (Sports Concussion Assessment Tool 6- SCAT6 and Sports Concussion Office Assessment Tool 6- SCOAT6) to assist HCPs in making a diagnosis of concussion (Patricios, Schneider, Dvorak, et al., 2023).

### 2.1.3 Rest, Re-evaluate, Recover

Upon a confirmed diagnosis, physical and cognitive rest is advised for 24-48 hours, along with limitations on driving and alcohol intake. This may mean rest from work or school (Patricios, Schneider, Dvorak, et al., 2023). A referral to other primary care clinicians with skills in the management of concussion symptoms and associated injuries such as cervical sprain or vestibular dysfunction, such as a physiotherapist, is also recommended (Art et al., 2023; Babula et al., 2023; Leddy et al., 2021; Maas et al., 2022; Matuszak et al., 2016; Patricios, Schneider, Dvorak, et al., 2023).

After an initial 24-48 hours of physical and cognitive rest, CISG guidelines suggest starting light exercise below symptom aggravation and considering an early gradual return to work or school-related activities to build up tolerance in a step-by-step fashion. For further information on the RTL strategy recommended by the CISG, see page 703 of Patricios, Schneider, Dvorak, et al. (2023). A full return to school or work commonly occurs within two to three weeks (Putukian et al., 2023; Wait et al., 2023).

## 2.2 CISG guidelines on RTP management

For the most part, SRC is managed similarly to all other concussions other than the requirement for the person to recover their pre-injury recreational aspects of function. Full functional recovery culminates with a return to full unrestricted recreational or sporting activity with no concussion-related symptoms (Patricios, Schneider, Dvorak, et al., 2023). The CISG guidelines suggest a stepwise progressive physical loading program (Table 4) known as the Graduated Return-to-Play (GRTP), characterised by HCP monitoring for symptom provocation, and medical determination of readiness to return to at-risk activity during progression through the program (Patricios, Schneider, Dvorak, et al., 2023). This program has been adapted from the original 6-step GRTP strategy invented by the Canadian Academy of Sports Medicine Concussion Committee (CASM, 2000).

Exercise and activity below symptom provocation thresholds and with low risks of collision or falls can occur 24 hours after injury if symptoms have stabilised; light exercise has been shown to assist in recovery (Leddy et al., 2021), and can be performed concurrently with a return to school or work. Low-risk recreational activity also can take place within the first two steps of the GRTP (Patricios, Schneider, Dvorak, et al., 2023).

As the person progresses through the steps, physical activity becomes more vigorous and challenging. The 2023 CISG guidelines suggest a medical determination that recovery has occurred before a person returns to activity with a heightened risk of falls and collisions; this may include step 3 if sport-specific training has heightened risk such as cycling or dancing. Step 4 involves including team-specific non-contact training, step 5 involves contact team training, and step 6 is a return to competitive play.

**Table 3:**

*Return To Play Strategy Recommended By CISG (Patricios, Schneider, Dvorak, et al., 2023, p. 704)*

| Step | Exercise strategy | Activity at each step | Goal |
|---|---|---|---|
| 1 | Symptom- limited activity | Daily activities that do not exacerbate symptoms (eg, walking). | Gradual reintroduction of work/school |
| 2 | Aerobic exercise<br>2A—Light (up to approximately 55% max HR) then<br>2B—Moderate (up to approximately 70% max HR) | Stationary cycling or walking at slow to medium pace.<br>May start light resistance training that does not result in<br>more than mild and brief exacerbation of concussion symptoms. | Increase heart rate |
| 3 | Individual sport- specific exercise<br>Note: If sport- specific training involves any risk of inadvertent head impact, medical clearance should occur prior to Step 3 | Sport- specific training away from the team environment<br>(eg, running, change of direction and/or individual training drills away from the team environment).<br>No<br>activities at risk of head impact. | Add movement, change of direction |
| 4 | Non- contact training drills | Exercise to high intensity including more challenging training drills (eg, passing drills, multiplayer training) can integrate into a team environment. | Resume usual intensity of exercise, coordination and increased thinking |
| 5 | Full contact practice | Participate in normal training activities. | Restore confidence and assess functional skills by the coaching staff |
| 6 | Return to sport | Normal gameplay. | |

CISG guidelines suggest that the GRTP step 1 can begin within 24 hours of the injury if symptoms have stabilised. Medical clearance to move beyond step 2 is recommended if step 3 (individual sport-specific activity) involves at-risk activity. The 2023 CISG clearance recommendation is a change from earlier CISG guidance which previously recommended clearance before step 5 (McCrory et al., 2017), and is in recognition that some individual sport-specific exercises or recreational activities away from team environments, such as riding a bike

or a horse, have inherent risks of falls or collisions (Patricios, Schneider, Dvorak, et al., 2023, p. 704). Steps 4–6 should not begin until successfully demonstrating no provoking of symptoms during or after the step 3. Within steps 1-3, if symptoms increase beyond mild (more than 2 points on a 0-10 scale of severity) and brief (less than an hour), the guideline suggests a rest for 24 hours and try again. If symptoms occur at any of the levels 4-6, a return to level 3 is advised to ensure symptoms have resolved before including at-risk activity again (Patricios, Schneider, Dvorak, et al., 2023).

### 2.3 ACC policy on medical clearance in New Zealand

Currently in New Zealand, ACC has a policy directive that people with SRC who intend to return to formal sporting activity in at-risk activities such as contact sports attend a final consultation with a GP to gain permission to return to those at-risk activities (Accident Compensation Corporation, 2023b). The 2023 CISG guideline makes the following recommendation for clearance for RTP:

> *Optimal concussion management strategies including implementing laws and protocols … to receive clearance to return-to-play from an HCP … are associated with a reduction in recurrent concussion rates.* (Patricios et al., 2023; p699).

> *Athletes may be moved into the later stages [of the GRTP] that involve risk of head impact (typically Steps 4–6 and Step 3 if there is any inadvertent risk of head impact with sport-specific activity) of the RTS strategy following authorisation by an HCP ...* (Patricios et al., 2023; p704).

The guideline is somewhat ambiguous and confusing with the further suggestion:

> *Athletes having difficulty progressing through the RTS strategy or with symptoms and signs that are not progressively recovering beyond the first 2–4 weeks may benefit from rehabilitation in addition to the RTL and RTS strategies … and/or involvement of a multidisciplinary team of HCPs experienced in managing SRC … Medical determination of readiness to return to at-risk activities should occur prior to returning to any activities at risk of contact, collision or fall ...* (Patricios et al., 2023; p704).

When interpreting this guidance, it is unclear if medical clearance is recommended solely for those with difficulty recovering from SRC, or if medical clearance is required for all SRC injuries.

Currently, ACC's interpretation of the CISG for New Zealand has continued with the older CISG guidance of medical clearance to RTP before steps 5 and 6 of the GRTP (compared to before steps 3 or 4 in the current guidelines), despite referencing the newer CISG guidance (Accident Compensation Corporation, 2023b, p. 4). This has created a disconnect between CISG guidelines and New Zealand-based policy, which may lead to dangers in returning to at-risk activities at step 3 of the GRTP without medical clearance.

In response to the latest ACC policy update (Accident Compensation Corporation, 2023b), sporting codes such as the New Zealand Rugby Union (New Zealand Rugby, 2024) have continued to adopt a medical clearance policy before returning to team contact training (step 5). New Zealand Rugby League, however, requires a medical clearance before returning to competitive play (step 6) (New Zealand Rugby League, 2024). Policy statements by the national sports organisations for football and equestrian sports in New Zealand are yet to be updated to reflect the latest ACC guidance; New Zealand Football requires medical clearance before any return to contact training (step 5) (New Zealand Football, 2018), and Equestrian Sports New Zealand requires clearance before step 3 in alignment with risks of falls from a horse (Equestrian Sports New Zealand, 2020).

The implication of these subtle differences in when a medical clearance is required creates confusion for stakeholders such as GPs and physiotherapists trying to implement the clearance into the GRTP.

Although non-medical HCPs such as physiotherapists are involved in the RTP management, ACC has maintained a "hard" policy of requiring a medical clearance to RTP (Accident Compensation Corporation, 2023b) ensuring the final decision on readiness to return

to at risk activity (clearance decision) is the responsibility of the medical practitioner (Salmon et al., 2022).

### 2.4 Assessing recovery and readiness for RTP following SRC

Progression through RTP is accompanied by a heightened risk of falls and collisions and is an added recovery element that those with SRC must consider, compared to non-SRC. It is critical for a safe RTP that a recovery from a SRC has occurred before returning to at-risk activity (Patricios, Schneider, Dvorak, et al., 2023). Incomplete recovery from a SRC and the occurrence of a subsequent SRC during the RTP period may have significant long-term health implications for the individual such as PCS (Déry et al., 2023).

Haider et al. (2018) performed a systematic review of 43 articles of recovery criteria commonly used to judge full recovery of SRC in young athletes. Criteria identified across the studies included the patient-disclosed return to baseline symptom resolution, cognitive recovery to baseline with cognitive exertion, symptom-free physical exertion, recovery of balance, and normal concussion-specific HCP physical examination, and a successful return to learn (RTL). The study revealed that primary care clinicians determined SRC recovery primarily on self-reports of physical, psychological and cognitive symptom resolution to the estimated pre-injury baselines. Most clinicians also discerned recovery by confirming normalization of balance and that no exacerbation of symptoms occurred following physical exertion, alongside other, examinations of cervical, oculomotor, and vestibular systems. Corwin et al. (2024) compared definitions of recovery from a range of concussion guidelines and applied these to a cohort of 174 paediatric concussion injuries. They found clinical definitions of recovery differed substantially across guidelines and that timeframes for recovery could vary dramatically between 4-12 weeks on the application of differing recovery definitions to their cases.

Putukian et al. (2023) performed a systematic review investigating timeframes to recover to RTP, defining criteria for clinical recovery from SRC as completion of the 6-step GRTP

strategy with no symptoms, no clinical findings that are associated with the concussion at rest, and maximal physical exertion, and no other clinical findings suggesting an inability to return.

### 2.4.1 The use of subjective disclosure of symptoms to assess recovery

HCPs rely on the disclosure of symptoms by the person with a concussion while tracking recovery. This creates difficulties for HCPs in discerning recovery that comes from the fact that symptoms attributed to a concussion are non-specific, so can therefore commonly occur in non-concussed individuals (Clark et al., 2022; Voormolen et al., 2019). Furthermore, co-existing preinjury conditions can be exacerbated by concussion, mimic concussion, or can be exacerbated by a variety of other biopsychosocial factors aside from the concussion. Examples of co-existing conditions may include mental health issues; learning or attention difficulties; visual, oculomotor, cervical, and vestibular problems; headache disorders and migraine; sleep disturbance; dysautonomia, including orthostatic intolerance and postural orthostatic tachycardia syndrome; and pain (Patricios, Schneider, Dvorak, et al., 2023). Alla et al. (2012) demonstrated that non-concussed individuals experience concussion-like symptoms in daily life to various degrees, suggesting that the use of full symptom resolution as a measure of post-concussion recovery was problematic, particularly as a pre-requisite to clearance for RTP. This was also found by Cosgrave et al. (2023) who performed baseline tests on athletes and found that many had symptoms similar to those with concussion with the most common being ‘fatigue or low energy’ (31%), neck pain (16%), and irritability (14%).

Haider et al. (2020) described symptoms of concussion crossing multiple domains of functioning which can overlap in presentation, such as physical, cognitive, vestibular and emotional symptoms. This makes the accuracy of discerning the source of persistent symptoms difficult to assess and treat.

Another challenge in using symptoms to discern recovery was demonstrated by Balasundaram et al. (2016) who investigated symptom disclosure in a cohort of 603 university students; they found the willingness of individuals to disclose concussion-like symptoms to a

HCP was influenced by lifestyle and psychological factors including alcohol consumption and sleep quality rather than concussion-related symptoms. Valovich McLeod et al. (2022) studied the social implications of having SRC among children, who described a social desire to RTP to connect with peers and family, concerns about how others regarded the concussion with uncertainly, and shame about having a concussion. This social pressure for a potentially premature return to activity influenced the reporting of symptoms and the recovery timeframes following SRC.

Due to subjective symptom reduction were to be the litmus test for recovery, alongside individuals' subjective and self-reporting biases, Alla et al. (2012) suggested recovery processes should aim to reduce symptoms to population-appropriate levels. The authors performed a systematic review of studies investigating the presence of concussion-like symptoms in non-concussed individuals both at rest (13 studies included) and with exercise (3 studies included). Using a commonly used concussion symptom severity scale, with 22 common concussion symptoms, each measured for severity using a 7-point Likert Scale (0=none, 6=severe), providing a combined severity score sum by multiplying individual symptom items by their severity (range 0-132), found that the average symptom severity of a non-concussed individual was 5 and 6 for males and females, respectively. Furthermore, the authors described the need for the person to demonstrate stability of symptoms at rest, during and after exertion, and achievement of normalization of objective measures such as neurological examinations, balance challenges, and cognitive functioning tests. The stability of symptoms people experience in daily life after exertion is also a characteristic of non-concussed individuals (Balasundaram et al., 2017). This concept of aiming for low levels of stable population normative symptoms has also been endorsed for use in paediatric populations as well (Irwin et al., 2020).

The aim of ongoing research is to better understand ways to discern recovery. Churchill et al. (2021), performed a case-control study on 61 athletes with uncomplicated concussion

injuries with a control group of 167 athletes; both groups had similar proportions of those with a history of concussion. Using serial MRIs at multiple time points up till the RTP and then for over a year after the RTP, the authors were able to show that concussed individuals had reduced cerebral blood flow (CBF) at the time of RTP clearance compared to controls, despite being symptom-free and being judged by a medical practitioner to have achieved clinical recovery. Reductions in CBF were observed to persist for over one year following RTP. The implications of this are unclear, but these findings raise questions about the effects of repeated concussion injury that takes place before adequate physiological recovery occurs and whether this could translate to cumulatively worsening blood flow or other consequences for brain health over time.

The search for more objective ways to discern recovery continues with formative research showing some promise such as evaluations of pupil dilation post-concussion (McKee et al., 2024), reaction time measurements (Barnes et al., 2024; Lempke, Oldham, et al., 2023), the use of serum neurobiological markers (Alanazi et al., 2024; O'Brien et al., 2024) and dynamic balance control (Lempke, Hoch, et al., 2023). Further studies are required to validate these new tests and to understand their clinical utility in primary care is.

Discerning the signs and symptoms of a SRC requires substantial clinical interpretation by HCPs, particularly when signs and symptoms can be subtle, non-specific, and often require disclosure to the HCP by the injured person. Objective methods for discerning recovery are not yet widely available or require further validation. This creates a challenging situation for HCPs trying to understand the presenting signs and symptoms that may or may not relate to continuing SRC dysfunction when making decisions to progress the RTP.

### 2.4.2 The challenge to assess cognitive and emotional recovery following SRC

Caron et al. (2023) performed a qualitative study of 22 SRC stakeholders (coaches, athletes, trainers, nurses, sports physicians, and physiotherapists). In general, a common critique of the CISG guidelines for RTP was that they are overly focused on physical recovery at

the expense of adequate testing of cognitive, psychological, and social factors involved with concussion injury. Choudhury et al. (2020) conducted a qualitative study on the experiences of adolescents after concussion and observed a substantial disconnect between the medical determination of recovery and what the person perceived as recovery. Adolescents described ongoing cognitive, emotional, social, and mental issues well over a year after being medically cleared to RTP. In another qualitative study of rugby players' experiences of SRC, Petrie et al. (2024) described the social isolation injured individuals experience, and how current RTP guidelines don't restore or address players' losses of confidence in their ability to perform at pre-injury levels for fear of re-injury. Participants expressed a need for more in-person concussion education and greater emphasis within the guidelines on social and psychological support during their recovery.

Hou et al. (2023), performed a systematic review of 47 studies investigating cognitive recovery following concussion in adolescents (n=8,877) demonstrating that physical recovery appeared to occur well before cognitive recovery, with symptoms of cognitive dysfunction present for 1-6 months following injury. The authors suggested an increased emphasis on adequate evaluation of cognitive function was required before RTP clearance.

Hallock et al. (2023) performed a narrative review of the literature concerning cognitive function following SRC and concluded that current guidelines lack adequate rehabilitation strategies for the management of acute and long-term cognitive symptoms. They suggested sufficient evaluation of the cognitive and psychological reserves, alongside physiological tests of patients were required to judge their ability to cope under RTP conditions before a full recovery could be judged.

The use of online cognitive tests has allowed clinicians access to validated measurement tools for assessing any ongoing cognitive issues. Darling et al. (2014) conducted a 2-month follow-up of 117 student-athletes who had completed RTP after SRC to evaluate whether physical stress testing alone was sufficient to assess SRC recovery or whether

computerized neuropsychological testing added value. The authors found 38.5% of the athletes disclosed they had experienced new cognitive issues, principally related to concentration, some months after injury, and despite achieving clearance to RTP, however, the use of computerized neuropsychological testing did not help discern those who would progress to experience challenges with returning to school. Cosgrave et al. (2023) performed a prospective cohort study on 135 adolescent rugby players and found there was a lack of evidence for the use of computerized neurocognitive tests or the King-Devick test in isolation when assessing recovery from concussion, however suggested their use should be to supplement the clinical assessment process.

Pre- or post-injury factors such as a history of migraines, depression, or anxiety are factors that may influence cognitive and emotional recovery and may also increase the risk of prolonged recovery from concussion (Putukian et al., 2023). CISG guidance suggests when these pre- or post-injury factors are identified, there should be a referral to specialty providers (Putukian et al., 2023). In the 2023 iteration of the CISG guidelines, efforts have been made within the SCOAT6 assessment tool to provide access to validated tools for measuring depression (PHQ-9) and anxiety, alongside optional suggestions of computerized online cognitive tests to assess cognitive function, to improve HCPs discernment of ongoing cognitive and emotional challenges of those with SRC (Davis, Patricios, Purcell, et al., 2023; Patricios, Schneider, van Ierssel, et al., 2023).

This section has covered the challenges HCPs face in determining if cognitive recovery has occurred following a SRC. HCPs rely on subjective disclosure and the athlete's ability to discern ongoing issues. There is limited evidence informing how GPs or physiotherapists in New Zealand currently discern cognitive and emotional recovery before allowing a person to RTP.

### 2.5 The prolonged recovery

Primary care clinicians regularly manage the late presentation of concussion injury (Maxtone et al., 2020). Delays to initial post-concussion care may be due to various reasons

including the person not seeking health care advice until their symptoms prevent them from functioning at work or home, their injury not being recognized at the time by the GP, the person's GP either lacking knowledge about the local concussion service providers to make a referral or choosing to manage the person themselves until they have exhausted their resources and knowledge, before deciding to refer on (Ruff et al., 2009). The late presentation of concussion injuries to a HCP has been linked to an increase in PCS 3 months following the injury (Bunt et al., 2023).

A working definition of PCS is symptoms that appear within hours of the concussion injury, which persist beyond the outer limits of expected recovery timeframes of 12 weeks, cannot be attributed to a pre-existing condition, and have an impact on at least one aspect of the person's life (Lagacé-Legendre et al., 2021). ACC suggests that 10-12% of concussion injuries have symptoms that persist beyond normal expected recovery timeframes (Accident Compensation Corporation, 2017). However, there is significant variation in the estimates of how many concussion injuries develop PCS; these range between 20% (Biagianti et al., 2020; Clark et al., 2022; Yeates et al., 2023) and 50% (Dikmen et al., 2017; Theadom et al., 2016). These variations arise because of difficulties in discerning whether the symptoms relate to the current concussion episode or co-existing pre-injury problems (Patricios, Schneider, Dvorak, et al., 2023).

Symptoms commonly found to persist in PCS were in the cognitive and emotional domains of function such as memory difficulties, fatigue, irritability or being easily angered, feeling frustrated, depressed or tearful, restlessness, and impatience (Forrest et al., 2018; Hind et al., 2022; Manley et al., 2017; Maxtone et al., 2020; Theadom et al., 2016).

Determining the presence of PCS is the role of HCPs, and CISG guidelines recommend a referral to MDT care (Patricios, Schneider, Dvorak, et al., 2023). In New Zealand, a registered medical professional, most commonly a GP, is instrumental in ensuring those who are experiencing PCS are referred to MDT care because ACC requires these referrals to come from

registered medical professionals (Accident Compensation Corporation, 2023a). In an analysis of ACC data from 2016 to 2018, Bastos Gottgtroy et al. (2022) found inefficiencies at both the primary care level and within the administrative processes at ACC, led to delays in enrolment by more than two months for one in four MDT referrals. Although this study drew from historical data, it does suggest that for those with PCS, gaining timely access to MDT care was a barrier to recovery. Delays in receiving MDT care are associated with an increase in enduring psychological cluster symptoms (Forrest et al., 2018). Long-term those with PCS have an increased probability of displaying anti-social behaviour (Theadom et al., 2024), self-harm, and mental health issues (Chrisman et al., 2021; Iverson et al., 2023; Lambert et al., 2022). The public health ramifications of chronic ill-health because of PCS include increased health costs, such as increased use of medical services and rehabilitation therapy, but also costs of lost productivity of caregivers (Agnihotri et al., 2021), with total healthcare costs for those in rural communities significantly more than urban areas, despite lower utilisation (Graves et al., 2019). The importance of recognizing PCS during the recovery process and instigating an early referral for MDT care has been shown to mitigate the significant impacts that PCS has on well-being, functional status, and quality of life (Faulkner et al., 2023).

In the area of SRC, these injuries appear to exhibit less risk of PCS of fatigue and dizziness compared to those with non-SRC (Beauchamp et al., 2021) and less risk of anxiety and depression (Smulligan et al., 2024). These findings may relate to an increased motivation to partake in physical activity during recovery (McLeod et al., 2024) which in turn has been shown to have a positive effect on recovery (Ellis et al., 2018).

The longer-term consequences of an inadequate recovery before RTP, poor management of PCS, and the effects of subsequent SRC, particularly if the person has not fully recovered from a previous concussion, are ongoing areas of research interest. Questions about possible links to various degenerative brain disorders such as Parkinsons, a range of dementias, Alzheimer's Disease, Motor Neurone Disease, and Chronic Traumatic Encephalopathy (CTE) in

retired athletes are currently being investigated (Alanazi et al., 2024; Barr, 2020; Cunningham et al., 2020; Iverson et al., 2023; Winblad et al., 2019).

### 2.5.1 Factors associated with a longer recovery

A range of factors are associated with a longer recovery from SRC; these can be divided into intrinsic (person-related), and extrinsic (injury-related). Intrinsic factors that may be associated with a longer recovery are being non-white (Theadom et al., 2016), a non-elite athlete (Wait et al., 2023), having a history of migraines (Putukian et al., 2023; Wang et al., 2022), returning to individual sports (Wang et al., 2022) and a pre-injury presence of a psychiatric disorder (Putukian et al., 2023; Wait et al., 2023). Being female (D'Lauro et al., 2018; Pratile et al., 2022; Theadom et al., 2016; Wait et al., 2023), of younger age (Wait et al., 2023), or having a previous history of concussion (Glendon et al., 2024; Pratile et al., 2022; Putukian et al., 2021; Theadom et al., 2016; Wait et al., 2023; Wang et al., 2022; Williams et al., 2023) may also be associated with longer recovery, however, competing studies question the association finding the links to being not statistically significant (Konstantinides et al., 2024; Putukian et al., 2023; Putukian et al., 2021). Additionally, Weishaar et al. (2024) surveyed 317 students with concussions and found higher socioeconomic status and female sex were associated with earlier RTP times.

Extrinsic factors that are linked to a longer recovery include delayed immediate rest post-injury (or continuing to play) (Putukian et al., 2023; Wait et al., 2023), loss of consciousness at the time of injury (Wait et al., 2023) and delayed access to healthcare providers (Bunt et al., 2023; Putukian et al., 2023). The initial symptom burden at 48 hours post-injury is the strongest predictor of a longer recovery (Putukian et al., 2023; Putukian et al., 2021; Wait et al., 2023; Wang et al., 2022), but particularly when there were abnormal vestibular ocular motor symptoms (Wang et al., 2022).

Déry et al. (2023) provided an overview of 25 systematic reviews analyzing intrinsic and extrinsic factors that heightened the probability of a longer recovery following a concussion

injury. Although older age, female sex, and a history of previous concussions showed positive associations with PCS across the studies, there was no single factor that could be classified as predictive of PCS. These findings imply that a complete understanding of factors contributing to an increased risk of a prolonged recovery remains complex.

### 2.6 Factors associated with optimal recovery and RTP

Charek et al. (2020) demonstrated that the efficient recognition of SRC and removal from play optimized RTP timeframes. They observed a longer recovery by an average of 25-28 days when athletes continued to play for a further 15 minutes after sustaining a SRC compared to those who were removed immediately from the field of play. This finding is supported by other studies conducted by Elbin et al. (2016), Asken et al. (2018) and Eagle et al. (2022).

Pratile et al. (2022) found that those who received their initial HCP assessment in the first 10 days were twice as likely to be discharged sooner with an average time to RTP of 23.5 days compared to those first assessed between 10-30 days for whom the average RTP was 37.1 days. An early initiation of rehabilitation strategies such as an assessment of sub-symptom exercise tolerance (Leddy et al., 2021; Lempke, Teel, et al., 2023), vestibular rehabilitation (Babula et al., 2023), cervical injury management (McPherson et al., 2024) and multimodal therapy (Art et al., 2023), created a quicker recovery to RTP than traditional cognitive and physical rest (Patricios, Schneider, Dvorak, et al., 2023).

The findings of these studies suggest that there is wide variability in recovery timeframes and factors that influence outcomes and highlight the importance of receiving timely and appropriate care to reduce the risk of a prolonged recovery.

### 2.7 Studies estimating time to recovery of RTP for SRC

The estimated time to RTP has been debated and challenged by researchers and practitioners over the decades of SRC research. The 2017 CISG consensus statement suggested most athletes achieve a RTP by 10 days (McCrory et al., 2017). D'Lauro et al. (2018) critiqued

guideline recovery timeframes; using a cohort study of 414 collegiate-level athletes with SRC, they demonstrated the time to RTP was longer, with a mean RTP time across the athletes under study of 29.4 days. Covassin et al. (2021) supported the extension of the suggested time to recovery after results from a descriptive epidemiology study in which 30% of 15,821 high school athletes who'd experienced SRC had still not received clearance for unrestricted RTP by 14 days. At 21 days, 13% of the athletes had not achieved medical clearance. Kara et al. (2020) used the Alla et al. (2012) criteria to determine recovery at a New Zealand concussion clinic; of 594 concussion injuries, clinical recovery was observed in 45% at a follow-up of 14 days. At four weeks, recovery was achieved for 77% of the injuries, and at eight weeks, recovery was confirmed for 96% of the concussion injuries.

Wait et al. (2023) performed a systematic review investigating recovery timeframes, including 65 studies. The median times to achieve symptom resolution across the studies ranged between 2-11 days with corresponding median times for RTL ranging between 3-23 days. In another systematic review of 278 studies by Putukian et al. (2023), observed the mean number of days to achieve symptom-free recovery was 14 days, and the mean times for RTL and RTP were 8.3 days and 19.8 days respectively.

The most recent CISG guideline suggests that most individuals with SRC follow a sequential course of recovery within one month of the injury to achieve an unrestricted RTP across all groups, including children, adolescents, and adults, with an estimated pooled mean time to RTP of 19.8 days (95%CI, 18.8 to 20.7 days) (Patricios, Schneider, Dvorak, et al., 2023).

### 2.8 The General Practitioner and RTP

For most people diagnosed with SRC in New Zealand, the majority of RTP care occurs at the primary care level; with a minority of 10-12% of SRC injuries requiring referral to MDT care due to PCS (Accident Compensation Corporation, 2017).

The 2023 New Zealand Health Survey (MOH, 2023a) showed that there were significant barriers for patients accessing GPs for medical care. Time factors and costs were identified as the principal barriers; 21% of adults and 15% of children did not visit a GP because of excessive waiting times with 13% of adults not visiting their GP due to high costs. The authors of the report predicted that delays to access will continue to increase over time. There also appears to be a growing shortage of GPs across New Zealand which will have a substantial impact on the availability of care and consequent access (Andrew, 2024; Betty et al., 2023).

Within rural primary care settings in New Zealand, there are added challenges including limited GP services (Betty et al., 2023; MOH, 2023c), limited access to a skilled workforce in concussion management, difficulties with access to MDT concussion services, and advanced diagnostic services such as neuroimaging (MOH, 2023a). People in rural communities are disproportionately affected by concussion (Feigin et al., 2013), but have lower utilization of concussion health services compared to those in urban areas. This is due to the limited easy access to local concussion expertise leading to less use of services. However, when services are used there are added costs to this access, for either the patient or HCP funder, most commonly the travel costs (time and travel expenses), making the costs of providing a service (funder costs) or using a service (patient) substantially higher in rural settings (Graves et al., 2019). The findings in the New Zealand rural setting reflect challenges experienced globally within rural communities when delivering concussion healthcare, where limited GP services mean higher patient loads and limited consultation times, which leads to issues for delivering the ideal concussion evaluation, education, and follow-up (Daugherty et al., 2021; Daugherty et al., 2022; Yue et al., 2020). To address access issues, primary care has seen an increased use of telehealth as an alternative means of delivering healthcare consultations to rural communities. However, the use of telehealth has led to unintended consequences with the potential to compromise the quality of care. Some of these consequences include a blurring of professional roles and boundaries (Gajarawala & Pelkowski, 2021), de-personalisation of the clinician-patient relationship with limited non-verbal communication (Alami et al., 2019),

increased workloads for clinicians, the inability to perform a physical examination, concerns about privacy, data security, lack of rigorous laws and regulations regarding telehealth use, increased fears of malpractice lawsuits, and issues with rural internet availability and reliability (Jang-Jaccard et al., 2014). There have been reported increased financial burdens on patients with a lack of government support for broadband costs, and equipment needed for telehealth (Osman et al., 2024).

In New Zealand, Stuart et al. (2022) surveyed 230 primary care GPs and found more than half of the respondents had no knowledge of the CISG consensus statements and only 46% of GP respondents reported confidence in managing the RTP aspects of concussion. This information is consistent with the findings of a literature review by Mrazik et al. (2015) in which knowledge of North American primary care physicians regarding concussion recovery guidelines varied by 15-50% across the identified studies.

A study of New Zealand GPs by Salmon, Sullivan, et al. (2020) described the challenges GPs experience with limitations on consultation time with patients; most GPs report consultation times of 15 minutes in which to conduct assessments to diagnose concussion, complete subsequent medical reviews around recovery progression, and consider criteria for a RTP clearance. GPs reported unfamiliarity with current best practice guidelines, inexperience with using standardized tools for assessing symptoms of concussion, insufficient time to examine, review, and clear patients to RTP safely, and a low caseload of 1-2 concussions per year.

Salmon et al. (2022) undertook a qualitative study of New Zealand GPs' experiences in delivering a rugby-specific concussion management pathway (CMP). GPs wanted support to manage concussion via resources such as time and remuneration to perform assessments and improve their knowledge, more technology, efficient communication systems with stakeholders, particularly physiotherapists, and MDT support to enable them to successfully

perform their roles. They also sought standardization of care with stakeholder consensus around diagnosis, management, and policies across sports.

In summary, GPs are responsible for diagnosing concussions, providing medical certificates, return-to-learn advice, coordinating MDT referrals care for patients who do not recover promptly, and discernment of clinical recovery for clearance to RTP for all SRCs (Accident Compensation Corporation, 2017, 2023b). The GPs' ability to deliver these aspects of the service, while critical to the efficiency of recovery, is currently hampered in New Zealand by workforce shortages, a range of financial and time-based costs for the injured person, the policies of health funders, the resources in the community in which they work, and shortcomings in GPs' knowledge on concussion management.

### 2.9 The physiotherapist's role in RTP

In New Zealand, HCPs other than GPs, including physiotherapists, work in primary care to provide clinical assessment, diagnosis, therapy, and rehabilitation for many accident-related injuries funded by ACC (Accident Compensation Corporation, 2023a). Currently, ACC policy does not allow primary care physiotherapists in New Zealand to diagnose concussions, provide clearance to RTP following concussion, provide medical certificates, or refer to MDT care for PCS (Accident Compensation Corporation, 2023a).

Salmon, Badenhorst, et al. (2023) performed a qualitative study on the experiences of New Zealand-based physiotherapists working with a rugby-specific CMP and found they regularly discern suspected concussions, remove injured persons from play, and liaise on recovery with stakeholders including the coach and GP. However, these physiotherapists also described concerns with a lack of communication from GPs, and a lack of access to GPs when needed for critical parts of the recovery such as diagnosis, medical certificates, and RTP clearance. Physiotherapists also described a lack of ability to act for themselves with authority due to perceived scopes of practice limitations, or perceived lack of respect from stakeholders

including coaches and managers, and a lack of resources and remuneration with many working as volunteers to fulfill this important role within the community.

Maxtone et al. (2020) surveyed 175 physiotherapists in New Zealand and reported that physiotherapists are already engaged in a range of concussion activities including recognition of concussion, assessment of concussion, and management of concussion including the RTP aspects. However, participants described the challenge of late presentation of concussion injury to the physiotherapist causing delays in good recovery management, with the need to seek a medical diagnosis suggested as one reason for the late presentation. A further challenge to continuity of care was the complexity of ACC services available for those with concussion, some of which were fully funded while others were not, creating transitions in and out of medical, community physiotherapy, and specialist services. Physiotherapists also described regularly having people return to their care with PCS after specialist services had finished, highlighting that many people with concussion often need support from physiotherapists after specialist services were completed.

Reid et al. (2020), surveyed 122 physiotherapists showing that 98% of those surveyed were able to identify the signs and symptoms of concussion. The authors suggested that physiotherapists had a very good knowledge of concussion management, showed a positive attitude towards correct concussion management, and that the physiotherapy profession was generally enthusiastic about the use of physiotherapists in the sideline management and testing of SRC and engagement in the decision-making process for RTP.

In summary, physiotherapists in New Zealand are already actively working in primary care with those with SRC and are well-positioned to assist GPs in the roles required of them concerning SRC and RTP. However, there is a paucity of evidence qualitatively describing the experience of GPs and physiotherapists focusing specifically on RTP following a SRC and how they feel about working with each other during RTP management.

## 2.10 Conclusion

RTP is an added complexity that a person with SRC and the supporting HCP must navigate. The ability to resume full competitive RTP without signs or symptoms during or after play is the hallmark of full functional recovery for those with SRC (Patricios, Schneider, Dvorak, et al., 2023). CISG guidelines recommend the assessment of recovery is to be made by a HCP with competence in discerning recovery before a formal clearance is provided for the person to proceed to recreational or sporting activities involving risks of falls or collisions (Patricios, Schneider, Dvorak, et al., 2023). A reduction of symptoms at rest to population normative levels has been suggested (Alla et al., 2012), with subsequent research suggesting symptom stability throughout the stepwise GRTP being a litmus test for physiological recovery (Balasundaram et al., 2017). Such RTP programs are designed to limit risks of further collisions or falls while symptoms and signs persist, then allow gradual increases in sport-specific loads to ensure recovery has correctly been discerned and progress these loads until full return to symptom stabile competitive play has been achieved (Patricios, Schneider, Dvorak, et al., 2023).

ACC policy for New Zealand maintains a GP or other medical professionals must provide medical clearance for the return to recreational or sports activity involving risk of re-injury (Accident Compensation Corporation, 2023b). Management of the GRTP predominantly occurs in primary care settings in New Zealand and typically involves HCPs such as GPs and physiotherapists (Accident Compensation Corporation, 2023b).

There are multiple challenges to the management of RTP after SRC in New Zealand (MOH, 2023c; Salmon et al., 2022; Salmon, Sullivan, et al., 2020; Stuart et al., 2022). These challenges include early identification of a SRC, timely access to care, loss to follow-up, limited clinical time, and variable clinical knowledge and confidence related to the management of symptoms and assessment of recovery following a SRC.

GPs, particularly in rural communities, are widely acknowledged to be unable to meet demands for services in New Zealand (Andrew, 2024; Betty et al., 2023; MOH, 2023c). Evidence

suggests GPs feel under-resourced, undertrained, and have limited capability to fulfil the required roles in concussion management (Salmon et al., 2022). Furthermore, GP knowledge of concussion guidelines and pathways appears limited (Stuart et al., 2022). Given that the medical community is heavily relied upon to perform the roles of diagnosis, oversight, onward referral to MDT if needed, and provision of clearances for return to school, work, and sport (Accident Compensation Corporation, 2017, 2023b) this impacts how well people are supported through the RTP process following a SRC.

One profession that could help alleviate pressure on the GP workforce is physiotherapy. Physiotherapists are already involved in managing various aspects of SRC, from initial recognition to ongoing rehabilitation. A benefit of physiotherapists is that they are already well-embedded in some community sports (e.g., rugby). This enables them to leverage existing relationships with people following a SRC, to monitor and assess recovery throughout the RTP process. However, while physiotherapists currently work alongside GPs managing SRC in primary care and appear enthusiastic to be more involved in helping GPs manage concussion, they are limited in their ability to do so because of restrictions within ACC policies (Reid et al., 2020; Salmon, Badenhorst, et al., 2023). Moreover, it is unclear how physiotherapists and GPs experience delivering the RTP process, and how they feel about sharing the responsibilities. This evidence gap is important to unravel to inform solutions about supporting better RTP processes, access, and outcomes following a SRC.

Therefore, the aim of this qualitative study is to explore the experience and perceptions of GPs and physiotherapists delivering RTP care for SRC in New Zealand**.** The key question is to explore what GPs and physiotherapists need to help RTP work optimally.

# Chapter 3: Design

## 3.1 Introduction

This chapter describes the qualitative approach used in this thesis to explore GPs' and physiotherapists' experiences and perceptions of delivering RTP for concussion in New Zealand. The chapter begins with a description of the methodology of the research, followed by a researcher reflexivity statement and a description of the methods used to sample participants, collect, and analyse the research data.

## 3.2 Ethical Approval

Ethical approval for the overall study was granted by the Auckland University of Technology (AUT) 12/05/2022, Ethics Committee: Reference 22/87

## 3.3 Methodology

This research used a qualitative research methodology (Klem, Shields, et al., 2022) underpinned by the constructivist paradigm. Constructivism is the theory where learners construct knowledge and wisdom about a phenomenon, using pre-existing knowledge and build on this with new knowledge as they experience the phenomenon over time, rather than just passively taking in information. Constructivism rests on the philosophical assumption that, although there may be a singular reality, people interpret reality within their own contextual situation creating multiple views of that reality (Lincoln et al., 2011). Primarily concerned with understanding how people make sense of their lives and experiences (Klem, Shields, et al., 2022), use of a qualitative methodology is appropriate to explore GPs' and physiotherapists' experiences, knowledge and perceptions of managing return to play following a concussion and identify areas for potential modifications to clinical practice.

### 3.4 Reflexivity statement

Reflexivity is an important consideration in qualitative research and lends to the trustworthiness (further discussed below in section 3.6, Trustworthiness) of qualitative investigations (Klem, Bunzli, et al., 2022). There are different types of reflexivity that can be used within qualitative research, however, it can generally be defined as a researcher being "rooted in a respect for and a valuing of subjectivity" (Olmos-Vega et al., 2023). The primary type of reflexivity considered in this study is personal reflexivity, whereby I reflect on my own background prior to commencing the study, which in turn allows the reader to interpret the results produced in context of this perspective, but rather than being a detracting factor meant to be eliminated, it is embraced as a contributing factor to the subjectivity of qualitative research. I acknowledge that my background (outlined in section 3.5) provides a unique perspective that is likely to influence the study design, interview processes, data analyses, and interpretation of results. I am a registered physiotherapist employed within a private practice in New Zealand, and I have experience in concussion injuries and rehabilitation. Given this experience, I take a constructivist view which acknowledges that there is no single way to interpret "reality" and therefore there will be multiple ways in which the data can be interpreted. Over the years in my clinical practice, I became aware of some of the barriers and challenges clinicians can experience in managing concussion and supporting return to play which led me to conduct this research. Whilst this personal clinical experience allows for a greater understanding of the participants' responses, my interpretation of the data is influenced by my professional experience in this subject. In qualitative research, it is important that researcher subjectivity is embraced and acknowledged reflexively for the interpretation of the data and consideration of the insights presented in the study (Olmos-Vega et al., 2023).

### 3.5 Primary researcher (MPhil candidate: Colin Hancock) background statement

I have been a New Zealand Registered Physiotherapist with a Bachelors degree in Physiotherapy since 1997. I have since had 27 years of experience working as a physiotherapist

in primary care, with a background in musculoskeletal and sports physiotherapy. Since 2018 I have been a full-time owner and clinician of a private physiotherapy practice in a medium-sized township in the central North Island. I had always intended to complete some formal post-graduate qualification, but due to family life commitments only managed to start postgraduate study toward a Master in Health Sciences in 2009 via the University of Otago. This was put on hold because of the Christchurch earthquake and global financial crises on my working and family life situation.

My rugby-playing days stopped in 1989 due to repeated concussion injuries and concerns around the ease with which I appeared to get concussions. This was at a time when very little was known about the effects of repeated concussion injury. I continued to be involved in rugby as a first aider but always had an interest in concussion injury because of my personal experiences with it. I have continued to work sideline with sports teams (mostly Rugby Union) and went on to study physiotherapy. After many years of performing this sideline physiotherapy role with very little formal sideline management training other than First Aid training courses, a post-graduate course emerged in 2013 specifically for sports physiotherapists that was focused on the sideline management aspects of the job developed by Sports and Exercise Physiotherapy New Zealand (SEPNZ), a special interest group of Physiotherapy New Zealand. Within this course was a dedicated section to acute concussion management. This was my first exposure to formal recognition and management of concussions. Since this time, I have attended a myriad of courses concerning various aspects of concussion management including cervical, vestibular, ocular motor, physiological, psychological, and cognitive aspects of recovery. Since 2013, knowledge and understanding of what constitutes good concussion management have changed significantly. Translating best practice to my primary care situation within a New Zealand context has been difficult, frustrated with unneeded complexity, particularly around medical diagnosis, medically determined referral to MDT care, and medical clearance to RTP, with guidelines often causing barriers to efficient and equitable care. New Zealand's health system is a medically driven

design and is still highly reliant on the skills and time of medical practitioners. These primary care medical practitioners appear increasingly overrun with work, under pressure to perform and often openly admit they feel limited in being able to perform well due to knowledge limitations. The current way the health system relies heavily on GPs appears to me to not cater well to the needs of the New Zealand healthcare consumer and is even less responsive in rural New Zealand.

From 2012 to 2023, I was employed as a physiotherapist for the King Country Rugby team, from which a newly developed role of Health Navigation Officer for all King Country rugby players. This required managing injuries of players of all ages in rural townships in distant parts of the region, which at times included concussion injuries. This required liaising with local healthcare professionals in other towns to ensure the players received adequate, appropriate, and timely healthcare, ensuring guidelines and protocols were followed for their RTP by coaches and stakeholders. What became apparent to me was the limited knowledge about concussion injuries many working in primary care such as GPs and physiotherapists had, and how difficult it was to get a quick medical diagnosis and timely rehabilitation, particularly rurally. Protocols were often ignored by players, many not disclosing their injuries due to the complexity or cost of getting them managed. Health professionals and other stakeholders had a poor understanding of concussion or inadequate knowledge of local health services. RTP occurred regularly without adequate checks on recovery.

What was apparent to me was the challenge facing people in rural towns that have limited medical coverage, which makes getting a timely formal concussion diagnosis, medical management, and medical clearance for RTP near impossible to provide in an efficient, knowledgeable, and equitable manner. There seemed to be a viable alternative that could be used locally using other HCPs, but as they were not medical doctors, could not be used due to ACC and sporting policy requiring medical diagnosis, MDT referrals, and clearance reviews only. When access could be obtained to local medical care, the GPs could only provide a quick

review, had limited insight into the process, and were often honest in their lack of knowledge around diagnosis, ongoing management, and skills for deducing recovery before RTP.

In discussing these issues with colleagues working with concussions, it became apparent there was a need for research to be done on how healthcare professionals discern concussion recovery and perform RTP in New Zealand, which could lead to a more responsive way of doing things to better meet the needs of the healthcare consumer. This is why I decided to embark on a Master in Philosophy at AUT, with the hope of contributing to the knowledge around how RTP after SRC is performed in New Zealand, with the hope this thesis may contribute ideas for what can be done better to suit the needs of our New Zealand community. I am aware that my professional and personal experience may influence my interpretation of the data. This was managed by the interviews also being coded by two of my supervisors and my results section was reviewed by all members of my supervisory team to ensure that my interpretations reflect the data rather than my own opinion.

## 3.6 Methods

### 3.6.1 Sampling

Convenience sampling was used to create a sample of GPs and physiotherapists, balanced by health profession (GP vs physiotherapist) and geographic location of practice (rural vs metropolitan). The inclusion criteria stated the participants needed to work in primary care practice in New Zealand as either a registered GP or physiotherapist and further have over two years of experience working with SRC. The size of the sample was determined by using the idea of “information power” that would likely be derived from the volunteer participants. Information power is described by Malterud et al. (2016) as “the more information the sample holds, relevant for the actual study, the lower amount of participants is needed”. It is suggested that information power comes from 5 key ingredients.

a) The study aim: the broader the aim the bigger the sample required, conversely the more specific the aim, the smaller the sample.

(b) Sample specificity: participants who are highly likely to have experiences and knowledge specific to the study aim lead to more information power therefore a smaller sample size is needed.

(c) Use of established theory: studies where there is already theoretical background knowledge about the subject, smaller sample sizes are required to produce significant new data about the subject.

(d) Quality of dialogue: strong interviews with plenty of quality expression of views and experiences from participants lead to more information power, allowing a smaller sample size.

(e) Analysis strategy: within an exploratory analysis, where the ambition is discovering selected patterns relevant to a well-defined study aim, a limited sample of well-chosen and well-articulated participants might illustrate a description easily enough to keep the sample low.

Within our study, it is likely that a modest sample of no more than 12 participants would be needed based on Malterud et al. (2016) description of information power due to;

(1) The research question (aim) being narrow, namely exploring the experience and perceptions of GPs and physiotherapists delivering RTP care for SRC in New Zealand**,** attitude to working with each other, barriers and enablers to success while gathering their ideas for where health professionals and communities could be better supported.

(2) The population of interest is likely to be able to communicate/express their thoughts precisely (specificity) on the subject due to their professional training and the nature of their work.

(3) Research presented by Guest et al. (2006) proposes that a sample size of 12 interviews is likely to gain saturation for theme development, with basic elements for themes being seen within six interviews. Braun and Clarke (2013) recommend that for 'small projects' involving interviews should draw on 6-10 participants.

### 3.6.2 Recruitment strategy

Professional organisations were contacted by email and asked to disseminate an advertisement about the study across their network (Appendix 2). Interested participants were invited to contact the primary researcher about the study by phone or email. GP networks included: Hauora Taiwhenua Rural Health Network October newsletter, GP NZ gazette, Goodfellow unit gazette, and Best Practice Advocacy Centre New Zealand. Physiotherapy networks included the Physiotherapy New Zealand and the special interest groups of New Zealand Manipulative Therapists Association and Sports and Exercise Physiotherapy New Zealand. To promote participant representation from Māori and rural backgrounds, all Māori Health provider organisations listed on the Ministry of Health Māori health provider directory (Health, 2018) were contacted via email and asked to share the study invitation across their membership. The study advertisement was also shared on social media (e.g. Facebook, Twitter), the AUT Traumatic Brain Injury Network, a Physiotherapy concussion special interest group (Headspace-NZ Concussion Clinicians), and a convenience sample of GPs and physiotherapists known to the research team.

### 3.6.3 Data collection

A semi-structured interview approach was used to gain insight into participants' experiences of managing concussions in primary care. Strengths of the interview approach are, for example, the ability to gain in-depth information about phenomena (Doyle et al., 2020) and the participant's ability to respond to questions without fear of judgment from other participants or colleagues. Using open-ended questions allows the interview to follow the thought process of the participants and foster rich insight into their experiences (Adams,

2010). Interview techniques were also used to draw further elaborative content from the participants such as reflective summaries following each answer, probing, and the use of pauses (DeJonckheere & Vaughn, 2019). Table 5 shows the interview questions which were designed to explore participant's experiences and perceptions of delivering RTP care for SRC.

**Table 4:**

*Interview Questions*

| Question<br>Probing question |
|---|
| 1. What does managing return to play (RTP) mean to you? |
| 1.1. Are you aware of any guidelines for managing RTP? |
| 1.2. can you name the guidelines you refer to? |
| 1.3. What barriers do you encounter when delivering RTP care? |
| 1.4. What enablers do you encounter when delivering RTP care? |
| 2. Is there anything that would support you to deliver better RTP care to your patients? |
| 2.1. Are there any special considerations, specifically for rural areas, that would support better RTP care? |
| 3. How confident are you in deciding whether or not a patient is safe to return to play or contact sport (or providing medical clearance, if a GP)? |
| 3.1. Why do you feel this way? |
| 4. What do you consider when deciding if a player is ready to return to play or contact sport? |
| 4.1. Do you use any *objective* assessments/tests? |
| 4.1.1.If yes, what objective measures do you use? |
| 4.2. Do you consider any *subjective* information, and if yes, what? |
| 4.3. Are there any other important considerations that you consider? |
| 4.4. What would make it easier for you to decide if a player is ready to RTP or provide medical clearance? |
| 5. What are your thoughts about working with GPs/physiotherapists? |
| 5.1. What do you see as their role in RTP care? |
| 5.2. What would make it easier for you to work in a multidisciplinary team with a GP/physiotherapist? |
| 6. Do you feel confident delivering culturally responsive RTP care? |
| 6.1. Why? |
| 6.2. What type of support would enable you to do this better? |
| 7. Is there anything else you would like to say? |

Characterising a study sample is also important because it helps inform judgments about the generalisability of the study findings. Prior to the interviews commencing demographic data (gender, ethnicity, clinical discipline, education level, geographical location (rural vs metropolitan), professional experience, experience working with concussion) for each participant was collected.

Up to 90 minutes was allocated per interview on the balance of participant burden and the need to allow time to explore the research question. Interviews were performed online using Zoom so that barriers to participation such as geography or the Covid-19 pandemic were minimised.

To prepare for the interviews, the primary researcher attended the course "AUT Interviewing Skills for Qualitative Researchers" (October 2022) and performed two pilot interviews with health professionals working in primary care via Zoom. The practice interviews allowed an understanding of whether the questions were able to draw the kind of information the study was seeking to gain from participants. These practice interviewees were asked to give feedback on questions and interviewer delivery to encourage the best environment in which the interviewees could express themselves. Subtle changes were made to the order of questions to make it flow more logically, then the way questions were asked to make the questions clearly open-ended, probing in nature to draw more information and induce elaboration on answers from participants.

### 3.6.4 Data analysis

Braun and Clarke's (2006) thematic analysis were used to analyse the interview data. This methodologically flexible approach is widely used in healthcare research (Clarke & Braun, 2018) and enables the analysis to be data-driven rather than being guided by a prespecified theoretical construct. This approach enables the analysis to draw out the issues of importance raised by the participants. Thematic analysis is characterised by putting the researchers' subjectivity in the foreground (Finlay, 2002). For example, as the primary researcher, my own "insider" status as a health professional working in the concussion management space in primary care (Braun & Clarke, 2013; Olmos-Vega et al., 2023) is seen to be of value in guiding the analysis.

To analyse the interview data, the audio recordings were transcribed verbatim using Otter.ai transcription software. The transcriptions were then checked by the primary researcher

(CH) for accuracy against the audio recordings and started the first step of the 6-steps Braun and Clarke (2006) suggested for thematic analysis, namely data familiarisation.

Braun and Clarke (2006) describe a 6-step process to undertake thematic analysis:

1. Familiarization with the dataset by firstly correcting errors of transcription software compared to the audio file and secondly reading through transcripts multiple times to get an in-depth understanding of the content and general impressions.
2. As concepts were discovered within the data these were used as draft headings termed “codes”. Generating these initial codes allows for repeating ideas of interest to be gathered from across the entire dataset. These draft codes (and supporting verbatim) were reviewed and then refined as codes of a similar nature became apparent.
3. Grouping of codes that followed along similar ideas allowed sub-themes to be constructed, which in turn fed into a larger overarching draft theme. Across the dataset, some ideas were repeated and these formed significant themes, but care was taken to include and discern the meaning of one-off ideas that could add value but were not consistent across the dataset.
4. The draft themes were then reviewed by reflecting them back on the sub-themes, ideas, codes, and verbatim from which they came, to make sure that there is coherence across these units of analysis. For example, Braun and Clark (2006) suggest that themes should ideally comprise internally homogenous data and should be externally heterogeneous (i.e. discrete).
5. Themes were then defined and named by identifying the essence of each theme and the overall story the analysis of the data tells.
6. A report was produced with commentary (descriptions) around how the themes and subthemes were identified, accompanied by key participant quotes to reflect the concepts captured by the data.

In keeping with the 6-step process, as mentioned above, the first step of data familiarisation started with the transcription process and transcript checks against the audio for corrections by CH. The transcripts were each reviewed multiple times and a general impression of data coming from each transcript was achieved.

The process for step 2, the generating of the initial codes, was supported by NVivo software (QSR International, Burlington, MA). The transcripts were loaded into Nvivo and read again with interesting statements attached to codes that were created. Later, the codes and their corresponding raw data (quotes) were moved from NVivo to Microsoft Word. The codes and raw data (quotes) were then printed out on paper and spread out on a table to facilitate familiarisation with the content of each code. This allowed an understanding of where codes had similar ideas, where statements crossed multiple codes, or where quotes could perhaps be better aligned with other codes.

The author then performed Step 3 by grouping codes along similar general ideas making sub-themes from these ideas. Further to this, the sub-themes could be grouped to create a draft theme. Ideas that seemed interesting by were not strongly verbalised across the dataset were noted as being worth a mention in the results but fell short of contributing to the main themes.

The author then performed Step 4 by retracing his steps from main themes to sub-themes from which this was composed, to ideas that made up these sub-themes, and then quotes from which these ideas came, ensuring that the context in which these quotes were said make sense when placed next to the final theme choice. Themes were thus firmly rooted in the data from which they came.

Step 5 was then performed by creating a draft framework linking the data to overarching themes. This was done to allow any reader to see how themes are linked to sub-themes, and then how these are linked to ideas that arose from codes and verbatim.

At this stage, before step 6 of Braun and Clarks' thematic analysis could take place, the research team added another step of an independently derived thematic analysis of the data by a second researcher (JC) allowing for any alternative interpretation of the data and alternative draft framework to be considered. The two independently derived draft frameworks were then disclosed to the other researcher (CH and JC) and discussion was had around how each had arrived at their draft framework. Both frameworks were compared for areas of similarity and dissimilarity and then discussed with a third researcher (AT). An agreement on an overarching framework was developed.

Then step 6 was performed producing a report outlining the themes and sub-themes that were arrived at including compelling verbatim to support how these themes came into being from the data. A final verification step involving a fourth researcher (DR) was performed to establish the face validity of the framework.

### 3.7 Trustworthiness

Trustworthiness is the means by which there is a demonstration of the integrity, competence, and legitimacy of the research process and knowledge claims (Ronkainen & Wiltshire, 2021). Klem, Bunzli, et al. (2022) suggest the use of five criteria originally created by Lincoln and Guba (1985): credibility, dependability, confirmability, transferability, and authenticity. These trustworthiness criteria are discussed below in relation to the current study.

1. Credibility means ensuring the research design and methods align with standard qualitative approaches. This study's methods and design aligned with standard qualitative design approaches, remaining faithful to credible key publications that support the method and citations to support the design. Each step was documented to enable transparency of the processes completed. During the analysis of data and subsequent theme development, the Braun and Clarke (2006) six-step process was followed. This process is a widely adopted approach for developing themes within qualitative study design.

2. Dependability in qualitative research is the ability to have the process taken for data collection and analysis described enough that the entire study can be reproduced. Within this study, this was demonstrated by creating and disclosing an audit trail detailing the activities undertaken during the data collection and analysis phase. The exact method employed, the semi-structured questions used to guide interviews, and the discernment used to create results, with decisions that were made for the creation of themes from raw data (appendix 3), ensures that to some degree the process taken by the researcher is repeatable.
3. Confirmability allows the reader to see a sensible link between the participant's words and the researcher's interpretation while bearing in mind the researcher's lens. Within this study, the method by which confirmability of themes was ensured was by allowing two of the research team to independently review the data (these were the primary researcher (CH) and lead supervisor (JC)), to create independently derived draft frameworks for the theme development, then comparing each framework for similarities and differences. This allowed for any potential alternative interpretations of the data to be found. These two draft frameworks were then presented and integrated to form an agreed-upon framework with a third researcher (AT), before validation by a fourth researcher (DR) to establish face validity of the framework. Participant quotes were used to support each theme and subtheme and how the theme captured the participant data (or if there did not appear to be a good fit with participant quotes, the theme was refined to enable a more accurate capture of experience). Personal reflexivity of the primary researcher's knowledge and interest in the subject was acknowledged and allowed any reader of the research to understand how this contributed to the interpretation of the data. Member checking (where participants could check and qualify meanings from the transcript of their interview) was not employed for this study due to the potential for participants to

alter their initial responses based on further research after the interview, since the subject matter may have stimulated further interest from participants in learning more about the subject, which in turn may have altered their initial thoughts or opinions. The involvement of other research team members helped highlight alternative interpretations of the data and reduce the influence of researcher bias.

4. Transferability suggests that any results can be useful across settings. This requires a rich description of where the data come from for the reader to discern the utility of the results in a broader range of settings. Within this study, there is a description of the context and demographics of participants and from where the resultant data was derived. This will allow the reader to examine the applicability of results to a general New Zealand primary care setting. Further examination of transferability will be discussed in the limitations section of this thesis.
5. Authenticity of the research is an honest disclosure of the diversity and range of participants' perspectives from which results are derived. Within this study, the sampling technique is described in the methods section and the success of gaining a broad perspective that is culturally relevant is further discussed in the limitations section of the thesis. Where diverging opinions are expressed, this is disclosed in the results section. Similarities and differences between participants and professions were described using the entire dataset.

### 3.8 Summary

The methodology of this study is described as qualitative research considering the study's aim to explore the experience and perceptions of GPs and physiotherapists delivering RTP care for SRC in New Zealand**,** their attitude to working with each other, barriers and enablers to success while gathering their ideas for where health professionals and communities could be better supported. The number of study participants followed the recommended guidelines for small qualitative studies (Braun & Clarke, 2006) alongside information power (Malterud et al., 2016). Recruitment strategies were in keeping with AUT and Ethics approval

guidelines, with efforts made to recruit a diverse group of participants. To provide context for the reader and facilitate interpretation of the results, this section included a personal reflexivity statement and outlined the demographic questions and interview questions that were used to generate the data and describe the participant sample. Further to this, the methods used for the analysis of data are described, then an outline of the efforts made to ensure the trustworthiness of the results.

# Chapter 4: Results

## 4.1 Introduction

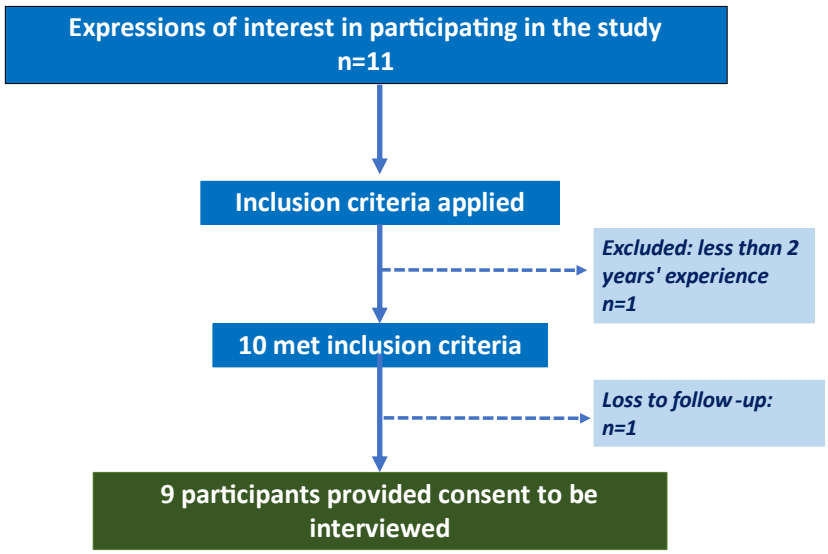
This chapter presents the findings from the interviews conducted with GPs and physiotherapists. A description of the study sample is provided and followed by the results of the analysis - a thematic framework describing GPs and physiotherapists' experiences delivering RTP and their perceptions about how RTP could be better delivered.

## 4.2 Participant characteristics

After a 3-month recruitment phase between October 2023 to December 2023, 11 potential participants responded to the study invitation. One respondent did not meet the inclusion criteria due to inadequate experience with concussion (less than 2 years' experience). Another potential participant was lost to follow-up, leaving 9 participants who consented to participate in the study.

**Figure 4:**

*Participant Recruitment*



Five physiotherapists and four GPs were interviewed between 18/10/22 and 09/02/23. Interviews took between 50 to 75 minutes to complete. Analysis was completed alongside conducting the interviews. It was initially planned to conduct 6 interviews. Recruitment was stopped after completing these nine interviews as similar themes were evident across the interviews and no new concepts emerged in the last two interviews. There was also a good mix of GPs and physiotherapists who had taken part from a range of rural and urban locations and years of clinical experience.

The demographic characteristics of the participants are presented in Table 6. Five participants were from rural (55%) and four from urban (44%) locations. Participants were aged from 31 to 72 years (mean 44.4 years, SD = 15.2). All participants worked in the primary care/community setting and reported encountering on average 18.2 (SD = 15.9) concussions per year (median 11, range 3-52). Five (56%) of the participants had 11 years or more experience, and four (44%) had less than four years of experience.

**Table 5:**

*Demographics Of Study Participants (N=9)*

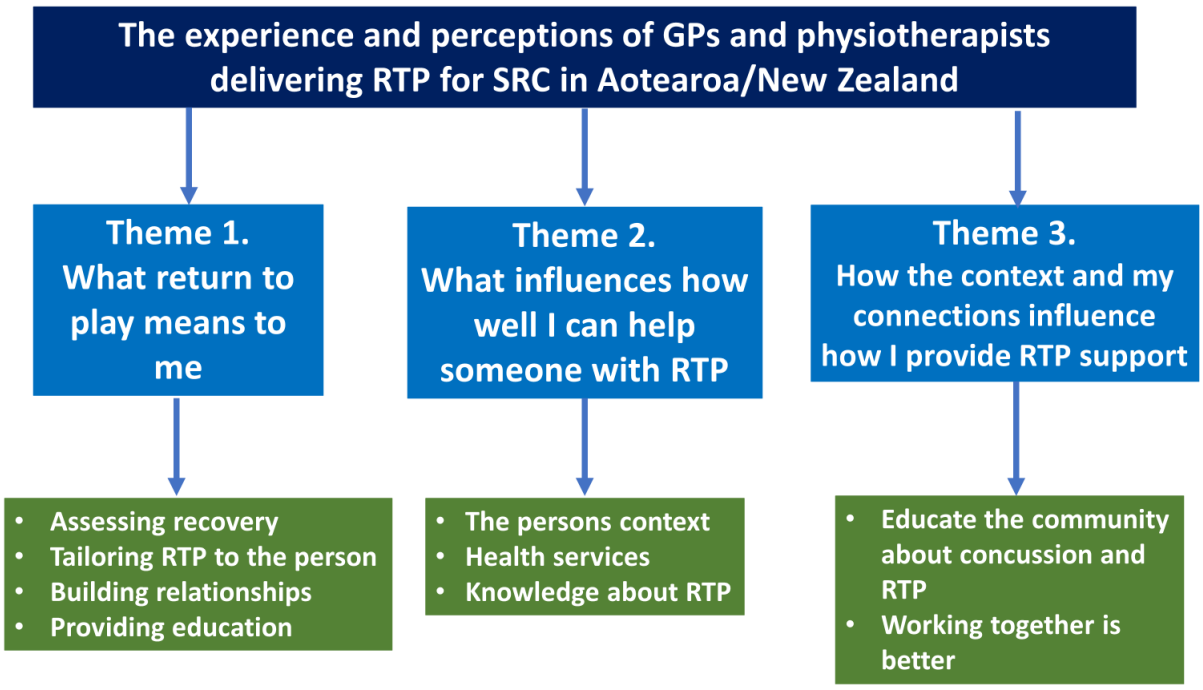
| Characteristic | | N (%) |
|---|---|---|
| Gender | Male | 6 (67) |
| | Female | 3 (33) |
| Ethnicity | NZ European | 8 (89) |
| | Other | 1 (11) |
| Clinical discipline | GP | 4 (44) |
| | Physiotherapist | 5 (56) |
| Education | Bachelors | 3 (30) |
| | Post Graduate | 1 (10) |
| | Certificate | 3 (30) |
| | Post Graduate Diploma | 2 (20) |
| | Masters | |
| Remoteness | Rural | 5 (56) |
| | Urban | 4 (44) |
| Professional experience (years) | >11 | 5 (56) |
| | 5-10 | 3 (33) |
| | <5 | 1 (11) |

### 4.3 Output of the thematic analysis

Overall, the data revealed that participants experienced varying levels of knowledge and confidence in managing RTP. Both GPs and physiotherapists supported the idea that managing RTP was an important part of their role. This extended from the early stages of initial assessment and diagnosis, through rehabilitation and medical clearance to RTP. There were three overarching themes identified (1) What RTP means to me in practice, (2) What influences how well I can help someone with RTP, (3) How the context and my connections influence how I provide RTP support (see Figure 1). Each of the three themes encompasses a number of sub-themes. Physiotherapists and GPs reported similar opinions in terms of what worked well and the challenges they encountered in delivering RTP. Where subtle differences between professions were identified, they are described within the respective subthemes. The following sections will describe the thematic framework by theme and subtheme, supported by illustrative participant quotes.

**Figure 5:**

*Three Overarching Themes Derived From The Data.*

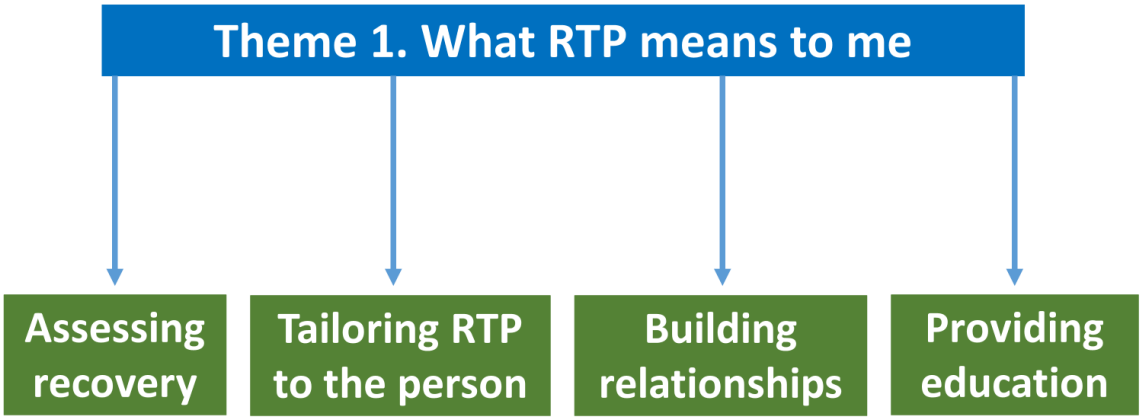


### 4.4 Theme 1: What RTP means to me

Theme one describes what participants understand RTP means from their point of view. It is supported by sub-themes describing how each group discerns and assists recovery, ensuring that the process is tailored to the individual circumstances while highlighting that patient-provider trust is needed for the process to work well, and the idea that early education of patients during the recovery regarding the need for a supervised RTP may increase buy-in and prevent loss to follow-up that often occurs in the late stage of recovery.

**Figure 6:**

*Theme 1: What RTP Means To Me*




#### 4.4.1 Assessing recovery

Participants described RTP as a process that involved assessing different aspects of recovery (symptom resolution, changes to mood, response to stress, function at work/school/overall function), stress testing and/or medical clearance. GPs tended to focus more on the overall impact of concussion on the person's function and impact on work or school, while physiotherapists tended to describe RTP more as a series of steps that involved a gradual

reintroduction of physical stress and testing, which culminated in a symptom-free return to full sports participation.

> *"… return to play could be anything from like, I'm a person who enjoys going for a run. And I'm like a jogger … it could also include someone who takes part in regular, like plays rugby, or races bikes, or whatever, and getting that person back to a place where they can be competing as they were pre-concussion." (GP 3)*

> *"To me, it means observing them as they return to play through the various stages making sure that you have observed every stage they get to and ask them questions the next day … I like to be able to sort of let the doctor know, Hey, I've watched them at training he's done his change of direction, He's done his rapid head movement and he's good to go to contact. And then also once the doctors cleared them for contact also make sure you observe that contact session and check them out 24 hours later and as long as the symptoms are clear, return to play" (PT3)*

### 4.4.2 Tailoring RTP to the person

Participants also described how RTP needed to be tailored to the individual. This was described as understanding their expectations of recovery, priorities, and motivation to return to sport.

> *"…you talk with them about what their expectation is first. And then you try and pull it back, depending on what symptoms they might still have or have just got over." (GP4)*

> *"… I think it needs another level of interpretation for you to be able to personalize it to people, … but thinking about it from like a different patient perspective, …to try and get something that's personalized to that person in their reality, be it job, what sport they do, what level they do it at, it's really hard to personalize it for someone." (GP3)*

Being culturally responsive (e.g., world view, language) was also described and being important to understand, as participants noted how the tools they used to assess recovery may not be culturally appropriate (e.g., perceptions of 'feeling more emotional').

> *"…what is meaningful to that person as well… I think it would be more important to connect with who they are and try and understand who their family ties are and where their whānau is from… just getting to know the individual is, that is most important thing." (PT5)*

> *"…. but the way that Māori and Pacific Islanders view an injury is very different as well. So to be able to just say that the SCAT questions, for instance, that are like "I don't feel right" and "feel more emotional", "more irritable", that sort of stuff … I think, in my experience, these people are answering differently, and I don't think that necessarily reflects their cultural background." (PT3)*

Participants felt that linking in with the person's support network/ whānau (e.g. partners, parents, teachers) added value to the RTP process. However, one of the participants noted that some people may not always want support from their whānau, for various reasons (i.e., domestic violence, pressure to RTP). In such instances, it was important to tread carefully to prevent the person from potential harm.

> *"Maybe having more involvement with the whānau to figure out if this person is going to tell you exactly what you want to hear so that they can get back to rugby straightaway. Whereas if you'd actually had a discussion with the partner, or the parents or the siblings, and then the Mums like, oh, actually he put orange juice in his Coco Pops instead of milk yesterday, whereas he's told you that I feel completely fine, then there's probably more things you concerned about."* (GP1)

> *"…also just to give you a general idea of from family where they're at, are they irritable, have there been any mood changes and concentration and then basically just*

*get them to monitor as well, I find it very important to get the family involved as well."* (PT4)

### 4.4.3 Patient-provider relationship

Participants felt that trust was vitally important because they relied on the person and/or their whanau to work with them to help identify any ongoing symptoms of concussion (e.g., accurate symptom reporting) or functional difficulties outside of the clinic (e.g., abnormal behaviour at home). For participants in rural areas, this was particularly important because once trust in the person was lost it meant that they would be unlikely to seek further healthcare (because of the limited healthcare options to pursue).

*"You need to have a relationship, you have to have a relationship. And also, it has to be relationship that the rest of your whānau trust as well. So if you are going to see a GP that you feel mismanaged your auntie, you are not going to trust that GP, gets complicated in rural areas where there aren't many options … there has to be a level of understanding and trust, and relationship and time." (GP2)*

*"I think that having conversations with that person about their reasons for wanting to return to play will also help to mitigate some of the issues with symptom reporting, if you spend more time building that relationship, which again, you could probably say that's a barrier to providing effective care under our existing funding model. It's you don't have the time or the capacity to." (PT2)*

### 4.4.4 Providing education

Participants described how a key aspect of RTP was providing education about concussions early in the process of recovery. Education was seen as a useful intervention to help patients understand the consequences of returning to play too soon after injury, to support buy-in (e.g., accurate symptom reporting), and to avoid loss to follow-up.

*"…I think the education part is key because people need to like own it themselves. You need to make sure [as] they can lie to you and be like, "I've got no symptoms, it's fine, I can go back", but I think if you explain it to people properly then they can … I think if you can make people take seriously what's actually going on with them. You need that critical part of it but that all takes time." (GP3)*

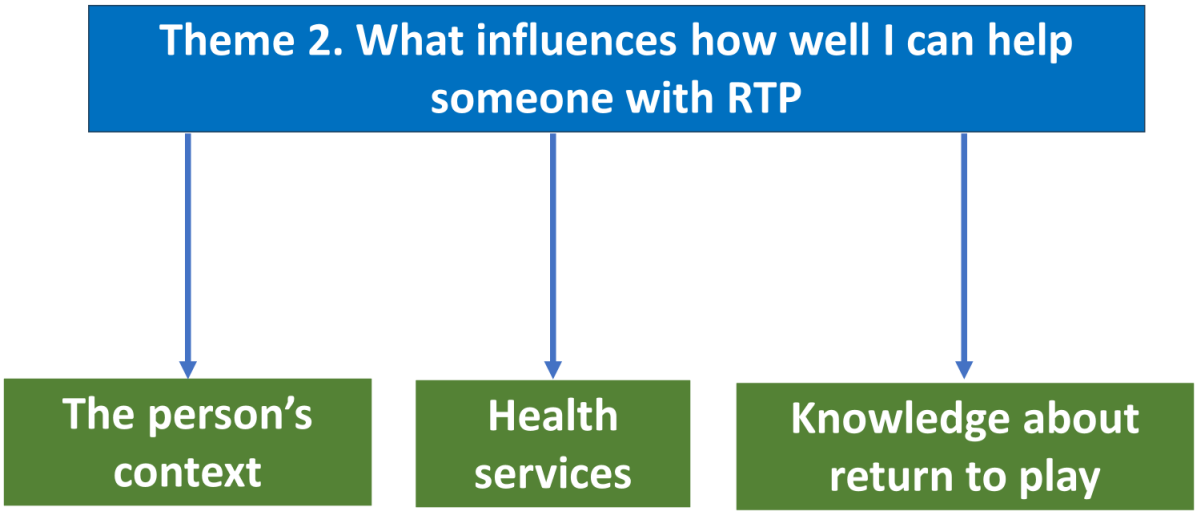
*"…sometimes there are varying degrees of health literacy among the people that I'll treat. So it may be that they are experiencing symptoms that they don't know that's a thing that they need to report, or they sort of don't necessarily understand the risks and ramifications in returning too early ..." (PT2)*

### 4.5 Theme 2: What influences how well I can help someone with RTP

Theme two describes what participants felt influenced how well the RTP went. This theme is supported by sub-themes describing internal (patient-related) contextual influences on recovery, external (non-patient related) influences on recovery such as the health service provision issues, knowledge of clinicians working in this area, and the challenges they face to upskill.

**Figure 7:**

*What Influences How Well I Can Help Someone With RTP*




#### 4.5.1 The person's context

Participants felt that the person's context influenced their ability to support them through RTP. A person's motivation to engage in RTP was seen as a major factor that influenced their desire to report symptoms accurately. They felt that this was influenced by their health literacy, which influenced their desire to seek healthcare in the first instance, as well as the trade-off a person made between their knowledge of the consequences of returning to play too soon and other external pressures (e.g., pressure to return to play from team, pressure to

not let others down, pressure not to be seen as unwell (whakama), or pressure to return to work).

> *"I feel like it's a bit of a juggling act of deciding how long people need to have off depending on how bad symptoms are. … I'll normally say right, two weeks off post-concussion, and then go from there." (GP1)*

> *"I guess the big overarching issue for me is the current process relies hugely … on the symptoms… sometimes they'll [athletes] say whatever you want to hear, to get back on the field. And then the other thing is, sometimes there are varying degrees of health literacy among the people that I'll treat. So it may be that they are experiencing symptoms that they don't know that's a thing that they need to report, or they sort of don't necessarily understand the risks and ramifications in returning too early …" (PT2)*

> *"Probably just chatting about that term, whakama, that some do know, some don't. That feeling of letting the team down feeling bit stink. So discussing that, but again, not going beyond my scope as a physiotherapist" (PT3)*

> *"Then you're dealing with personalities, you're dealing with people, there's a lot of peer pressure, you're dealing with lots of lots of things that are all subjective. And you know, you have players, they'll go to five to 10 people or go to three different doctors to get the opinion they want." (PT1)*

Participants from rural areas, also felt that these issues may be exacerbated by the nature of the person's work which meant they were geographically isolated or transient, which made it difficult for them to attend follow-up appointments.

> *"…we have a lot of shearing gangs … if they're out shearing all day … two hours from anywhere, and they had a head knock on Saturday, they're like, it'll be fine… On Sunday our practice isn't open, then them trying to get in on a Monday, well, one, they're probably in the shearing van already, … so people just aren't going to show up." (GP1)*

The cost of accessing healthcare to the person was also considered by participants. Costs considered were the cost of appointments, travel, and time off work. While telehealth was useful for overcoming geographical barriers, its utility was limited by the cost to the person and to those with an adequate internet connection.

> *"And that's an hour cost appointment to the patient … having to charge a surcharge, that's going to be even more challenging to get people to come in for that one more appointment ... the advent of telehealth and the fact that ACC is also remunerating us to telehealth … I will do a telehealth with them after their first contact training and a telehealth with them after the game … just catch up to make sure that they passed and ticked everything, we don't charge a surcharge for those sort of telehealth, so it is a free service ..." (PT2)*

> *"Cost is definitely part of it … in (rural town name), they're going to have to try [the GP] and if they're lucky, they'll get a spot on the list that day, and then they've got to pay to come in as well. And if you've got to get them in for the initial and then you've got to get them in for a couple of follow-ups, you're looking at 100 bucks in three consults … plus whatever cost it's going to be for seeing the physios and getting an assessment from that side of things as well." (GP1)*

### 4.5.2 Health services

Participants felt that health services did not help the person to access a supported RTP process in a timely manner. GPs felt that they had limited clinical time to conduct assessments and book follow-up visits, which was also perceived by physiotherapists.

> *"… If they don't pass [the medical clearance assessment], you then can't book them in for repeat in a week or two weeks. It's a repeat in four weeks, which is there's no ability to sort of work with people to upscale." (GP2)*

> *"… the hardest part was actually getting them into their Docs enough and effectively lodging the concussion … I can put down a contusion to the head, but as soon as I put concussion on an ACC form, they say "no you can't diagnose it", which is probably my biggest thing is … I think any physio can, even a new graduate can diagnose a suspected concussion." (PT3)*

> *"I think they're [GPs] just very constrained, I think they just don't have the time and I think very often, they just don't also know what to do with it and straight after they very often refer back to physio … patients get lost in the system." (PT3)*

Participants also felt that how the person was initially managed when they first sought healthcare also influenced their outcomes.

> *"…I had a concussion this year… and my GP, tried to just write me off … for four weeks to do nothing and that was it and she's a good GP, but that's what her knowledge around concussion and what I needed to do was, I referred myself to a physio … It's comical now, in the sense that I didn't really recognize I had a concussion for three days and, you know, been trying to self-treat anyway. But I referred myself to a physio at a week and that was the best thing I did. That was the only thing that was helpful." (GP3)*

Participants suggested that there was no care pathway for managing concussion, which often meant that they couldn't track the progress of the person. One physiotherapist, for example, described how a person was able to 'slip' through several checkpoints before being seen 14-15 days after the initial injury.

> *"… [after referral back to GP] don't know if they've got a medical clearance or not, they just go into the ether." (PT4)*

> *"… often I'm not catching these people acutely … probably it's coming really clear [from] this conversation is the timeframe and how delayed my input really is." (PT5)*

*"My experience is it doesn't currently work well, … [we] don't have open lines of communication. So that needs to be ensured." (PT5)*

*"… I think I've had just a few letters back … But considering the number of people that I've seen, and the struggles in getting that onward referral and care … It would be nicer to get a quicker speedier service." (GP4)*

### 4.5.3 Knowledge about the return to play

All participants perceived that both GP and physiotherapy professions needed to upskill their knowledge about RTP care. For example, when asked what RTP meant to them, one GP reported that RTP meant different things depending on the context they were in:

*"It depends a little bit on whether I'm seeing them at a sports field or at a Ski field, or in an emergency department, or whether I'm seeing them as a GP. If you think you're at ED, it'd be the diagnosis side of things, they wouldn't probably be managing the returns of play aspects, they would hand that over to the GP to do … or if you're doing after hours, you might have a situation where somebody comes to you for the clearance to say I want to go back and play, and so you might have to make a clinical decision around whether they have recovered enough or not." (GP4)*

The desire for more knowledge was also reflected in some of the participant's dialogue. Participants noted that they were not familiar with RTP guidelines and explained how they found guidance about medical clearance and stand-down periods unclear and confusing. For example, participants reflected on how mandatory stand-down periods were arbitrary rather than informed by an individual's state of recovery and noted how there were different rules for different sports.

*"… that is probably one of the things I struggle with, with lots of the rugby stuff and lots of the guidelines … that says you need to get a medical clearance before you go back. It's really vague what that is. And does that mean you can go and see a nurse in a*

*rural clinic [for medical clearance] … I think it's intentionally vague, to make it workable. But then why have it?" (GP3)*

*"… 21 days off before you can do anything I think is too arbitrary." (GP3)*

*"… It's based on symptomatology more and then the timing, … you've got quite strict guidelines around when they can return, particularly in rugby. But I've always seen that as more of a minimum than a target. So if their symptoms are still severe at that point, I would be pretty unlikely to clear them to go back onto the field." (GP2)*

The need for medical clearance before RTP was also described by both physiotherapists and GPs as being more like a rubber-stamping exercise rather than the conclusion of a graduated RTP process. GPs acknowledged that they often did not work closely enough with the person to determine if they were ready to be medically cleared to RTP. Physiotherapists observed how their patients were able to obtain a medical clearance, despite their observations that the patient had not yet fully recovered.

*"… you see a different GP, and they're going to give you a completely different plan, or some will sign you off when some wouldn't. Which isn't really good enough, when you're using GP clearance as the standard to go back to the field, it needs to be standardized. So I'm very aware that it's not standardized at the moment you go and see someone who's time poor, they'll just sign people off, might see somebody else who has a much higher threshold." (GP2)*

*"…they just went to the urgent doctors here and the doctor assessed her. And she said, 'no, I've got no symptoms, … I'm fine.' And the doctor cleared her." (PT3)*

Participants from rural areas also explained that they had poor access to colleagues experienced in RTP care, which made upskilling more difficult in these areas where collegial isolation was more apparent, and time-poor clinicians were already bombarded with extensive opportunities to upskill in other areas.

*“… it needs to be better training. How that would happen, from a timing point of view is impossible. You know, we're being sent training modules for everything under the sun … and there's only so many … training modules you can do.” (GP2)*

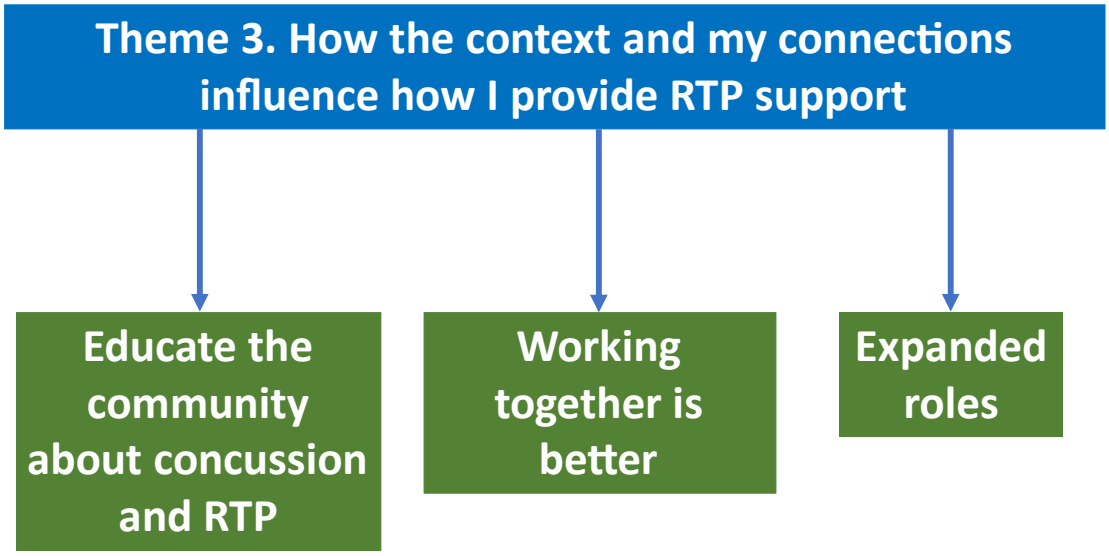
*“… there is only one other physio I'm aware that has treated concussion this year for the sport. So, no I don't feel like I have other colleagues that I can call on very freely.” (PT5)*

### 4.6 Theme 3: How the context and my connections influence how I provide RTP support

Theme three details how participants suggest leveraging the resources that may already be available in the community could improve the way RTP is delivered. This theme is supported by sub-themes describing utilising the community itself in assisting RTP by delivering education on concussion and RTP to them, supporting the improvement of IDT communication may improve patient care, and suggestions of evolving the role and scope of physiotherapists to aid GPs with diagnosis and clearance decisions may help things work better.

**Figure 8:**

*How The Context And My Connections Influence How I Provide RTP Support*




#### 4.6.1 Educate the community about concussion and RTP

Participants felt that raising community concussion awareness could facilitate the RTP process so that the person and the people around them had the agency to seek help when a suspected concussion occurred and were well informed to understand the process of recovery.

> *"… that should be part of what training should be. It's not just running around the field and passing the ball. There's a little bit of Blackboard stuff … concussion? How do you get back to playing, you know, in a real positive sort of way. And so that should be part of it. We shouldn't be afraid to talk about it." (GP4).*

Some participants also felt that the person's return to play could be better supported by someone in the community, such as a community navigator, or written documentation, to help the community support the person's recovery at home (e.g., with whānau), work or sport.

> *"... having very easily accessible educational resources pitched at different levels. So you could have a package that was kind of like, offered as part of a coaching program, for example of, 'here's some things to keep an eye out for in your athlete as they return'." (PT2)*

> *"Well, often they will come with whānau, depending on the age, of course. At other times, they won't. And sometimes they'll indicate that they need to report back to coach or family or work. … Whether what you say gets converted back … correctly is another matter." (GP4)*

Participants suggested using local health professionals who regularly work with concussion, as educators at community group meetings, would improve community understanding of who the local providers of concussion care are. However, participants noted that this would be challenging due to limited capacity.

> *"I'd get ACC, to actually fund education for the coaches. Okay. And to use physios to do it, because they're good at it. Yeah and respected by the sports people." (GP4)*

> *"We've got three physios in town. All of whom are completely slammed, one of them only works two days a week … suggested of them going down to training and stuff, the answer is no. Just due to limited capability." (GP1)*

### 4.6.2 Working together is better

Participants described a situation where there was poor communication between GPs and physiotherapists when it came to managing the person's RTP. Some participants described the idea that “two heads are better than one” when it came to making decisions about RTP and medical clearance.

> *“I think if I was in a situation where I had a physio that I knew, who sent me an email and said,’ Hey, I'm sending in X person to come and have a [medical], they need their sign off.’ …I would have a lot more confidence that that person was getting better care… I think the information that a physio can get from a patient can be quite different from what a doctor can get. It's just a slightly different relationship.” (GP3)*

> *“… I think it's a really natural kind of partnership and I think they both have areas that they like their skills will kind of complement each other because, feedback from a lot of GPs that we've talked to is that they don't want to be kind of solely managing this and that they don't have the time for it … making things relevant for the patient, that's something that we have to do all the time with exercise programming.” (PT2)*

One GP who worked closely with a physiotherapist felt more confident diagnosing the concussion and providing medical clearance with support from a physiotherapist.

> *“I'm quite glad that I send people to physios, because … within 15 minutes for me to actually assess someone, have these conversations, try and come up with a suitable kind of ideas around activity is nearly impossible. Plus, I don't really have a good understanding… that ability to follow up and actually physically see how people are going as well. … I'm just taking their word for it a lot of the time.” (GP2)*

Conversely, without physiotherapy support, the same GP expressed concern about providing medical clearance.

> *“… I've been sent a couple of patients I've had nothing to do with except for the fact that they need this GP medical clearance. …. it's really, really hard to have someone*

*turn up in your office saying, I want medical clearance and you've never met them before. You have no history on what's going on. Probably you need a second set of eyes with the GP being involved… you would want that to be a GP who's actually adding value, rather than just a rubber stamp." (GP2)*

### 4.6.3 Expanded roles

GPs and physiotherapists also felt that when they were able to work together, this resulted in better care of the person. One suggestion from multiple participants was to increase the scope of physiotherapy practice to include concussion diagnosis and medical clearance.

*"… we probably just need to be a little bit less high and mighty about saying that doctors are the only ones to do it. … I think that should be changed. Because I mean, we don't get taught about concussion at medical school, specifically, or making a diagnosis using modern evidence-based stuff. So there should be like an alternative qualification to say you can do it. I think that'd be more helpful." (GP3)*

*" … And that's the biggest thing, is quick access for diagnosis … because [if] physios can diagnose it, then you don't need the quick access. So that's the sort of thing if ACC want to go … Let the physio diagnose it on the weekend." (PT3)*

This change was perceived to be valuable, particularly for rural communities where access to a skilled concussion workforce was limited, and also where physiotherapists felt they were already managing the person to full recovery.

*"So they say they must be cleared by a GP... we've already covered everything… they've been able to return to high-intensity activities symptom-free, they've been able to complete two full-on non-contact sessions symptom-free…I think at the end of the day to make a call on someone going back … I think the physiotherapist is still in the best*

*position to make that decision. But I don't believe that legally, we're in a position to be able to make a decision without a doctor …" (PT1)*

*"… how do we continue to strengthen the links between GPs and their local physios, so that physiotherapists can be more involved in this because … I think it was 45% of them or something didn't feel confident managing the return to play process." (PT2)*

### 4.7 Summary

The results of the thematic analysis describe three themes (1) What RTP means to me in practice, (2) What influences how well I can help someone with RTP, (3) How the context and my connections influence how I provide RTP support.

Both GPs and physiotherapists supported the idea that managing RTP was an important part of their role. Physiotherapists and GPs reported similar opinions in terms of what worked well and the challenges they encountered in delivering RTP. However, the data revealed that participants experienced varying levels of knowledge and confidence in managing RTP.

There were subtle differences between professions in interpretation of expectations regarding RTP management which will be described in the discussion section (chapter 5).

# Chapter 5: Discussion

The purpose of this study was to explore the experience and perceptions of both GPs and physiotherapists on providing advice on RTP following SRC in primary care. This investigation of these HCPs is an important addition to the body of evidence about RTP after SRC by highlighting challenges and identifying areas where greater support could be established for clinicians. Previously, GPs have reported low confidence in managing concussion and RTP (Stuart et al., 2022), while physiotherapists expressed confidence in working with SRC and would like to work with more scope to help GPs in this important role of management of SRC and RTP (Reid et al., 2020). This study expands on this knowledge, by providing a nuanced understanding of what this means for the experience of those managing SRC and RTP in practice.

The main findings indicate that a successful RTP for people with SRC requires consideration by HCPs of the person's perceptions, motivations, and context, as well as symptoms and tolerance for physical activity. The HCPs in this study reported a desire for improved clarity on how to operationalize guidelines in a culturally responsive way. Contextual influences were found to play a key role in the RTP support clinicians could provide, such as availability of the clinician, the time required for consultations, and the ability of the person to pay for follow-up support. GPs and physiotherapists also wanted improved clarity on their roles and how they could work together more efficiently to optimize the care provided for their patient.

## 5.1 Knowledge and assessment of RTP

The results of this study show that GPs and physiotherapists had an overall understanding of RTP principles after SRC as outlined in the CISG guideline (Patricios, Schneider, Dvorak, et al., 2023). The study participants described a process of assessment of recovery including discerning the presence and resolution of SRC signs and symptoms whilst supporting the person to RTP alongside return to work or school. They described encouraging

patients to undertake low-risk physical activity in the early phases of GRTP, followed by progressive increases in physical exertional stress to the injured person in a controlled and safe environment with minimal risk of re-injury. The GPs and physiotherapists also described the importance of achieving symptom stability prior to progressing to the next step of exercise intensity, to culminate in full, unrestricted RTP.

There was much less agreement, and some variation between participants and within professions, regarding how to assess recovery. The GPs and physiotherapists described the necessity of considering a range of potential SRC impacts including cognitive or emotional dysfunction alongside physical symptoms such as fatigue and headaches. Physiotherapists also perceived a need for testing tolerance to physical activity rather than relying on self-reported symptoms, particularly in situations where a person may be motivated to under-report symptoms, for instance if they wanted to RTP for an important match. The lack of specificity on how to operationalise recommendations has previously been described in a critique of RTP guidelines by Hallock et al. (2023). This is likely to result in considerable variation in the provision of care for a person affected by SRC creating inequities across New Zealand, where care relies on the skills and experience of the treating clinician.

There is some evidence that suggests physical recovery may precede cognitive recovery, with many athletes describing cognitive issues 1-6 months after injury, and often after a clearance to RTP has occurred (Hou et al., 2023). Further, several studies have demonstrated the increased probability of chronic emotional health issues in those who have experienced concussion injury compared to the non-concussed population (Chrisman et al., 2021; Forrest et al., 2018; Hind et al., 2022; Iverson et al., 2023; Lambert et al., 2022; Ma et al., 2024; Manley et al., 2017; Smulligan et al., 2024). Yet, GPs and Physiotherapists described having limited knowledge and the time to investigate ongoing cognitive or emotional issues. One GP claimed to use the brief memory test within the SCAT5 to discern recovery, despite the SCAT tool being a screening diagnostic tool and not a tool to be used to assess recovery (Echemendia, Burma, et

al., 2023). The implications of this are that people with SRC may be cleared to RTP with both physiotherapist and subsequent GP approval but continue to experience cognitive and emotional sequelae relating to the SRC injury that may have been insufficiently assessed.

### 5.2 Attitudes to the medical clearance

Currently, ACC guidelines state that medical clearance needs to be provided by a GP. Both GPs and physiotherapists identified challenges with this approach; GPs described feeling limited in their capacity to perform this role well, principally due to time limits on consultations. Physiotherapists also expressed difficulty in getting timely reviews or diagnoses from GPs due to a lack of easy access. Limited GP workforce issues have become an ongoing issue for New Zealand (Andrew, 2024). The lack of time to perform consultations, and lack of confidence/ knowledge on RTP aspects of SRC management supports previous findings on New Zealand GPs working in SRC (Salmon, Sullivan, et al., 2020; Stuart et al., 2022). GPs consequently felt that medical clearance was like a “box-tick” exercise rather than a consistent, comprehensive, medical assessment process. Both physiotherapists and GPs described they would feel more confident in determining a person’s readiness for RTP if they had been involved in monitoring and supporting of people through the stages of the GRTP process which aligns with findings published elsewhere (Dalton et al., 2024). The GP participants described support with GRTP from physiotherapists as very helpful, and they valued reports and recommendations from physiotherapists in assisting their decision-making on providing medical clearance.

Variations in practice, and opinion on when a medical clearance should occur highlighted by participants may reflect subtle but important differences between CISG guidelines (Patricios, Schneider, Dvorak, et al., 2023), ACC policy documents (Accident Compensation Corporation, 2023b) and individual sporting organizations concussion policies (Equestrian Sports New Zealand, 2020; New Zealand Rugby, 2024; New Zealand Rugby League, 2024). According to the different documents, medical clearance should occur at either steps 3,

4, 5 or 6 depending on which document is followed. There also appeared to be differing attitudes between participants to the requirement for HCP oversight of the subsequent RTP steps after the medical clearance, with GPs leaving these steps up to the person involved to navigate independently, while physiotherapists preferred to review the individual after each step until a full return to competitive play had been achieved. An important challenge for GPs in making a judgement on a person's recovery is their reliance on a person's self-reported symptoms, because the risk of re-injury is higher during the subsequent steps of the GRTP after the clearance has been provided; this means there is some risk that a person may receive clearance when they had not achieved sufficient recovery. Questions about the sensitivity of the RTP clearance to discern holistic recovery have been raised across multiple studies (Choudhury et al., 2020; Churchill et al., 2021; Darling et al., 2014; Petrie et al., 2024). The CISG guidelines provide no clear advice on the necessity for oversight, by a HCP, or another support person such as an athletic trainer, parent, or coach, to ensure continued symptom stability during these riskier steps of the GRTP i.e., return to sport-specific training, team training or competition. This is perhaps an issue to consider for future consensus statement updates.

### 5.3 Healthcare providers want to feel more confident managing RTP

The confidence of primary care HCPs in managing SRC and RTP is important because 90% of SRC injuries are managed at a primary care level (Accident Compensation Corporation, 2017). In the current study, participants described wanting more learning opportunities to support the implementation of RTP guidelines following SRC within primary care. Whilst expressing the desire for more knowledge about RTP, GPs acknowledged the challenge for them to complete professional development alongside the demands of general practice, because they would need to complete this education in their own time. One GP suggested that unless they had a specific interest in concussion, most doctors would pay little attention to learning material until required to use it. Indeed, both GPs and physiotherapists who did not see people with concussion regularly, stated that they had to check the guidelines to refresh

their knowledge when they saw a patient following SRC. Previous research suggests most GPs encounter only a few people with concussions each year in practice (Salmon, Sullivan, et al., 2020) and the regular use of concussion guidelines was associated with more experience in managing concussion injury (Derbyshire et al., 2021). This is likely to be similar for physiotherapists who are not based in sports clinics or specialist concussion services.

The necessity for further learning opportunities focused on RTP for SRC has been reported in previous studies by Salmon, Badenhorst, et al. (2023) and Dalton et al. (2024). However, having sufficient time to learn about concussion guidelines within busy workloads was viewed as a major barrier and may explain why clinicians have low adherence to clinical guidelines and recommendations (Derbyshire et al., 2021). The implications of these findings mean that improvements in knowledge of primary care HCPs working with SRC are still required, particularly when they are responsible for the management of SRC and RTP.

### 5.4 The importance of community education about concussion and RTP

Participants were aware that many people with SRC do not disclose their injury to a HCP; they understand there is likely a significant unmet need in the community, leaving many people to manage their SRC and RTP without any HCP oversight. The participants also noted that reluctance to seek HCP help may be due to inadequate education regarding SRC signs and symptoms, the need to seek HCP care, and how it is managed, including the RTP. Participants described regularly working with people with low levels of health literacy regarding concussion, with their knowledge of signs and symptoms of concussion influencing the value they place in undergoing a managed RTP before recovery (Theme 2, sub-theme “health systems”, and Theme 1, sub-theme “providing education”). Previous studies describing the knowledge and attitudes to SRC among New Zealand-based equestrian athletes (Theadom, Reid, et al., 2020), cyclists (O'Reilly et al., 2020), and adolescent rugby players (Salmon, McGowan, et al., 2020), show variation in knowledge and attitudes between sporting communities, which infers that some sports are better at delivering SRC health messaging to their community than others.

People's health literacy (Moen et al., 2022; Pappadis et al., 2024) and broader socioeconomic background can influence their propensity to disclose a concussion injury to a HCP (Graves et al., 2019; McLeod et al., 2024; O'Reilly et al., 2020; Thorne et al., 2022; Weishaar et al., 2024). In addition, broader systemic issues, such as sports organisational support; e.g. team healthcare or volunteer support (Clacy et al., 2017; Echlin et al., 2012; Petrie et al., 2024; Sullivan & Jaganathan, 2024) and health system issues (Andrew, 2024; Bastos Gottgtroy et al., 2022; Betty et al., 2023; MOH, 2023c; Poloai et al., 2023; Ruff et al., 2009) may also play a role in injury disclosure. In the current study, participants described the need for ongoing public health messaging to improve the health literacy of the community regarding SRC, particularly for people to understand the reasons to engage with HCPs following a suspected SRC. This would be aligned with CISG guideline management principles (Patricios, Schneider, Dvorak, et al., 2023) and is important to address given that approximately 30% of SRC are not reported (Accident Compensation Corporation, 2023b).

### 5.5 Loss to follow up

The participants described many patients with SRC not returning to the clinic to complete a supervised GRTP and becoming lost to follow-up as a further challenge. The GPs and physiotherapists indicated that without a better understanding of the full recovery process, the patient/whānau may not see the value in attending follow-up appointments, particularly when symptoms dissipate. This means that some people with a SRC diagnosis have limited HCP oversight of their RTP, potentially placing them at risk of further harm if their recovery is insufficient prior to a RTP. Participants also described how the initial HCP interaction may be crucial to improve the person's/ whānau knowledge regarding the full process of recovery, including the importance of a managed GRTP.

Participants described that a significant barrier for people with SRC to attending follow-up appointments to support RTP was the costs of follow-up appointments. Sociocultural influences on loss to follow-up, such as cost and access issues (Graves et al., 2019), fear of

missing out on sport (McLeod et al., 2024; O'Reilly et al., 2020), shame associated with SRC (Valovich McLeod et al., 2022) and concerns about the expertise of HCPs (O'Reilly et al., 2020) have all been described in previous research. It is necessary to address the range of factors why loses to follow-up occur in the New Zealand context to remove barriers for people to engage in GRTP processes.

Telehealth-based appointments were proposed by some participants as a reasonable cost-effective solution for follow-up appointments, particularly for rural-based patients, that may help to reduce the loss to follow-up during the GRTP process. Although the use of telehealth has addressed some barriers to access such as rural isolation and cost, participants report it is “less ideal” than face-to-face consultations. While not specifically addressing the use of telehealth for SRC, Osman et al. (2024) suggests telehealth use should be used with caution given that it has also brought some new challenges to healthcare such as blurring of professional boundaries, increased workload on clinicians, depersonalization of the clinician-patient relationship with limited non-verbal communication, the inability to perform a physical examination, concerns about privacy, data security, lack of rigorous laws and regulations regarding telehealth use, increasing fears of malpractice lawsuits, issues with rural internet availability and reliability, alongside increased financial burden on patients with lack of government support for broadband costs and equipment needed for telehealth. Consequently, although telehealth is a readily available solution for GPs and physiotherapists to utilize, HCPs should be careful to ensure that patient care is not reduced due to removal of physical assessments that need to be conducted in person. There is currently no research on the utility and safety of telehealth specific to the complexities of SRC and RTP in a New Zealand sociocultural context which would be critical to ensuring safe implementation of such an approach.

### 5.6 Attitudes to working together during RTP

Both GPs and physiotherapists wanted greater clarity on their roles in supporting RTP. The participants described experiences where working alongside each other worked well and cited GPs providing diagnoses and medical clearances with the physiotherapist providing RTP support. Both GPs and physiotherapists recognized the value of a “second set of eyes” and recognised the complementary sets of expertise across the two professions. However, there were also experiences where working together did not work so well; they noted time delays in the provision of diagnosis or medical clearance, or patients being given a conflicting decision on whether they were ready to be medically cleared for RTP. Further, participants reported that repeated medical consultations may generate inefficiencies in an already burdened primary care medical system. Previous studies of New Zealand physiotherapists describe how they are already actively involved in managing concussions and had positive attitudes regarding having greater scope to work alongside GPs in managing SRC and the RTP process including assisting GPs to provide medical clearance (Dalton et al., 2024; Maxtone et al., 2020; Reid et al., 2020; Salmon, Badenhorst, et al., 2023).

The findings from this study align with those from a recently published study in the New Zealand context completed during this project. Dalton et al. (2024), explored the perspectives of 18 sports physiotherapists on their scopes of practice and their clinical practice concerning SRC, diagnosis, and RTP. They also described concerns with delayed access to SRC-trained GPs, challenges with navigating SRC care in a strained healthcare system, and the necessity for policymakers to consider an expanded role for physiotherapists within SRC management. Although physiotherapists noted requirements for knowledge improvement across their profession, they expressed confidence in their ability to help GPs manage concussion by assisting in the provision of a diagnosis, assisting with referrals for MDT care, and providing recovery clearance to RTP for SRC. This study has augmented the findings of

Dalton et al. (2024) by highlighting that GPs were also open to the idea of physiotherapists assisting them in determining medical clearance for the RTP.

In this context, the current study raises important questions about who ultimately makes RTP decisions. While physiotherapists and other non-medical healthcare professionals are involved in RTP, ACC's policy mandates that medical practitioners are responsible for providing medical clearance for starting the at-risk activity steps of RTP (e.g., full-contact training) (Accident Compensation Corporation, 2023b; Salmon et al., 2022). Yet not all people will have access to a GP, and it is likely that many GPs will not be able to lead a RTP program to make informed decisions about an individual's medical clearance. In contrast, a physiotherapist, for example may be well positioned to contribute to decision-making at this critical point in RTP, especially if they already have a working relationship with the individual and are involved in the RTP (such as with team physiotherapists). Currently, the New Zealand Physiotherapy Board has created regulations that allow physiotherapists who can demonstrate knowledge and skills in a defined area, such as concussion management, to extend their scope of practice and provide this role alongside GPs (PBNZ, 2021). ACC may consider allowing appropriately upskilled physiotherapists to make clearance decisions to create a larger pool of HCPs able to provide this part of RTP management. Relaxing the 'hard policy' may also help address inequities in healthcare access in rural communities, where shortages in the medical healthcare workforce are widely acknowledged (Betty et al., 2023; MOH, 2023c). Physiotherapists are already highly involved in SRC RTP management and often provide oversight of the terminal steps of the RTP beyond the clearance decisions. The CISG guideline does not clearly state if HCP oversight is required during the terminal steps of the RTP after the clearance which would ensure the decision was correct (Patricios, Schneider, Dvorak, et al., 2023). This is an important consideration for future iterations of guidelines given how difficult discerning recovery is for the HCP. Crucially, physiotherapists are well-positioned to determine the accuracy of a clearance decision during the terminal steps of the RTP as part of ongoing healthcare management for individuals and sports teams.

### 5.7 Better support for interdisciplinary/ stakeholder communication on RTP is required

To facilitate improved collaborations between GPs and physiotherapists, the participants identified that clear lines of communication are needed. Both physiotherapist and GP participants remarked that collaborative relationships are fostered by trust gained through both time and repeated interactions. They reported that there were often difficulties achieving collaborative relationships when HCPs (either the GP or physiotherapist) were unaware of who the local providers were; this challenge is exacerbated for transient locum practitioners in rural communities. Participants reported efforts by funders or policymakers to improve inter-disciplinary communication between GPs and physiotherapists may lead to an improved progression of recovery to RTP (theme 3, sub-theme “Working together is better”). In New Zealand, the funder of primary care accident-related health services is ACC, therefore ACC is a key stakeholder influencing how SRC is managed. This finding implies that investment by funders that encourage better inter-disciplinary communication on SRC and RTP will assist in optimal recovery and RTP experience for the person with SRC.

### 5.8 Connection with the community

Several participants in this study identified a requirement for clear communication with the wider community as adding significant value to the person’s recovery and RTP. The physiotherapists in this study associated optimal recovery with regular liaison with these stakeholders to assist the transition back to work, school and/or sport. These stakeholders include whānau, multidisciplinary health teams, schools, workplaces, coaches, and funders (ACC). An example of this has been described in a qualitative study by Costa et al. (2024) where rugby players felt that while there was structure to the RTP which allowed liaison between HCP and stakeholders, they felt unsupported during their RTL aspects of recovery. One of the participants in the present study suggested establishing formal health liaison roles within schools and sports organizations to enable direct communication between HCPs and community stakeholders to ensure RTL or RTP advice was translated to the classroom or school

sports field. However, participants reported this regular liaising with stakeholders took time and investment of resources and that this element of communication on recovery is not recognized or valued within ACC's current primary care funding models. Participants saw the lack of funding for their time to liaise with community stakeholders as a significant barrier to encouraging communication; which aligns with findings from the qualitative studies of GPs (Salmon et al., 2022) and physiotherapists (Salmon, Badenhorst, et al., 2023).

### 5.9 Individualizing the RTP to the person's needs

Participants described the importance of addressing the person's individual motivations, perceptions and sociocultural context when providing RTP support. In order to do this both GPs and physiotherapists acknowledged that positive therapeutic relationships and trust needed to be developed with the injured person and their whānau (theme 1, sub-theme "Building relationships"). They described understanding a person's sociocultural context allowed the RTP to be adapted to meet the individual's needs, particularly as clinicians relied heavily on symptom disclosure by the person involved and support from their whanau to inform RTP decision-making. Derbyshire et al. (2021) surveyed New Zealand-based HCPs for preferences in choice and use of concussion clinical practice guidelines, describing how clinicians felt that a "one size fits all" model did not translate well to practice, and that guidelines should be adapted to meet the needs of individuals. The CISG suggests tailoring the RTP to the needs of the individual, including their pre-injury co-morbidities and risk factors. The CISG also acknowledges barriers and challenges with resourcing faced by many HCPs across a range of settings and recommends that they adapt their advice and practice to suit the local context and supply of resources (Patricios, Schneider, Dvorak, et al., 2023). However, greater guidance may be needed about what factors clinicians should consider and ways of doing this.

The participants appreciated the value of engaging directly with whānau when considering the responsiveness to the Māori community during the management of SRC and

RTP. They described how they encouraged the presence of whānau at consultations, seeking whānau opinions on patient recovery, and asking questions about any unusual behaviours that may indicate ongoing cognitive or emotional distress for the person with SRC. One participant suggested adapting tools used in primary such as the SCAT (Sports Concussion Assessment Tool) to align with sociocultural contexts, by using words and phrases that align with how Māori describe symptoms. Two separate participants mentioned the word “whakama” often used by Māori and Pasifika athletes to describe feelings of shame, shyness, or embarrassment when they believe they cannot contribute to their sports team. Some participants described that this contributed to social isolation during recovery. Shame and social isolation are additional behavioural dimensions that leads to underreporting of symptoms or disengagement in the recovery process with HCPs and has previously been described in (Petrie et al., 2024; Valovich McLeod et al., 2022).

Sociocultural pressure on athletes to achieve early RTP, not report SRC and any ongoing symptoms to a coach or HCP was observed in a qualitative study of New Zealand rugby players by Costa et al. (2024). Attitudes of coaches, and the collective culture of rugby profoundly influenced players’ experiences. In addition, Salmon, McGowan, et al. (2020) found a culture in high school rugby settings where players would willingly sacrifice their health to RTP early for the team. The lack of adequate consideration of psychosocial aspects of readiness for RTP has been previously discussed by Caron et al. (2023), and the understanding of sociocultural contexts within community, sports, and rehabilitation settings is important to address within guideline advice and in practice.

These findings show there are significant challenges for HCPs in primary care to deliver SRC management and RTP that is individualized to the sociocultural needs of a person with SRC. The implications for policymakers and funders are that work is required to improve the time and resources available to HCPs to deliver a service that better meets the needs of individuals in a New Zealand primary care setting.

### 5.10 Using local HCP to educate communities

Participants also agreed that public health messaging and engagement with communities regarding SRC and RTP was required, and that this was more valuable when delivered by a local HCP (theme 3, sub-theme “Educate the community about concussion and RTP”). This was seen as an important relationship-building activity that improved connections within communities and trust in both the HCP delivering the service and community support for the recovery process which extended to the RTP. The CISC guidelines describe public health messaging as critical to many of the principles of management of SRC including recognition, reduction, removal, rest, referral, support of recovery, and RTP (Patricios, Schneider, Dvorak, et al., 2023).

Both GPs and physiotherapists described how closer therapeutic relationships and time to discern recovery for RTP occurred when HCPs such as team physiotherapists were engaged with sports clubs. Building a trusted therapeutic relationship between a person recovering from SRC and their HCP was described as often occurring for sports-team physiotherapists in a New-Zealand based qualitative study of rugby players by Costa et al. (2024). Both GPs and physiotherapists in this study described how it was generally easier for physiotherapists to build trust with individuals given their longer consultation times, and trust within communities regarding SRC due to their interactions with sports and stakeholders in the community. Having local HCPs engaging in local communities could also address community-specific challenges such as misconceptions that is present regarding SRC and the recovery process. An example of this was discussed by some participants when they described mandatory minimum stand-down periods implemented by most contact sports organizations they saw as contributing to the confusion about optimal recovery from concussion, and readiness for RTP. They state the person may incorrectly assume that completing the minimum stand-down period is the minimum requirement for recovery and RTP (theme 2, sub-theme “Clinicians’ knowledge about return to play”). Improving health literacy regarding SRC using targeted education specific to

each community has also been supported by research by Salmon et al. (2022) and Churton et al. (2020). Greater clarity on issues such as confusion about stand-down periods, delivered in educational sessions for local sports organizations, coaches, players, and whānau alike, would be advantageous to addressing community-specific issues. Improving community support for the principles of SRC management creates a wider support system for individuals, overcoming shame and social isolation experienced by individuals as described by (Petrie et al., 2024). Unified public health messaging and delivery of these messages to local stakeholders, such as sports coaches, by local HCPs could help improve the wider community support systems for individuals recovering from SRC. Previous findings show community education that leads to an improved acceptance and support from coaches and teammates, led to improved players' experiences of recovery from SRC (Costa et al., 2024). Participants across both GPs and physiotherapists describe that although community education by local HCPs was ideal, this takes time and resources to implement which was not recognized in the funding of primary care for SRC by ACC currently.

The implications of these findings suggest policymakers and funding organisations should consider supporting the use of local HCPs to deliver SRC health promotion to their communities. This has the effect of improving the health literacy of communities, support for the principles of management including the RTP, improving trust in HCPs providing the service, improving disclosure of SRC injuries, and improving community support for those with SRC to minimize the shame and social isolation the injury comes with.

### 5.11 Strengths and limitations

A strength of this study is the high proportion of rural-based health practitioners who participated in this study. The delivery of primary health care in rural New Zealand is associated with a number of challenges which were raised by the study participants, such as the inability of people to attend follow-up appointments, poor access to transport, and ethical considerations regarding the safety of expecting people with SRC injuries to drive to

appointments in urban centres or wait until a clinician can drive to the rural community to see them. This means that the findings from this study are likely to be transferrable to other similar contexts. Another strength of this study was the use of qualitative methodology and the generation of a rich and nuanced dataset that may not have been obtained from a survey about GP and physiotherapists experiences and perceptions about the RTP process.

There are some limitations of this study. Attempts to recruit HCPs who identify as Māori were unsuccessful despite attempts to engage with iwi-based providers to identify and recruit Māori healthcare providers. Participants were asked about cultural responsiveness and safety during their interviews; they noted structural elements of the healthcare environment that created and entrenched inequities for Māori. However, these responses were from a cohort of non-Māori practitioners and are not reflective of the lived experience of members of a group who have experienced disadvantages due to inequities within the health system in New Zealand. In addition, other HCPs who are not GPs or physiotherapists working in primary care with SRC (nurses, occupational therapists, and psychologists) and community stakeholders (coaches, team management, school nurses, and whānau) who are involved in recovery from SRC may have valuable insights about the RTP process in New Zealand. The lived experiences of people with SRC who are undergoing rehabilitation within the health system as consumers or have experienced the RTP process are also important to understand their experiences of RTP and how processes can be aligned with their preferences for care.

### 5.12 Future research

The findings from this study give rise to considerations of future research in this area. Firstly, there appears to be a desire from the GPs and physiotherapists in this study to expand the scope of practice for physiotherapists to assist GPs or replace them in providing RTP clearance as part of SRC rehabilitation.

Secondly, more research is needed to understand the appropriateness of making decisions about recovery and suitability for RTP, particularly by telehealth, with no observed

physical or cognitive stress testing process, relying heavily on self-discernment and disclosure of symptoms, which is influenced by the health literacy of the injured person and supporting whānau, and the person's motivations to RTP. Further research in the assessment of SRC recovery processes should investigate the need to observe stress testing and the impact of load and fatigue on symptom and sign presentation to improve the determination of recovery.

Thirdly, while the experience and views of GPs and physiotherapists are valuable to understand as key stakeholders in the RTP process, the additional views from people who have undergone the RTP process after SRC, and other stakeholders from within the health system who may have an interest in the RTP process i.e., nurses, occupational therapists, and also stakeholders from within the communities in which SRC is a risk i.e., all contact sports coaches or other non-contact sports such as equestrian, cycling, netball. Information on the experience of these groups on RTP would provide valuable additions to the body of evidence to inform how RTP is performed.

**Table 6:**

*Summary Of Recommendations To Improve RTP Processes Identified In This Study*

| Recommendation | Rationale |
|---|---|
| Improve GP and physiotherapist knowledge/ clinical confidence in how to assess holistic recovery for RTP after SRC. | Participants reported difficulty assessing recovery from SRC and felt uncomfortable relying on self-reported measures. Participants described a limited objective review of cognitive and emotional recovery. |
| Providing opportunities for GPs and physiotherapists to invest in professional development will be important to help drive evidence-based RTP processes. | Participants wanted more educational opportunities to improve their clinical confidence about RTP. However, they expressed difficulty doing so due to limited clinical time and other priorities. |
| Align national, sport-organisation, and clinical guidance around when medical clearance is appropriate in the RTP process. | Currently, there is inconsistency in when medical clearance is required between the GRTP between guidelines, ACC policy, and sporting organisations documents which create confusion. |
| Promote interdisciplinary RTP decision-making by supporting better communication | Good communication was identified as a facilitator of well-managed RTP, however, |

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| between GPs and physiotherapists with the time and resources to do so. | this did not happen consistently due to time and resource constraints. Improved coordination between HCPs can help to overcome barriers to making informed decisions about recovery. |
| Promote improved communication with community stakeholders on RTP management with time and resources to do so. | Participants describe the need to liaise with community stakeholders i.e., coach, school, whānau, for RTP to work well. However, this took time and resources to achieve, so it often got missed, creating poor RTP coordination with the community. Improved support for communication with community stakeholders by HCPs during the RTP management may enhance the RTP experience for the person involved and the community stakeholders and help reduce loss-to-follow-up while further improving trust in the process. |
| Address barriers to adherence to RTP to minimise loss to follow-up. | Participants reported that they were often unable to complete the RTP with individuals due to loss-to-follow-up. A common reason was the cost of follow-up appointments. Understanding the peoples' experience of RTP will be important to support strategies to minimise barriers causing poor adherence (e.g., by providing telehealth appointments). |
| Ongoing support for positive public health messaging about SRC and RTP. | Participants acknowledged that community health literacy regarding SRC was critical to the recognition, subsequent management, and RTP. Improving public knowledge about SRC and RTP could increase people's safety net following SRC by helping HCPs overcome community barriers such as poor attitudes and beliefs about SRC, low trust/openness with HCPs, and poor community/sports support for the principles of SRC management, including the RTP. |
| Guidelines should give more specificity on how to operationalise RTP recommendations so that both GPs and physiotherapists have some role clarity to who should do what and how. | Participants differ on how much physical testing is required during the GRTP by a HCP, when medical clearance is required during the RTP process, what the medical review should entail, and how much oversight is needed thereafter to complete the RTP. GPs and physiotherapists want guidance on who is responsible for doing what part of the RTP |

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| | so they can both support each other better across their different clinical contexts. |
| There is a need to explore the injured persons' preferences for RTP in future research to inform how HCPs can meet the needs of the person and their community in a culturally responsive way. | Participants reported that the way RTP is currently performed is not responsive to the sociocultural needs of individuals and specific communities' contextual situations. Investigating how RTP processes can be adapted to better suit the needs of individuals and communities should be a focus of future research. |

## Conclusion

SRC is a subset of concussion injury which is most often managed in primary healthcare settings and requires HCP expertise for the management of RTP. In the New Zealand primary care settings, GPs and physiotherapists are key contributors to this RTP management and it is important to understand their experiences and perceptions of how this is delivered.

RTP is challenging to perform well for GPs and physiotherapists due to inadequate resourcing, with limitations on clinical time and health workforce challenges identified as key barriers to supporting RTP effectively. These challenges were found to be amplified for HCPs working in rural communities.

Both GPs and physiotherapists were positive about working with each other during RTP management, however, improved interdisciplinary communication is needed for this to work well. These HCPs were supportive of sharing responsibility in aspects of SRC such as diagnosis, referral to multi-disciplinary teams (MDT), and RTP decision-making.

The findings of this study should be used when considering the support needed for HCPs, such as GPs and physiotherapists, in delivering the RTP care following SRC that better suits the primary care situation many communities in New Zealand face.

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**Appendix 1**

**Approach to the structured search**

Computer searches were conducted of the peer-reviewed English language literature. Ebsco Health Databases were searched including MEDLINE, SPORTDiscus, and CINAHL Complete. Search terms are summarised in Table 6. A search of concussion-related terms found 40,967 articles from within the databases from 1799 to 2024. The addition of sport-related terms refined to 20,929 articles. Further search terms for RTP refined the number of articles to 5,277. Subsequent searches included the New Zealand context (76 articles), primary care (149 articles), and guidelines (1503). Combinations of these subsequent searches found 62 articles for primary care and guidelines, 38 articles for New Zealand context and guidelines, and one article for New Zealand, primary care and guidelines. The addition of a date to refine the articles to more recent literature from 2010 onward found 1592 articles.

An initial title and abstract scan were performed for relevance before the whole article review was performed on articles relevant to the literature review. Reference list checks were performed when pertinent studies were identified, some of which were dated before 2010, to review the source literature and give a deeper understanding of the historical context or to add additional interpretation to the articles identified in the search.

In total 121 articles were included in the narrative literature review.

**Table 7:**

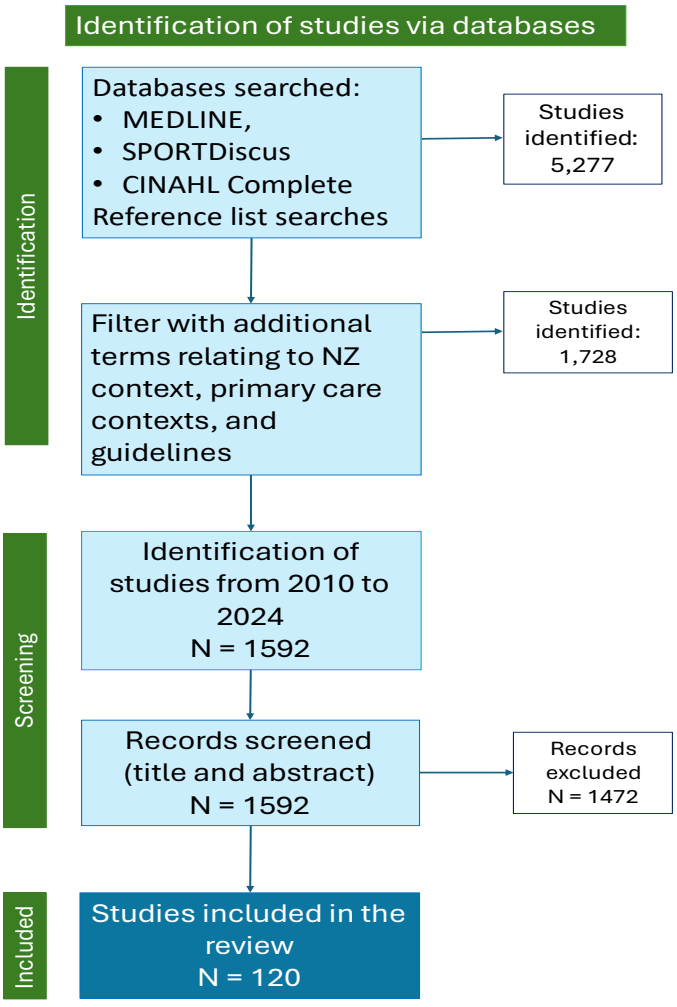
*Summary Of Search Terms*

| | Search terms | No of articles identified |
|---|---|---|
| Concussion-related terms | *“Concussion” or "mild traumatic brain injur*" or "mild tbi" or mtbi or "post concussi*" or "postconcussi*"* | 40,967 |
| Concussion-related terms AND sport-related terms | *AND sport* or athlet* or football or soccer or rugby or gridiron* | 20,929 |
| Concussion-related terms AND sport-related terms AND return to play terms | *"return to play" or "return to sport*" or "return to activit*"* | 5,277 |

| | | |
|---|---|---|
| | *or "return to exertion" or recovery* | |
| Within 5,277 results | | |
| New Zealand context: | *"new zealand*" or aotearoa or nz or Maori,* | 76 |
| Primary care contexts | *"primary care" or "primary health care" or "primary healthcare" or "general practice" or gp,* (149 articles or three articles when 1&2 were combined). | 149 |
| Guidelines | *guidelines or protocols or "practice guideline" or "clinical practice guideline",* | 1,503 |

**Figure 9:**

*Summary Of Search For Studies For The Literature Review*



**Appendix 2:**

Advert for participants.

Kia ora, are you a physiotherapist or a general practitioner? Researchers at AUT want to learn about your knowledge and perceptions about return to play (RTP) care following sports-related concussion, and what would help you to deliver better RTP care. Participation in this study will involve an interview, lasting about 60-90 minutes.

Have a say on this important topic and help inform how we can deliver better return to play care for our patients and whānau!

Please contact me (Colin Hancock) for more information now by emailing colin@greatlakephysio.co.nz or call/text 0276970466. Thank you for your interest.

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O TĀMAKI MAKAU RAU

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This project has been approved by AUT Ethics Committee (ref:22/8

**Appendix 3**

**Table 8:**

*Example Of How Data Translated To Theme Development*

| Data | Code | Category | Sub-theme | Theme |
|---|---|---|---|---|
| *"… I think it needs another level of interpretation for you to be able to personalize it to people, … but thinking about it from like a different patient perspective, …to try and get something that's personalized to that person in their reality, be it job, what sport they do, what level they do it at, it's really hard to personalize it for someone." (GP3)* | Sociocultural factors with RTP | RTP protocols require an individualised lens to be applied to it to consider a New Zealand socio-cultural context | **Tailoring RTP to the person** | **What RTP means to me** |