

**UNIVERSITY of
STIRLING**



**The Psychological Effects of Cross-Training on Elite Athletes: A
Mixed Methods Exploration of Social Identity, Mental Health, and Sport
Commitment**

Total Word Count: 41,566

Abstract Word Count: 331

Appendices Word Count: 3382

Thesis submitted in accordance with the requirements of University of Stirling
for the degree of Master of Philosophy

By

Oliver Heath Carter

April 2025

Declaration

I declare that the contents of this thesis are entirely my own work, and that the document was composed by myself under the supervision of Dr. Robert Morris, Dr. Chris Hartley, and Professor Anna Whittaker. The experimental studies within this thesis were all approved by the University of Stirling cross-faculty ethics committees, and procedures were conducted as they were approved. Neither the thesis, nor the original work within have been submitted to this or any other institution towards a higher degree. This thesis does not infringe upon anyone's copyright and any material from the work of others included in this thesis are fully acknowledged in accordance with common reference practices.

Signed: OCarter

Ollie Carter, September 2024

The copyright of this thesis belongs to the author, under the terms of the United Kingdom copyright act, as qualified by the University of Stirling regulations. Due acknowledgement must always be made to the author when using any materials contained in or derived from this thesis.

Abstract

Background: An athlete's mental health is crucial for their overall wellbeing, training effectiveness, and optimal performance. Social identity plays a central role in shaping an athlete's psychological state, influencing their vulnerability to poor mental health and suboptimal performance outcomes. Due to the intense specialisation often required in elite sport from a young age, athletes typically develop a strong Athletic Identity but a narrow Social Identity, commonly referred to as exclusive Athletic Identity. While this exclusivity supports performance success, the Social Identity Approach and the Social Identity Model for Identity Change highlight the associated risks, including poor mental health outcomes, reduced resilience, and challenges during transitions. A broader Social Identity, encompassing multiple groups, has been shown to mitigate these risks, improve mental health outcomes, and support smoother transitions. However, achieving a balance between a strong Athletic Identity and a diverse Social Identity presents a significant challenge for athletes. **Aims:** This study aimed to investigate the viability of cross-training as a potential solution to this dilemma, while also exploring previously unexamined psychological effects of cross-training on elite athletes. **Methods:** Forty elite athlete scholars (26 males, 14 females) from the University of Stirling participated in a six-week cross-training intervention, selecting and engaging in a secondary sport alongside their regular training. Pre- and post-programme measures included Social Identity Maps and four standardised questionnaires (AIMS, SIQS, SCQ-2, and PSS). Post-intervention, participants also took part in semi-structured focus groups and interviews. Data was analysed using a deductive thematic approach, guided by existing theory, and integrated with quantitative results and identity maps data to support triangulation and theme development. **Results:** Quantitative analysis revealed no statistically significant changes across the four psychological scales. However, 20 participants expanded their Social Identity Maps to include at least one cross-training-related group. Deductive analysis of qualitative data generated 18 categories and nine core themes, which, when triangulated with quantitative and mapping data, were synthesised into six higher-order themes. **Conclusions:** A six-week cross-training programme broadens elite athletes' Social Identity, with significant implications for stress reduction, resilience during hardships, and smoother transitions. Importantly, this can be achieved without diminishing Athletic Identity. Cross-training may even enhance sport commitment, though further research is required.

Key Words: *Social Identity; Athletic Identity; Social Identity Model for Identity Change; Cross Training; Psychology; Mental Health; Transitions; Elite Athletes; Elite Sport*

Table of Contents

Declaration.....	i
Abstract.....	ii
List of Tables and Figures.....	v
List of Abbreviations.....	vi
Acknowledgments.....	vii
1. Introduction.....	1
1.1 Cross-Training and Its Psychological Potential	2
1.2 Research Aims	3
2. Literature Review.....	4
2.1 Social Identity, the Social Identity Approach, and the Social Identity Model for Identity Change	4
2.2 Athletic Identity	15
2.3 Athlete Specialisation (AS)	18
2.4 The Athlete Dilemma	20
2.5 Motivation and Sport Commitment.....	22
2.6 Athlete Stress and Mental Health	37
2.7 Mental Health	44
2.8 Cross-Training.....	46
2.9 Research Rationale	51
3. Methodology	54
3.1 Methodology Overview and Underpinning Principles.....	54
3.2 Participants	55
3.3 Data Collection Tools	57
3.4 Data Collection Procedure.....	64
3.5 Data Analysis.....	65
3.6 Researcher Positionality	67
4. Results.....	69
4.1 Broadened Social Identity	69
4.2 Social Connection and Team Dynamics.....	72
4.3 Athletic Identity	75
4.4 Sport Commitment	80
4.5 Psychological Benefits of Cross-Training.....	83
4.6 Cross-Training and Performance Perceptions	87

4.7 Summary	88
5. Discussion	90
5.1 Discussion of Findings	90
5.2 Study Implications	98
5.3 Study Limitations and Recommendations for Future Research	100
5.4 Conclusions	102
Reference List	104
Appendix 1 - Social Identity Mapping (SIM) Session Guide and Procedure	A
Appendix 2 - Social Identity Questionnaire for Sport (SIQS)	D
Appendix 3 - Athletic Identity Measurement Scale (AIMS)	E
Appendix 4 - Sport Commitment Questionnaire-2 (SCQ-2)	F
Appendix 5 - Perceived Stress Scale (PSS)	I
Appendix 6 - Semi-Structured Focus Groups (SSFG) and Interviews (SSI) Guide	J
Appendix 7 Programming CT	M

List of Tables and Figures

Tables

Table 1: Pre–Post Cross Training Block Main Sport Post-it-note data within participants Social Identity Map.

Table 2: Post Cross Training Block Cross Training Post-it-note data within participants Social Identity Map.

Table 3: Difference between overall Athletic Identity Measurement Scale (AIMS) and AIMS subscales scores Pre–Post Cross Training Block.

Table 4: Difference between overall Social Identity Questionnaire for Sport (SIQS) and SIQS subscales scores Pre–Post Cross Training Block.

Table 5: Difference between overall Sport Commitment Questionnaire 2 (SCQ-2) and SCQ-2 subscales scores Pre–Post Cross-Training Block

Table 6: Difference between overall Perceived Stress Scale (PSS) scores Pre–Post Cross Training Block

Figures

Figure 1: The Sport Commitment Model

List of Abbreviations

In order of appearance:

- Social Identity Approach – SIA
- Social Identity Model for Identity Change – SIMIC
- Social Identity – SI
- Group Memberships – GM
- Athletic Identity – AI
- Cross Training – CT
- Athlete Specialisation – AS
- Early Specialisation – ES
- Early Diversification – ED
- Sport Commitment – SC
- Sport Commitment Model – SCM
- Strength and Conditioning – S&C
- Cardiovascular – CV
- International Sport Scholarship Program – ISSP
- Social Identity Mapping – SIM
- Social Identity Questionnaire for Sport – SIQS
- Athletic Identity Measurement Scale – AIMS
- Semi-Structured Focus Groups – SSFG
- Semi-Structured Interviews – SSI
- Perceived Stress Scale – PSS
- Sport Commitment Questionnaire – SCQ
- Sport Commitment Questionnaire version 2 – SCQ-2
- Standard Deviation – SD
- Main Sport Post-it-note – MSP
- Cross-Training related post-it-note – CTP

Acknowledgments

World Champs – 2nd Fantasy Book – Paris Trails – Thailand – Fights – Amazing Journey

Upon writing this final finishing touch to my thesis I feel myself lost for words. I have changed considerably, been through so much between starting and finishing and I find myself adrift in my mind reflecting upon it all, perplexed and spellbound as I look back over the path and journey that brought me here. Reminiscing over this winding walkway through the land of my previous life, I also find myself caught up on all the people that accompanied, helped, and supported me along the way, for the shortest time or from start to finish.

I suppose it is only right I begin with my main supervisor Robert Morris, who like a mentor from the mountains helped me with passion and ease from start to finish. Your guidance was invaluable; your aid navigating my many plethora of thoughts, feelings, and ideas irreplaceable; and your more relaxed and laid-back approach to the entire process was greatly appreciated and very much needed as my surrounding life raged on like a tempest in an ocean. The amount of thought, work, and effort you also put into this thesis is exemplary and shows clearly why you are the calm mountain mentor and myself the sporadic swimming student.

The work, help, and advice of my other supervisors – Chris Hartley, and Anna Whittaker, should also be thanked at this point, so thank you both as well.

Another noteworthy person that must be mention, as she was by my side from before the start till the very end is, Aria. My partner is crime over our MPhil process. What could be written about you and your help goes far far beyond the scope of this acknowledgments section. All I can say is thank you for being on the journey with me and treading a similar but different path that continually crossed into mine, and mine into yours. It meant that you could fascinate me with your study and lend an ear to my psychological rambling, as well as provide me with a best friend that I can't imagine could be replaced. Truly a treasure.

HP2 and my swimming support team deserve far more thanks than I think possible. But all I can do is thank everyone, from my squad mates, to my coaches Josh and Martyn, to my lifestyle advisor Chris. You all took me to another World Championships and nearly to the Paralympics, and most importantly still helped and supported me when I didn't make it.

My SUMT family deserve a mention. You were my home away from home, my source of friendly violent enjoyment, and it was an honour to serve and lead you for a period.
#wedontplaygames

Oh, and my mum. Thank you, mum. For everything.

1. Introduction

Athletes face numerous sources of potential hardship throughout their sporting careers. Issues such as learned helplessness, loss of motivation and enjoyment, constrained commitment, chronic stress, high anxiety, mental health disorders, depression, stunted social development, burnout, and identity crises are not only possible but sometimes inevitable in elite sport (Baker, Cobley & Fraser-Thomas, 2009; Woods, 2011; Scanlan, Chow, Sousa, Scanlan & Knifsend, 2016; Schacter, Gilbert, Wegner & Hood, 2016; Weinberg & Gould, 2019; Haslam, Fransen, Boen & Reicher, 2020; Greenaway, Sankaran, Wolf & Mitchell, 2020; Cruwys, Stevens, Haslam & Olive, 2020). These challenges are often internalised as an inherent part of the athlete lifestyle (Haslam et al., 2020; Cruwys et al., 2020) but can often also result in poorer mental health for athletes. Athletes' mental health and psychological state are of paramount importance, not only for their performance but also for their overall health and wellbeing. While athletes may rank among the most physically fit individuals in the world, the World Health Organisation (WHO) emphasises that “there is no health without mental health” (WHO, 2014). At the elite level, where physical abilities are often closely matched, it is frequently the mental game that distinguishes success from failure (Woods, 2011; Weinberg & Gould, 2019; Salvatore, Sankaran & Cole, 2020), and these challenges that athletes face can often be a barrier to athletes being in the best possible mental state for performance.

Using the Social Identity Approach (SIA) and the Social Identity Model for Identity Change (SIMIC), we can gain insight into an athlete's mental health, identify what promotes and protects it, and understand athletes' ability to manage hardships and career transitions (Haslam, Steffens, Branscombe, Haslam, Cruwys, Lam, Pachana & Yang, 2019; O'Halloran & Haslam, 2020). Social Identity (SI) is pivotal in determining athletes' psychological state and their capacity to cope or thrive in their environment (Rees, Haslam, Coffee & Lavalley, 2015; Boen, Fransen & Haslam, 2020). Key factors in athletes' SI include the number and compatibility of group memberships (GM), the significance of these groups, how deeply they are internalised, their quality, and their overall positivity. These factors can significantly impact athletes' mental flourishing (Cruwys, Steffens, Haslam, Haslam, Jetten & Dingle, 2016; Haslam et al., 2019; Haslam et al., 2020). Specifically, having diverse group identities is crucial for improving and safeguarding mental health, particularly during challenges athletes may face throughout their career, such as sporting transitions (Cruwys et al., 2016; Haslam et al., 2020; Cruwys et al., 2020; O'Halloran & Haslam, 2020). Group memberships provide resources to alleviate mental health challenges, protect against stressors, aid recovery from setbacks, and help athletes navigate transitions such as injury rehabilitation or

retirement (Rees et al., 2015; Haslam et al., 2020; O'Halloran & Haslam, 2020). Multiple GM act as buffers against mental health threats and serve as resources during such difficulties (Cruwys et al., 2020; O'Halloran & Haslam, 2020). Possessing multiple GM has been associated with improved life satisfaction, better quality of life, and reduced depression (Cruwys et al., 2016; Cruwys et al., 2020). Additionally, the “performance hypothesis” suggests that SI positively influences performance factors, such as resilience and mental health, ultimately enhancing athletic performance (Stephen, Coffee, Habeeb, Morris & Tod, 2023). These benefits are particularly relevant during periods when athletes' dominant Athletic Identity (AI) and sport-related groups are sources of significant stress. In such cases, these identities cannot be used as psychological resources. Without alternative identities, athletes face risks of mental health deterioration and loss of personal control (Rees et al., 2015; Cruwys et al., 2016; Haslam et al., 2020).

Athletes typically have a narrow SI, with a strong and exclusive AI, due to the early and intense specialisation required for success in elite sport (Brewer, Raalte & Linder, 1993; Baker, 2003; Gould, 2010; Lochbaum, Cooper & Limp, 2022). While this exclusivity supports performance, it also increases vulnerability to mental health challenges and identity crises, particularly during career transitions (Cruwys et al., 2020; O'Halloran & Haslam, 2020). Balancing a strong AI with a broader SI, comprising multiple compatible GM, presents a complex dilemma. This study looks to explore whether cross-training (CT) may offer a potential solution to this dilemma.

1.1 Cross-Training and Its Psychological Potential

CT has been extensively researched from a physiological perspective. For elite athletes, its utility for performance improvement diminishes as specificity training becomes paramount (Loy, Hoffmann & Holland, 1995; Ruby, Robergs, Leadbetter, Mermier, Chick & Stark, 1996; Godfrey, 1998). However, CT retains value during injury rehabilitation, maintenance, or recovery phases (Tanaka, 1994; Godfrey, 1998; Millet, Candau, Barbier, Busso, Rouillon & Chatard, 2002). Despite this, the psychological impacts of CT remain underexplored, even though psychological outcomes are often decisive in athletic success (Weinberg & Gould, 2019; Boen et al., 2020).

CT introduces variety into training programmes, which has been suggested to reduce boredom, alleviate psychological fatigue, and prevent staleness (Stamford, 1991; Tanaka, 1994; Loy et al., 1995; Pizza, Flynn, Starling, Brolinson, Sigg, Kubitz & Davenport, 1995; Godfrey, 1998; Becker, Lindle-Chewning, Huff, Sherlock, Sherlock, Stolt & Haff, 2008;

Yuvaraj & Vishnuvardhan, 2015). This variety may increase enjoyment, motivation, and adherence, potentially enhancing performance indirectly (Stamford, 1991; Mutton, Loy, Rogers, Holland, Vincent, & Heng, 1993; Tanaka, 1994; Godfrey, 1998). Furthermore, some evidence suggests CT reduces stress associated with main sports training by providing mental refreshment and balance (Stamford, 1991; Tanaka, 1994). The SIMIC framework supports these claims, positing that CT could introduce new groups into athletes' SI, contributing positively to mental health (Haslam et al., 2019; Haslam et al., 2020).

Limited evidence indicates that CT may yield psychological benefits. For example, White (2003) observed that athletes who incorporated CT reported greater enjoyment and felt “refreshed” and “eager to continue training,” while non-CT athletes reported fatigue and lack of enthusiasm. Although promising, further investigation is required to substantiate these findings.

1.2 Research Aims

This intervention-based study aimed to explore the psychological effects of a six-week CT programme on elite athletes' SI, AI, sport commitment, and stress. The study also sought to determine whether CT could facilitate positive mental health outcomes for elite-athletes. By addressing a gap in the literature, this research contributes to the growing field of SI in sport and investigates CT as a potential tool for mental health and performance enhancement.

Sport is an ideal domain for advancing SI research and enhancing sport psychology knowledge (Woods, 2011; Rees et al., 2015; Boen et al., 2020; Haslam et al., 2020; Stephen et al., 2023). With SI in sport research gaining momentum - 80% of related studies have been published since 2010 (Stephen et al., 2023) - this study adds to this expanding field. Findings may challenge the prevailing belief that elite athletes should focus solely on one sport, suggesting instead that pairing a secondary sport with their main discipline could offer significant benefits. For example, the “Great British Medallist Project” found that “super elite” athletes were more likely to pair a main sport with a secondary “social” sport compared to their elite and sub-elite counterparts (Rees, Hardy, Güllich, Abernethy, Côté, Woodman, Montgomery, Laing, & Warr, 2016).

2. Literature Review

2.1 Social Identity, the Social Identity Approach, and the Social Identity Model for Identity Change

Social Identity

The subdiscipline of social psychology investigates the causes and consequences of interpersonal behaviour. It examines behaviour within the broader context of human interaction. Psychologists often focus on an individual's brain and mind as the cause of their mentality and behaviour - they view the individual as the primary unit of psychological analysis and all other factors as external influences that merely provide context for the thoughts, emotions, and behaviour of the individuals. However, it is important to recognise that humans are fundamentally social animals who are an integral part of a vast network of diverse groups with unique characteristics, capabilities, and objectives. Attempting to comprehend individuals without acknowledging and focusing on this social context is akin to attempting to understand a single ant or a bee without considering the function and influence of the colony (Schacter et al., 2016; Boen et al., 2020). Consequently, social psychology is dedicated to understanding the brain as a social organ, the mind as a social adaptation, and thus the individual as a social creature that exists within a network of other similar social creatures (Rees et al., 2015; Schacter et al., 2016; Boen et al., 2020).

As inherently social beings, humans possess a universal and innate propensity to establish and maintain robust and positive relationships with others. This innate tendency may be encoded in our genetic makeup (Woods, 2011; Schacter et al., 2016). Consequently, humans have evolved to seek collaboration, cooperation, and coexistence within groups where individuals share a common sense of identity (Schacter et al., 2016; Boen et al., 2020). Consequently, SI theory serves as the cornerstone of social psychology.

SI Theory, initially developed by Tajfel (1972, 1979), posits that individuals possess a psychological force that transforms a group of disparate individuals into a cohesive and meaningful entity with distinct focus, energy, and power. (Boen et al., 2020, p.5). In essence, an individual's SI encompasses the GM they identify with and internalise into their sense of self. Consequently, these groups exert a profound influence on an individual's behaviour and perception of belonging (Rees et al., 2015; Boen et al., 2020). A group is simply a collection of two or more individuals who share a common belief or attribute (Woods, 2011; Schacter et al., 2016; Boen et al., 2020). Groups exhibit diverse characteristics, including unique attributes, beliefs, values, and traditions. They can range from intimate family and friend groups to vast global communities (Woods, 2011; Schacter et al., 2016; Boen et al., 2020;

Haslam et al., 2020). The diverse groups individuals identify with represent their shared interests and sense of belonging, contributing to their overall identity (Woods, 2011; Schacter et al., 2016; Boen et al., 2020; Haslam et al., 2020).

SI posits a transformative process that reshapes individuals' perceptions, enabling them to view the world through the lens of their various social groups. These GM also facilitate a transformation of behaviour, leading individuals to act and behave as group members rather than solely as individuals. Consequently, individuals conform to the expected behaviour of their group in specific situations (Woods, 2011; Boen et al., 2020; Haslam et al., 2020; Stephen et al., 2023). Furthermore, an individual's self-concept is intrinsically linked to their ability to be defined by their GM. SI, therefore, not only transforms individuals into groups, but also empowers individuals to internalise different groups into their sense of self (Haslam et al., 2020). This capacity to internalise GM into the self determines the extent and degree to which these diverse groups influence, shape, and structure individuals' perceptions, psychology, and behaviour (Rees et al., 2015; Schacter et al., 2016; Bruner & Benson, 2018a; Haslam et al., 2020; Greenaway et al., 2020).

Consequently, it is crucial to recognise that we are not merely individuals within our groups, but rather an integral part of those groups. While the universal components of social behaviours may be encoded in our genes, instilling in us a desire for genetic modification, it is our social identity within these groups that truly transforms us and significantly shapes our mental processes and behaviours. Therefore, it can be asserted that the human brain is genetically predisposed to produce a universal system for processing the world, but it is our shared social identity that ultimately moulds these processes (Rees et al., 2015; Schacter, et al, 2016; Boen, et al, 2020; Haslam, et al, 2020; Stephen, et al, 2023).

In essence, our perception, processing, and behaviour within the world are not solely a reflection of our individuality and the surrounding context, but rather a manifestation of the genetic makeup we identify with and share with others, as well as the group values they embody. Our social connections with others serve as the foundation upon which our psychology and behaviour are structured (Rees et al., 2015; Haslam, et al 2020; Greenaway et al., 2020; Stephen, et al, 2023).

The fundamental process of SI that facilitates group cohesion and member integration involves the depersonalisation and self-stereotyping of individuals. In this process, each member's sense of self is defined by the shared characteristics of the group. This enables individuals to perceive themselves as group members and to act in accordance with group norms (Rees et al., 2015; Haslam et al., 2020). Regardless of the group's size or form,

members exhibit similar characteristics. Notably, they demonstrate a strong inclination to maintain and enhance the group, driven by their desire to distinguish their group positively from comparison groups. Consequently, when individuals strongly identify with a group and its members, they collectively strive to justify and enhance their group's status (Rees et al., 2015; Haslam et al., 2020). Groups transcend their individual members' shared commonalities, becoming entities greater than the sum of their parts. This phenomenon is underpinned by SI (Woods, 2011; Schacter et al., 2016; Boen et al., 2020). Furthermore, members of all groups exhibit positive discriminatory behaviour towards fellow group members and negative discriminatory behaviour towards non-group or rival group members (Schacter et al., 2016; Haslam et al., 2020).

The formation and stability of groups are influenced by three primary structures:

1. Permeability of group boundaries: This refers to the ease with which individuals can join or leave a group. Groups with permeable boundaries may experience high rates of membership turnover, indicating instability.
2. Stability relative to other groups: This aspect considers the longevity and resilience of a group in comparison to others. Groups with a long history and a strong likelihood of enduring demonstrate stability.
3. Legitimacy relative to other groups: Legitimacy refers to the perception of a group's authority and standing within the broader social context. Groups with low status and permeable boundaries may face challenges in maintaining their legitimacy, leading to potential challenges and conflicts.

In response to these challenges, groups seek to enhance their stability. This can be achieved through collective action and inter-group cooperation, which involves creative problem-solving and the development of shared environments. However, groups may also discriminate against individuals who are not part of their group, reinforcing their boundaries and maintaining their status (Rees et al., 2015; Schacter et al., 2016; Haslam et al., 2020).

Within one's SI, GM compatibility with other groups can vary and this has important consequences. Furthermore, individuals show that they adopt, embrace, and show certain GM identities over others and at different times dependant on the internal and environmental social context (Rees et al., 2015; Cruwys et al., 2016; Schacter et al., 2016; Haslam, et al., 2020). These multiple group identities appear to establish a hierarchical structure within one's self-identity, with each group's inclusion and emotional significance to the individual progressively increasing (Turner, Hogg & Oakes, 1987). This concept is known as "self-categorization theory" (developed by Turner and colleagues in 1982, 1985, 1987). It extends

SI theory to provide a deeper understanding of the dynamic workings of the individual, as their self is conceptualised as a context-sensitive process that fluctuates across various and prevailing social contexts. In essence, an individual's self-perception and subsequent behaviour are influenced by the significance of their internalised groups and the surrounding social environment (Rees et al., 2015; Haslam et al., 2020; Stephen et al., 2023).

In summary, an individual's SI is composed of multiple layers of self-identity to different groups, depending on how they perceive that group (Schacter et al., 2016; Haslam et al., 2020). The stronger an individual's SI, the greater their capacity to internalize various groups into their sense of self. These group identities significantly influence an individual's perception of the world, mental cognitive processing, and behaviour. The more an individual identifies with a group, the greater its emotional significance, making it more salient within their sense of self and, consequently, more powerful in shaping their psychology and behaviour, overpowering lesser salient group identities. Consequently, dominant groups constitute the majority of an individual's stable daily perceptions, psychology, and behaviour (Boen et al., 2020; Haslam et al., 2020). However, social circumstances still vary the dominance and influence of any given group on an individual's self, regardless of its significance within their SI, as they embrace groups that are most appropriate for the social situation. In other words, the specific groups an individual embraces provide them with a positive sense of self in any particular social context. Furthermore, the strength of an individual's need to feel like they belong to one group or another significantly affects the significance of their SI groups, which is again heavily influenced by wider social circumstances (Burns, Jasinski, Dunn & Fletcher, 2012; Schacter et al., 2016; Haslam et al., 2020).

The Social Identity Approach and the Influence of Social Identity

The Social Identity Approach (SIA) integrates Self-Identity Theory (SI Theory) and Self-Categorization Theory (Rees et al., 2015; Boen et al., 2020). The SIA posits that group processes and the psychological mechanisms underlying them constitute the central focus of psychological inquiry. It contends that "group processes are central to most, if not all, aspects of sport and exercise (and many other domains beyond). Moreover, these group processes are fundamentally grounded in individuals' capacity to define themselves in terms of their social identity" (Boen et al., 2020, p. 5). While individual identity, and consequently behaviour, is shaped by personal development, it is also influenced by the group and social identity. Notably, SI often emerges as the predominant factor (Haslam et al., 2020). Consequently, the

SIA offers a comprehensive analysis of how individual psychology both structures and is structured by the dynamics of group life (Rees et al., 2015, p. 1083).

The SIA presents a novel and innovative methodology for investigating sport psychology. This approach focuses on investigating more collective, social, and group-based principles that individualistic approaches often overlook or neglect. A notable strength of SIA lies in its ability to specify and elucidate connections between micro-psychological processes, meso-group processes, and macro-social phenomena. Consequently, it emerges as an exceptionally valuable and insightful framework for investigating psychology, potentially illuminating aspects that traditional individualistic psychology approaches may not be able to address (Boen et al., 2020; Haslam et al., 2020).

Furthermore, the current study is a sport psychology one, and SI is synonymous with sport psychology. Sport psychology has always had close connections with social psychology, as the two disciplines share an extensive history (Boen et al., 2020). Sport is inherently social, shaped by the intricate relationships between individuals, social, and contextual factors. Sport is rarely, if ever, a purely personal pursuit. It is an activity that individuals engage in, but what makes sport significant, powerful, and meaningful is that individuals participate not as individuals but as members of social groups, whether as athletes, fans, teams, or coaches (Haslam et al., 2020; Stephen et al., 2023). SI is a prerequisite for most forms of sporting behaviour, as our very processes and eventual behaviour are profoundly influenced by our SI. Sport, therefore, is shaped by SI (Rees et al., 2015; Boen et al., 2020; Haslam et al., 2020; Stephen et al., 2023). Our decision to even participate or engage in sport is facilitated by our SI. We would not be involved in sport if we did not identify with it in some way initially. Elite sport, in particular, is a domain characterised by our capacity for collective endeavours aimed at achieving performance success. It transcends merely serving as a context for social behaviour and rather presents an arena where behaviour can be transformed in creative and socially impactful ways (Rees et al., 2015; Boen et al., 2020; Haslam et al., 2020; Stephen et al., 2023).

Our inclination to join groups that resonate with our values fosters a sense of connection with others and a sense of belonging that would otherwise be elusive. This connection leads to enhanced and more positive emotional experiences. Furthermore, our efforts to differentiate and elevate our groups contribute to a positive self-perception and increased confidence. These positive emotions serve as a coping resource for drawing upon in various aspects of life when experiencing challenge. Notably, in this respect, sports provide an effective platform for facilitating these positive processes (Rees et al., 2015; Cruwys et al.,

2016; Haslam et al., 2020; Cruwys et al., 2020; Bruner & Benson, 2018a; Stephen et al., 2023).

Furthermore, this sense of shared identity and belonging within a specific social context fosters a motivation to exert greater effort and dedication towards the group (Rees et al., 2015; Bruner & Benson, 2018a; Haslam et al., 2020; O'Halloran & Haslam, 2020; Stephen et al., 2023). This phenomenon is commonly referred to as social labour. Athletes demonstrate enhanced performance compared to their individual capabilities when they experience a heightened sense of social identification with their sport, team, club, or teammates. This demonstrates the capacity of social identification to influence sports performance (Haslam et al., 2020; O'Halloran & Haslam, 2020; Stephen et al., 2023). This concept is also known as the 'performance hypothesis.' The performance hypothesis posits that sports performance is shaped by social identification with the norms, values, resources, processes, and goals associated with an athlete's salient sporting goal within their social identification; not only that, but social identification also influences the diverse processes and outcomes that precede and determine sports performance, making it crucial for achieving performance outcomes such as motivation, commitment, stress, mental well-being, and resilience (Stephen et al., 2023). Athletes do not necessarily require identification with others to enhance their performance. This phenomenon is known as social facilitation, whereby the presence of individuals, whether competitors or observers, can improve an athlete's performance on simple or well-learned tasks (Woods, 2011; Schacter et al., 2016; Boen et al., 2020; Greenaway et al., 2020; Stephen et al., 2023). Moreover, an athlete's level of identification with their sporting groups and teams can influence their subjective perceptions of sports performance, even within individual-based sports. This is also evident in the extent to which an athlete is willing to sacrifice for their sport and team, with individual sacrifices increasing with the strength of identification. Additionally, our sporting GM salience predicts our emotional responses pre-, during, and post-performance towards ourselves and our opponents. Athletes with high strength SI experience more positive and pleasant emotions, while athletes with low strength SI experience more negative and unpleasant emotions (Stephen et al., 2023).

Perceived competence is also influenced by an athlete's SI. The more significant a competence is within an athlete's SI, the more important perceived competence in that task becomes to them. Conversely, perceived incompetence in a task will not matter to an athlete or potentially be even perceived as incompetence if it does not align with their SI values (Brewer et al., 1993; Greenaway et al., 2020). Furthermore, group identification is associated

with stronger feelings of control, as it provides structure and solid support to an athlete's life (Woods, 2011; Haslam et al., 2020; Greenaway et al., 2020; Cruwys et al., 2020; O'Halloran & Haslam, 2020).

In accordance with the expectations of a SIA, individuals appear to possess an innate capacity for self-regulation of SI, enabling them to adjust the prominence of specific identities in response to relevant situations. Consequently, SI facilitates athletes not only in enhancing their sporting training and performance by amplifying the salience of appropriate identities, but also in accommodating other social groups and passions within their lives. This capability holds particular significance for maintaining sustained mental well-being (Haslam et al., 2020; Cruwys et al., 2020; Stephen et al., 2023). This phenomenon aligns with the principles of self-categorisation theory, as athletes readily identify with the identities that are pertinent to the social context (Haslam et al., 2020).

However, social identity can also negatively impact sports performance. A high level of group identification can lead to overconfidence or create excessive pressure to perform, driven by the fear of meeting the group's expectations and values, as well as its history (Haslam et al., 2020). Furthermore, social loafing occurs among athletes who do not identify strongly with the group (if at all). This social phenomenon involves individuals exerting less effort into group tasks or performances compared to when they are performing independently, essentially the opposite of social labour (Schacter et al., 2016; Haslam et al., 2020; Stephen et al., 2023). Additionally, social inhibition occurs when our performance is impaired by the presence of others (opposite of social facilitation), particularly when the task is complex or poorly learned (Woods, 2011; Schacter et al., 2016; Haslam et al., 2020; Greenaway et al., 2020).

Clearly then, the nature of an individual's GM and SI significantly impacts their performance and mental health and wellbeing. The relationships between these group identities and the specific task or performance at hand also play crucial roles. Furthermore, the current social and environmental context exerts a substantial influence on performance outcomes. However, the most evident connection lies in the inextricable link between SI and sport, particularly in the realm of sporting performance.

Social Identity Model for Identity Change, the Power of Multiple Groups

Life is characterised by constant change and adversity. Individuals encounter various stressors daily, not only in their physical environments such as schools, workplaces, and neighbourhoods, but also in their socioeconomic status, spanning from childhood to teenage

years, young adulthood, and even the establishment of their own families. Career progression and even career changes are also inevitable aspects of life. In this context, we can observe individuals undergoing transitions throughout their lives. A transition is defined as an event that results in a change in one's assumptions about themselves and the world, necessitating a corresponding adjustment in behaviour and relationships (O'Halloran & Haslam, 2020). Notably, transitions are not confined to personal life but are also evident in the journey of athletes. Athletes do not merely progress through talent development; they also navigate significant life transitions within the context of their sporting careers. These transitions encompass the progression from novice to elite, from unskilled to expert, from junior to senior, and from pathway to national selection. Additionally, athletes may experience relocations, such as moving from home programmes to established performance centres, from one country to another, or even switching teams or squads within the same programme. Furthermore, athletes may encounter negative transitions, including deselection or injury rehabilitation. It is crucial to recognise the profound impact that life transitions, particularly in the context of sports, can have on athletes and their group identities (Haslam et al., 2019; O'Halloran & Haslam, 2020). Transitions have significant implications for sport identity, as they essentially involve a negotiation of identity change. More specifically, they present the prospect of substantial group identity gain but also, ultimately, identity loss (O'Halloran & Haslam, 2020).

To facilitate this process of transition which athletes may experience, the Self-Identity Management and Change (Social Identity Model for Identity Change) – SIMIC – approach can be employed. The SIMIC extends SI theory and elucidates how GM within an athlete's SI influence their responses to life and sporting transitions. In this context, overall well-being and adjustment are enhanced to the extent that transitioning athletes can retain their pre-existing GM that are significant to them and/or acquire new meaningful groups (Haslam et al., 2019; O'Halloran & Haslam, 2020). Consequently, the SIMIC can be regarded as a model of psychological response to life change derived from a SIA (Haslam et al., 2019, p. 6). The SIMIC posits that any life change, whether positive or negative, necessitates athletes to reorient themselves in the world, potentially leading to uncertainty, instability, and posing a threat to their identity, subsequent well-being, and sports performance. Athletes are compelled to alter their self-definition and interpersonal relationships. This reorientation and negotiation require adjustment from the athlete, and the uncertainty surrounding this experience serves as a significant source of potential stress, identity threat, and compromised well-being. In essence, a transition engenders a profound psychological response with

substantial implications for athletes that they must navigate (Haslam et al., 2019; Cruwys et al., 2020; O'Halloran & Haslam, 2020).

The SIMIC posits that the most crucial factors for an athlete to effectively navigate life and sporting transitions are: (1) The quantity and significance of multiple and important groups; (2) The preservation of positive and valued existing groups throughout transitions; (3) The development and joining of meaningful new groups throughout transitions; and (4) The compatibility of all these new and old groups with one another (Haslam et al., 2019; Cruwys et al., 2020; O'Halloran & Haslam, 2020). These four points operate through two pathways, as several group processes from the multiple groups possessed by the athlete assist in managing uncertainty and adapting to life changes. The first pathway is the 'social identity continuity pathway.' Through this pathway, the multiple GM within an athlete's SI are a source of 'SI capital,' a resource. The more GM, the more capital. A SI possessing many GMs increases the likelihood that at least some of the groups will be retained throughout the transition, and thereby provide the athlete with a sense of self-continuity in the face of change. Athletes are essentially able to still grasp and hold onto a part of themselves, even when the world changes around them. Subsequently, with an athlete not relying solely on a single source of identity, they will retain a portion of their identity even in the face of disruption. Consequently, the adjustment process during the transition will be facilitated. The greater the number of highly valued GM that the athlete can maintain, the more pronounced the enhanced adjustment will be (Haslam et al., 2019; Cruwys et al., 2020; O'Halloran & Haslam, 2020).

It is not always feasible to maintain existing social identities in the face of life and sporting changes. The reality is that losing GM is an inevitable consequence of life's numerous unpredictable changes, and some changes may necessitate the abandonment of certain GM identities. This is particularly true in the world of elite sports. However, adjustment can be facilitated through the second "social identity gain pathway," which involves the development of new GM and identities. In this pathway, pre-existing GM serve as a "scaffold resource" that provides an experiential basis for athletes to engage with other groups and eventually incorporate them into a new aspect of their social identity. When these new GM are meaningful, positive, and internalised into the athlete's social identity, they contribute to their resource base in ways that support adjustment, overcome challenges, and lead to self-redefinition in the face of change (Haslam et al., 2019; O'Halloran & Haslam, 2020).

Consequently, successful adjustment to any life or sporting transition that preserves identity, well-being, and reduces stress entails a process of SI change through the two pathways. In this process, an athlete's current GM are likely to undergo alterations, either by becoming more or less significant or by being completely eliminated. Conversely, new GM may also be acquired (Haslam et al., 2019; O'Halloran & Haslam, 2020).

It is crucial to acknowledge, however, that the SIMIC posits that the mere possession of multiple GMs is not sufficient for successful adjustment; rather, these GM must hold psychological significance (Haslam et al., 2019). Furthermore, these groups must be perceived as meaningful and valuable by the athlete, and they must foster high levels of social identification (Haslam et al., 2019; O'Halloran & Haslam, 2020). Additionally, these multiple possessed GM must be compatible with one another to serve as a positive resource for athletes, particularly in the context of newly adopted identities resulting from transitions (Haslam et al., 2019; Cruwys et al., 2020; O'Halloran & Haslam, 2020). Notably, the SIMIC suggests that successful adjustment hinges on the extent to which existing and new groups are perceived as compatible by the athlete (Haslam et al., 2019). Incompatibility breeds tension, conflict, and strained relationships with group members, all of which exacerbate the threat and stress associated with transitions, significantly compromising an athlete's well-being (Haslam et al., 2019; Cruwys et al., 2020; O'Halloran & Haslam, 2020). Conversely, greater compatibility between an athlete's old and new GM enhances a sense of continuity in their self-concept, thereby facilitating successful adjustment and reducing the threat and stress of the transition (Haslam et al., 2019). Therefore, it is not simply the quantity of groups that matters, but rather the positive quality and inter-group relations of these groups that are crucial for GM to positively impact an athlete's well-being and adjustment throughout a transition (Haslam et al., 2019; Cruwys et al., 2020; O'Halloran & Haslam, 2020).

Although the SIMIC has not been extensively investigated within sporting populations, particularly among athletes, findings from athletes who experienced greater GMs before retirement (a significant life transition) suggest that it can positively impact their outcomes. Furthermore, it has been demonstrated that athletes' SI accounted for 76% and 58% of the variance in life satisfaction, and 46% and 61% of the variance in depression, indicating the SIMIC's potential utility in sport intervention research based on SI (Cruwys et al., 2020). Additionally, there is substantial support for the SIMIC in various life transitions, such as starting university, becoming a parent, recovering from acquired brain injury, and retiring from the workforce (Haslam et al., 2019; Cruwys et al., 2020). These findings demonstrate that SI theorising, as exemplified by the SIMIC, offers a novel perspective and

approach to sport psychology, particularly in the context of sporting change and mental well-being (Cruwys et al., 2020; O'Halloran & Haslam, 2020). This provides a promising foundation for future research that explains how athletes' social groups influence various aspects of both their personal and group functioning, ultimately impacting performance and mental health (Cruwys et al., 2020; Stephen et al., 2023).

Although there are many positives to SI, SIA, and SIMIC, as outlined, there are some criticisms that should be noted. It is argued that SI theory is overly deterministic. It does not fully or properly account for the role of individual agency and personality in shaping group formation and maintenance. Consequently, the subsequent role of the individual in shaping and ranking their GM identities and the true influence of GM on an individual's entire perceptions, processes, and behaviour is not wholly accounted for (Hornsey, 2008; TheoryHub, 2024). In other words, SI theory implies that individuals have limited agency in shaping their own identities and are primarily driven by their need to form positive identities for themselves, which subsequently determine their entire identity and behaviour, often deviating from reality (Huddy, 2001; Hornsey, 2008; TheoryHub, 2024). Furthermore, since SI theory focuses on the role of GM in shaping an individual's self, it is criticised that SI theory is limited in scope as it does not fully address other factors that can shape an individual's identity, such as personal experiences, culture, or inner personality (Huddy, 2001; Hornsey, 2008; TheoryHub, 2024).

It is possible to argue that SI theory addresses these limitations, as it acknowledges the individual's agency. This is because SI posits that individuals identify with only certain groups and adopt them into their self-image when these groups appear to align with their current self-concept. Otherwise, they would be rejected and never internalised. The groups an individual chooses to identify with are determined by their agency, as they must feel a positive connection to the group to engage with it and subsequently internalise it (Oakes, 2002; Boen et al., 2020; Haslam et al., 2020). In essence, accounting for the distinctiveness and positive nature of groups and personal motivations mitigates this limitation (Oakes, 2002; Demirden, 2021). Furthermore, SI theory incorporates cultural experiences, as it anticipates that an individual who identifies with a culture or their culture in some way will internalize it into their self to some extent, thereby influencing their self-concept (Boen et al., 2020; Haslam, et al., 2020). Additionally, as will be discussed later with phenomena such as 'learned helplessness,' SI theory has the capacity to account for personal experiences as well (Greenaway et al., 2020).

It is also crucial to acknowledge that SI theory addresses the processes of social change (Ellemers & Haslam, 2012; Haslam et al., 2020). Unlike other theories that merely contribute to the perpetuation of the status quo, regardless of the scale (micro to macro), SI theory posits that it can facilitate transformative change in the world (Ellemers & Haslam, 2012). This progressive and optimistic perspective contrasts with pessimism regarding individual agency. Instead of being deterministic, SI theory offers opportunities for interventions to enhance individual well-being, group interactions, and social relations (Ellemers & Haslam, 2012; Cruwys et al., 2020). Consequently, SI theory provides a distinct perspective on individuals and groups, with a specific focus on the influence of social group factors (Ellemers & Haslam, 2012; Boen et al., 2020; Haslam et al., 2020). While this comprehensive nature of the theory may lead to criticisms regarding its falsifiability, examining its core ideas and variables reveals their potential to enhance psychology's understanding of a diverse range of phenomena across various contexts and settings (Ellemers & Haslam, 2012). In comparison, more individualistic theories may not achieve the same level of understanding (Boen, et al., 2020; Haslam, et al., 2020).

In light of the aforementioned considerations, it is evident that athlete SI serves as the foundational pillar upon which our perception, processing, emotions, and actions are built. Consequently, it plays a pivotal role in determining our mental well-being. Furthermore, our SI is a prerequisite for our psychological sporting processes, mental health, subsequent behaviours, and performances. It serves as the underlying foundation, exerting a significant influence on these aspects, either positively or negatively (Rees et al., 2015; Boen et al., 2020; Haslam et al., 2020; Stephen et al., 2023).

2.2 Athletic Identity

A specific GM that holds significant relevance to the investigation of SI in athletes is their AI. First conceptualised by Brewer and colleagues in 1993, AI refers to the extent to which an athlete identifies with the athletic role and with the group of athletes. As anticipated, athletes, particularly elite athletes, place considerable psychological significance on their involvement in sports and the nature of their participation (e.g., intense, purposeful training aimed at performance enhancement). This heightened psychological significance leads to this particular GM becoming a dominant factor in their SI. Consequently, the individual perceives and interprets information and behaves in accordance with how an athlete would or should (Brewer et al., 1993; Brewer & Cornelius, 2001; Lamont-Mills & Christensen, 2006; Burns et al., 2012). As expected, the more an individual engages in sports,

particularly at higher levels, the greater and more dominant their AI becomes. This phenomenon is further amplified by their athletic achievements, likely due to the performance hypothesis (Stephen et al., 2023). Therefore, an elite athlete who strongly identifies with their athletic identity internalises this AI within their sense of self to a profound extent (Brewer et al., 1993; Lamont-Mills & Christensen, 2006; Burns et al., 2012; Haslam et al., 2020; Lochbaum et al., 2022).

AI comprises three factors: (1) SI, the extent to which an individual perceives and identifies themselves in the role of an athlete; (2) Exclusivity, the degree to which an individual's self-worth and identity are established through being an athlete; and (3) Negative Affectivity, the extent to which an individual experiences concern or negative emotions due to undesirable sporting outcomes or an inability to fulfil their athletic role (Brewer & Cornelius, 2001; Lamont-Mills & Christensen, 2006; Burns et al., 2012).

There are many positives associated with a strong and salient AI. Foremost, it leads to the development of a salient sense of self with a clear direction and purpose. This, in turn, facilitates clear ways to derive judgements of personal worth and competence (Brewer et al., 1993). Moreover, a salient AI enhances the drive for skill development, increases motivation to participate in sports, and fosters a greater desire to exert effort in both the short and long term. These factors contribute to the improvement of measurable abilities and skills, ultimately enhancing performance, as outlined in the performance hypothesis (Stephen et al., 2023). Additionally, increased social interaction, an expanded social network, and a boost in confidence are also positive impacts of a strong AI (Brewer et al., 1993; Lamont-Mills & Christensen, 2006; O'Halloran & Haslam, 2020; Lochbaum et al., 2022). In fact, athletes with a strong and salient AI exhibit higher levels of sport-related competitiveness, goal orientation, and win orientation (Brewer et al., 1993). Furthermore, the stronger an athlete's AI, the greater their satisfaction and enjoyment derived from their athletic and sporting experiences (Burns et al., 2012; O'Halloran & Haslam, 2020). It is clear, then, that a strong AI is essential for elite athlete success in both their careers and performances.

However, there are negative consequences associated with a strong AI. The most significant concerns relate to negative athletic transitions, such as being cut from teams, squads, funding, or scholarships, suffering an injury, or retiring from sport (Brewer et al., 1993; O'Halloran & Haslam, 2020). In such situations, athletes face considerable threats to their sense of self, experience significant losses in self-worth, and are vulnerable to mental hardship and emotional difficulties, including chronic stress and depression, when their ability to fulfil their athletic role and identity is disrupted (Brewer et al., 1993; Lamont-Mills

& Christensen, 2006; Vissek, Hurst, Maxwell & Watson, 2008; O'Halloran & Haslam, 2020; Lochbaum et al., 2022). Additionally, when confronted with undesirable sporting outcomes, developmental delays, and setbacks, athletes with a high AI are likely to perceive these events as major challenges, experiencing negative emotions and a diminished sense of self-worth (Lamont-Mills & Christensen, 2006; Vissek et al., 2008; O'Halloran & Haslam, 2020; Lochbaum et al., 2022). Furthermore, a strong AI may lead athletes to engage in their sport to such an extent that their physical and/or mental health is jeopardised. Excessive training, pushing through injuries, and social isolation due to rigorous training schedules may ultimately do more harm than good; however, their strong AI compels them to persist in these behaviours (Brewer et al., 1993).

Due to the overpowering effects of more dominant GM within an individual's SI, combined with the all-consuming nature of elite sport, having a strong and salient AI may result in a narrow SI for athletes. In other words, athletes develop and maintain a strong AI at the expense of other group memberships, leading to a SI that encompasses few, if any, other identities. Consequently, they internalise very few non-athletic identities into their sense of self (Brewer et al., 1993; Haslam et al., 2020; O'Halloran & Haslam, 2020). The rigorous demands of training and competition in elite sport often necessitate the narrowing of external activities to achieve optimal athletic performance (Brewer et al., 1993). As a result, athletes may set aside other identities, such as those related to education, friendships, hobbies, and relationships, in favour of their sporting commitments. Moreover, this sacrifice is often encouraged, as alternative identities are perceived as distractions or surplus to requirements, reinforcing the belief that a singular, strong AI is essential for success (Lamont-Mills & Christensen, 2006).

Individuals with a strong AI and an extremely narrow SI are described as having an exclusive AI, which can exacerbate the negative consequences associated with a strong AI (Brewer et al., 1993; Cruwys et al., 2020). According to the SIMIC, such individuals struggle to cope with hardships and transitions, placing their identity and well-being at significant risk (Cruwys et al., 2020; O'Halloran & Haslam, 2020). Furthermore, athletes with an exclusive AI lack alternative sources of self-worth, identity, and support outside of their athletic role, further intensifying the negative consequences of AI (Brewer et al., 1993; O'Halloran & Haslam, 2020; Cruwys et al., 2020). In addition, exclusive AI athletes are less likely to explore other identities - such as career, education, hobbies, and lifestyle pursuits - due to their intensive focus on sport. They often perceive other pursuits as unnecessary or unattainable, lacking the opportunities and incentives to explore alternative group

memberships and identities. This phenomenon, known as identity foreclosure, can result in identity and mental health crises following setbacks or transitions in their sporting career (Brewer et al., 1993; O'Halloran & Haslam, 2020). In summary, an exclusive AI significantly undermines an athlete's well-being and resilience in the face of challenges, outweighing any potential benefits for training and performance.

2.3 Athlete Specialisation (AS)

Due to the dramatically increased rewards and pressures associated with elite sport - ranging from personal glory to financial incentives - the pressure for **AS**, which involves year-round training with vigour and intensity, has risen significantly. This pressure stems from various sources, including coaches, sporting programmes, and substantial state investment in developing elite athletes (Baker, 2003; Weinberg & Gould, 2019).

Sport-specific, rigorous, year-round training is widely regarded as essential for athletes to improve and develop the talent needed to succeed in their sport. In fact, one of the most robust relationships identified in behavioural science is the positive correlation between time spent practising and level of achievement (Baker et al., 2009; Moesch, Hauge & Wikman, 2011). High-quality, specific training is considered the primary determinant of proficiency in sport (Baker, 2003; Moesch et al., 2011). This aligns with the development of a strong AI (Lochbaum et al., 2022). However, the optimal time to begin specialisation and AI development remains a topic of debate, as research consistently indicates that athletes who specialise early or late do not necessarily gain a predictive advantage or competitive edge later in their careers (Gould, 2010; Moesch et al., 2011; Feeley, Agel & LaPrade, 2015; O'Halloran & Haslam, 2020). Consequently, two primary approaches to AS have emerged.

Early Specialisation (ES)

ES is defined as “childhood sport participation in a single sport, with a deliberate focus on training and development in that sport” (Baker, 2003, p.85). ES involves intensive, year-round, deliberate training in a single sport to the exclusion of other sports from a young age and is widely encouraged across sporting programmes worldwide (Baker, 2003; Gould, 2010; Feeley et al., 2015). ES is characterised by four specific parameters: (1) an early start in sport; (2) early exclusive participation in one sport rather than several; (3) early engagement in focused, high-intensity training; and (4) early involvement in competitive sport (Baker et al., 2009).

The theoretical foundation of ES is based on two key concepts: the "10-year rule" (or "10,000 hours rule"), which posits that a decade of deliberate training (accumulating 10,000 hours) is required to achieve expertise; and the "power law of practice," which suggests that learning occurs rapidly in the initial stages but slows exponentially over time (Baker, 2003; Baker et al., 2009). Proponents of ES argue that starting earlier accelerates the path to expertise.

However, ES has been associated with several drawbacks and negative consequences. The limited skill diversity within a single sport can hinder overall motor skill development. Moreover, ES is linked to an increased risk of overuse injuries, inflexibility, and conditions such as osteochondrosis (Baker, 2003; Baker et al., 2009; Gould, 2010; Feeley et al., 2015). In addition to these physical risks, ES can impede psychological and social development, as it restricts opportunities for broader social experiences and identity exploration. This can lead to premature identity foreclosure, social isolation, and psychological issues such as loss of motivation, heightened emotional stress, burnout, feelings of a "lost childhood," and even eating disorders (Baker, 2003; Gould, 2010; Moesch et al., 2011; Cruwys et al., 2020; O'Halloran & Haslam, 2020).

Critics argue that the ES model is outdated and does not reflect modern athlete development, which often involves extended exploration periods into young adulthood, such as pursuing higher education, trying different career paths, or travelling (O'Halloran & Haslam, 2020).

Early Diversification (ED)

An alternative to ES is **ED**, which promotes participation in a variety of sports during childhood, with a focus on enjoyment before specialising later in life. ED suggests that the early years should involve multiple sports and play-oriented practice rather than structured, deliberate training. Athletes following this approach gradually narrow their focus to a single sport around the ages of 12–16 and engage in highly deliberate training by ages 16–18 (Baker, 2003; Moesch et al., 2011).

Research indicates that ED can be equally effective as ES in the development of physical skills (Baker, 2003; Baker et al., 2009). Interestingly, ED athletes demonstrate that the so-called "power law of practice" is less of a barrier, as they often intensify their training later in adolescence, accumulating as many—if not more—training hours than their ES counterparts by age 21 (Moesch et al., 2011; Feeley et al., 2015). Studies suggest that athletes with an ED background are just as likely to achieve elite status and often enjoy longer, more

successful careers with better overall health and well-being (Gould, 2010; Moesch et al., 2011; Feeley et al., 2015).

ED also provides greater opportunities for sociological and psychological enrichment, fostering broader social networks, higher intrinsic motivation, and a more well-rounded identity (Baker et al., 2009; Moesch et al., 2011; O'Halloran & Haslam, 2020). However, while ED offers numerous benefits, it does not eliminate the need for deliberate, sport-specific training at later stages (Baker et al., 2009). Furthermore, ED has yet to be proven superior to ES in terms of physical skill acquisition (Moesch et al., 2011).

The Implications of AS on SI and Well-being

The literature consistently shows that ES is not a prerequisite for elite-level success. In fact, evidence suggests that athletes with a diversified sporting background are at no disadvantage compared to those who specialise early (Baker, 2003; Baker et al., 2009; Gould, 2010; Moesch et al., 2011; Feeley et al., 2015). Notably, ES athletes tend to have shorter careers and less time on national teams compared to those who specialised later (Baker, 2003; Baker et al., 2009; Gould, 2010). Moreover, early success at the junior level does not necessarily predict senior-level success (Gould, 2010).

Athletes with an exclusive AI, which can result from ES, face challenges when transitioning out of sport due to their narrow SI and limited sources of self-worth (Cruwys et al., 2020; O'Halloran & Haslam, 2020). Conversely, athletes from an ED background tend to develop a broader SI, which provides psychological resilience and longer-lasting careers.

In conclusion, while specialisation is necessary for elite performance, the timing and nature of AS have significant implications for an athlete's SI and overall well-being. Delayed specialisation, rooted in diverse experiences, fosters greater resilience and well-being, whereas ES can predispose athletes to avoidable hardships (Cruwys et al., 2020; O'Halloran & Haslam, 2020; Stephen et al., 2023).

2.4 The Athlete Dilemma

The dilemma facing athletes is now clear. For performance and career success, athletes require a strong and salient AI. In fact, achieving success necessitates heavy specialisation in their sport, which directly enhances their AI and increases the salience of sport-related GM within their identity. However, it is equally critical for athletes to possess multiple, positive GMs that are both meaningful and compatible. These additional identities are crucial for managing inevitable setbacks, hardships, and career transitions both during and

after their athletic careers. This presents a significant challenge in itself; however, an even greater implication arises when considering the characteristics of elite sport in conjunction with the dominance of AI. A strong AI tends to narrow SI, diminishing the significance of other GMs and often leading to their exclusion. Furthermore, due to the all-encompassing nature of elite sport, finding meaningful and compatible groups that align with the time-consuming and demanding nature of athletic commitments becomes an exceptionally difficult task. This challenge further complicates the athletes' ability to achieve balance. Conversely, possessing a broadened and varied SI inherently limits the extent to which one can specialise and elevate any given GM to the degree required for AS and elite performance, often resulting in significant internal conflict.

Although it is possible for athletes to balance these competing demands within their SI, doing so presents a persistent challenge. Both aspects inherently conflict with each other - a dominant AI naturally seeks to overshadow an athletes' SI, whereas the maintenance of multiple broad GMs can dilute AI. The demands of elite sport further complicate this dynamic. Nevertheless, both elements are essential for optimal well-being, resilience in the face of hardship, and ultimately, long-term performance success.

Recognition of this athlete dilemma may also provide insight into the greater longevity and success observed among ED athletes compared to ES athletes. ED athletes, upon reaching the elite level, have likely navigated this dilemma and have benefited from possessing both a strong AI and a varied SI. Their involvement in multiple sports and diverse groups during their formative years may have predisposed them to a well-developed and diversified identity. As they progressed through AS and their athletic journey, they may have retained aspects of this broader identity, allowing them to better manage the demands of elite sport.

In contrast, ES athletes often lack this predisposition. Their early and exclusive commitment to a single sport limits opportunities to develop a broader, more varied SI. Consequently, their foreclosed and exclusive identity not only restricts their capacity to cultivate additional GMs but also impairs their ability to navigate the athlete dilemma. This leaves them vulnerable to the negative consequences of possessing a strong, exclusive AI without access to other SI resources necessary for coping with setbacks, hardships, and career transitions.

2.5 Motivation and Sport Commitment

Motivation

An important aspect of SI research, particularly AI in sport, is motivation. Motivation is an extensively studied area of sport psychology and is considered imperative to sport and performance (Roberts, 1992; Woods, 2011; Greenaway et al., 2020). At its core, motivation is the desire to fulfil a need for reward, and it can be understood through two key aspects: (1) it drives behaviour by generating actions, and (2) it directs behaviour by influencing decisions. Because of this, motivation lies at the heart of all sporting pursuits (Woods, 2011; Greenaway et al., 2020). Sport offers opportunities to fulfil needs and provides direction for their fulfilment within a context that offers substantial rewards (Woods, 2011). Therefore, understanding motivation and how to promote, direct, and sustain it is critical to ensuring the continued effort and success of athletes throughout their sporting careers (Greenaway et al., 2020).

Various models have been developed to understand motivation, but in general, the concept is comprised of numerous behavioural components, cognitions, and thought processes that take place within dynamic social contexts. These cognitions, processes, and social contexts, in turn, govern motivated action and shape an athlete's ongoing effort and persistence in sport (Roberts, 1992; Greenaway et al., 2020). In sport psychology, the term **achievement motivation** is most commonly used to describe an athlete's motivation to strive for performance success and achieve their goals. This type of motivation enables athletes to persist even when facing obstacles and failure (Woods, 2011; Greenaway et al., 2020). The literature on achievement behaviour is dominated by the role of mediating cognitions and their influence on motivation (Roberts, 1992; Woods, 2011). Additionally, these cognitive processes, when combined with social variables and personality factors, facilitate various motivational dispositions and cognitive assessments that influence an athlete's behaviour in achievement situations (Roberts, 1992).

The importance of an athlete's perception of a task, internal processes, and the surrounding social environment in influencing motivation is evident. Individual perspectives and cognitive processes determine the extent to which an athlete strives for achievement and the level of success they attain (Roberts, 1992). Individuals are more likely to engage in different tasks, exert effort, persevere through failure, and ultimately succeed when they believe they have the necessary resources and opportunities. For athletes, their evaluations and personal expectations of success predict greater achievement motivation and, in turn, better performance (Roberts, 1992; Woods, 2011; Greenaway et al., 2020).

Sources of achievement motivation can be classified as **extrinsic** or **intrinsic** (Woods, 2011; Greenaway et al., 2020). These sources are defined by the rewards they offer athletes for their efforts. Extrinsic motivation comes from external sources outside of the individual athlete, whereas intrinsic motivation is driven by internal factors (Woods, 2011; Greenaway et al., 2020). Intrinsic motivation is often considered the more optimal form of sport achievement motivation, as it is associated with greater enjoyment, effort output, positive attitudes, behavioural intentions to train, and persistence in sports. Moreover, sport enjoyment is widely regarded as a cornerstone of sport motivation (Roberts, 1992; Scanlan & Simons, 1992; Greenaway et al., 2020), and, as will be discussed later, it is a foundational component of SC (Scanlan et al., 2016).

Applying a SIA perspective highlights the importance and value of an athlete's SI, particularly their AI, in their motivation. The extent to which athletes can generate and direct sport-relevant motivation and subsequent behaviour that will benefit their performance in the short and long term is limited by their capacity to internalise sport-related GM, such as AI. The more they identify as an athlete, with their sport, or with their team/programme, the more optimally motivated they will be. This identification also leads to increased effort in athletic pursuits, such as consistent training attendance and greater commitment to improvement. Additionally, through phenomena such as social facilitation and labouring, it is evident that motivation is not only shaped by an athlete's SI but can also be enhanced through its processes, leading to better performance (Stephen et al., 2023). Thus, an athlete's motivation is inherently constrained or enabled by their sport-related SI, such as AI. Consequently, changes in an athlete's SI will inevitably result in alterations to their sporting motivation, behaviour, and performance, for better or worse (Rees et al., 2015; Haslam et al., 2020; Greenaway et al., 2020; Stephen et al., 2023).

Moreover, as motivation consists of various behavioural components, cognitions, and thought processes that occur within dynamic social contexts (Roberts, 1992; Greenaway et al., 2020), SI has a profound effect on it. An athlete's SI shapes their perceptions of the world, mental processes, and subsequent behaviour. People perceive, think, and act as members of groups, which influences their motivational processes and goal-directed behaviour. In other words, an athlete's motivation and resultant actions are underpinned and filtered through their SI (Roberts, 1992; Rees et al., 2015; Haslam et al., 2020; Greenaway et al., 2020). Furthermore, an athlete's achievement motivation results from extensive cognitive evaluations, with their perception of tasks facilitating their striving for achievement and their level of success (Roberts, 1992). Many cognitive processes that shape motivation are, in turn,

shaped by SI (Brewer et al., 1993; Haslam et al., 2020; Salvatore et al., 2020; Greenaway et al., 2020; O'Halloran & Haslam, 2020; Stephen et al., 2023). A key factor influencing an athlete's perspective is their perception of the world, which is constructed through their SI and GM (Rees et al., 2015; Haslam et al., 2020).

The goals athletes set, as well as the intrinsic and extrinsic sources of motivation that provide them with a sense of reward, are heavily influenced by their SI (Woods, 2011; Greenaway et al., 2020). Athletes will set goals that align with their GM values and derive motivational rewards from the groups that matter most to them. In this way, an athlete's SI can transform extrinsic rewards into intrinsic ones and guide goal-setting and behaviour to what is most relevant (Rees et al., 2015; Greenaway et al., 2020). Thus, an athlete's SI shapes the very nature and sources of their achievement motivation (Haslam et al., 2020; Greenaway et al., 2020).

Even the fundamental components of motivation - autonomy and control, perceived competence, and ability - are shaped by SI. While humans may have an innate competence motive, it only significantly influences motivation when the task aligns with the values and goals of their GM (Brewer et al., 1993; Greenaway et al., 2020; O'Halloran & Haslam, 2020). Furthermore, the perceived value of a task, the evaluation of available resources, and the sense of control over the task are all shaped and facilitated through SI and GM (Haslam et al., 2020; Greenaway et al., 2020).

When investigating motivation, it is important to acknowledge the extensive range of motivation theories available. Although there is some convergence among them, the main issue is that 'motivation' or even 'achievement motivation' is too broad a concept, with varying forms resulting in different mindsets and behaviours. Therefore, it is crucial to clarify the specific behaviour being investigated and select the appropriate model to understand and explain it (Roberts, 1992). Perhaps the most significant athlete behaviour for SI research, and the most relevant to this study, is their continued persistence in sport through challenges and the transformative influence sport has on athletes' lives beyond their athletic careers.

Sport Commitment (SC)

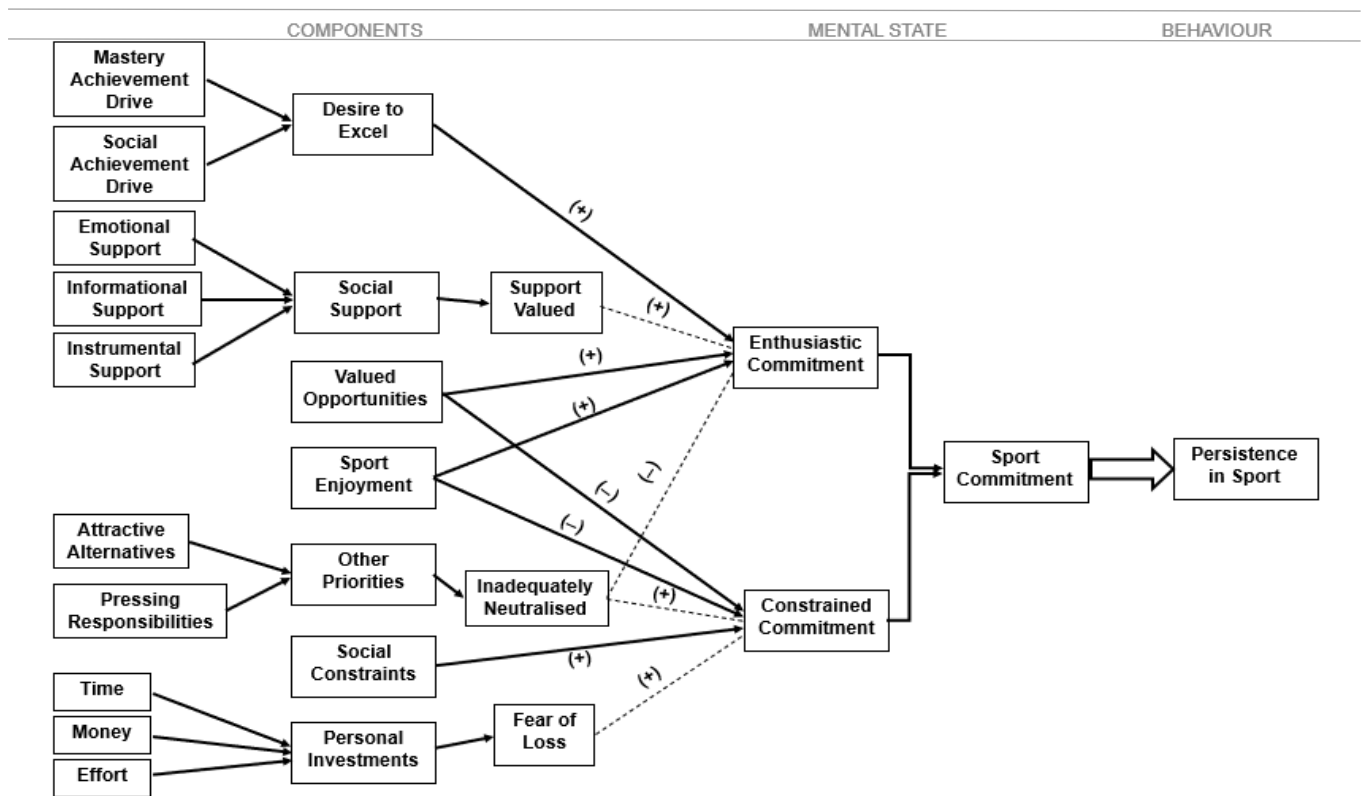
Progressing from a novice sportsperson to an athlete, and ultimately to an elite athlete, requires more than just continual motivation to achieve success. It necessitates a commitment to maximising one's abilities over time and an ongoing resolve to strive for and achieve goals. At elite levels, this intense commitment extends beyond sports training and competition; in fact, achieving elite sports goals requires motivated changes and dedication

across nearly all areas of an athlete's life, including diet, sleep patterns, social interactions, educational or work commitments, and maintaining a persistent lifestyle (Greenaway et al., 2020). Within these contexts, an athlete's achievement motivation is best understood through the concept of **SC**, which can be explained using the Sport Commitment Model (SCM; Scanlan, Carpenter, Simons, Schmidt & Keeler, 1993a; Scanlan et al., 2016).

SC is defined as “a psychological construct representing the desire or resolve to continue sport participation” (Scanlan et al., 1993a, p. 6). Accordingly, SC represents a general achievement motivational state that leads to continued participation in sport, specifically persistence despite challenges and setbacks (Scanlan et al., 1993a; Scanlan, Russell, Magyar, & Scanlan, 2009; Scanlan, Russell, Scanlan, Klunchoo, & Chow, 2013). In other words, SC reflects an athlete's mental state of sustained stability and perseverance in sport (Mirhosseini, Hadavi, & Mozaffari, 2013). This definition of SC - “to continually persist in sport over time” - has remained consistent across studies and will be adopted for this study as well (Scanlan et al., 2016, p. 234).

The level of SC an athlete possesses is of vital importance to their sports behaviour and performance, directly influencing their persistence in sport (Scanlan et al., 2009; Scanlan et al., 2013). The world of elite sport is arduous, filled with both positive and negative experiences - ‘ups and downs’ - all regarded as part of the journey. Thus, the ability to persist through difficult experiences and remain committed is crucial for athletes, and this ability is a direct consequence of their SC (Scanlan et al., 2016). Indeed, elite athletes consistently cite SC as the single most important factor contributing to their success at the highest level (Scanlan, Russell, Wilson, & Scanlan, 2003a). A visualisation of the SCM is shown below in Figure 1.

Figure 1

The Sport Commitment Model

Notes. (+) = Strengthening influence
 (-) = Lessening influence
 (→) = Direct influence
 (---) = Influence can be nullified
 (⇒) = Behavioural response

As illustrated in Figure 1, the SCM states that an athlete's overall SC is composed of two dimensions: enthusiastic commitment and constrained commitment. These states consist of several independent components that influence SC. The components explain why athletes experience both enthusiastic and constrained commitment and why these factors fluctuate over time, as they are dynamic in nature (Scanlan & Simons, 1992; Scanlan et al., 1993a; Scanlan et al., 2016). Specifically, SC is determined by seven broad components that apply to athletes at all competitive levels: (1) Sport Enjoyment, (2) Other Priorities, (3) Personal Investments, (4) Social Constraints, (5) Valued Opportunities, (6) Social Support, and (7) Desire to Excel (Scanlan & Simons, 1992; Scanlan et al., 1993a; Scanlan et al., 2009; Scanlan et al., 2013; Scanlan et al., 2016). Each component influences SC independently, and the relative significance of each varies between athletes and their individual circumstances, evolving over time (Scanlan et al., 1993a; Scanlan, Carpenter, Simons, Schmidt & Keeler,

1993b; Scanlan et al., 2016). Fundamentally, each component is shaped by the athlete's individual perceptions (Scanlan & Simons, 1992).

The SCM emerged from the integration of previous dropout and burnout models in sport (Smith, 1986; Gould, 1987; Gould & Petlichkoff, 1988), which were rooted in social exchange theory (Thibaut & Kelley, 1959). These models were combined with the love and commitment model (Kelley, 1983) and the investment model (Rusbult, 1983), both of which were adapted for the sports context (Scanlan, Carpenter, Simons, Keeler, & Schmidt, 1990; Simons, Scanlan, Carpenter, & Schmidt, 1990; Schmidt & Stein, 1991; Scanlan & Simons, 1992). Over the years, through extensive investigation of athletes ranging from youth and recreational participants to elite 'best-in-the-world' competitors, the SCM has been rigorously tested and refined into its most current and robust iteration (Scanlan et al., 2016).

The SCM provides insights into why some individuals persist in sport due to sheer love and enjoyment, while others remain for reasons unrelated to enjoyment, such as obligations or constraints. Additionally, the model explains how stable or unstable an athlete's reasons for remaining in sport may be (Schmidt & Stein, 1991; Scanlan & Simons, 1992). Specifically, the SCM posits that an athlete's commitment to their sport stems from two major factors: whether they "want to" persist or "have to" persist. The nature of commitment inherently includes both functional and obligatory components; thus, SC should be understood as a reflection of both voluntary and obligatory engagement in sport (Scanlan et al., 1993a; Wilson, Rodgers, Carpenter, Hardy, & Fraser, 2004; Scanlan et al., 2016). When an athlete's commitment is driven by a sense of obligation to remain in the sport, it can sometimes lead to sport entrapment, akin to being 'trapped' in a relationship or career (Raedeke, 1997). However, within the SCM, the 'having to' aspect of commitment is referred to as Constrained Commitment, while the 'wanting to' aspect is known as Enthusiastic Commitment; together, these elements constitute an athlete's overall SC (Scanlan et al., 2016).

It is important to note that the SCM suggests that athletes can experience both enthusiastic and constrained commitment simultaneously, and the degree of each fluctuates over time (Scanlan et al., 2016). However, rather than focusing solely on these different states of SC, the SCM primarily examines the underlying mechanisms and meaning that athletes attribute to their sport participation, which varies greatly across individuals, sports, and levels of competition (Scanlan & Simons, 1992; Scanlan et al., 1993a; Scanlan et al., 1993b; Casper & Andrew, 2008). These mechanisms include -

1. Sport Enjoyment

The sport enjoyment component is defined as “a positive affective response to the sport experience that reflects generalised feelings such as pleasure, liking, and fun” (Scanlan et al., 1993a, p. 6). Simply put, this component measures the extent to which athletes enjoy their sporting experience; the greater the enjoyment, the stronger its influence on their overall SC (Scanlan et al., 2016). Sport enjoyment is more specific than a general positive affect but broader than a specific emotion such as excitement or happiness. Furthermore, it is distinctly different from intrinsic motivation, as enjoyment can be derived from both extrinsic and intrinsic sources. It is also influenced by both achievement and non-achievement outcomes in sport (Scanlan, Stein, & Ravizza, 1989; Scanlan & Simons, 1992).

2. Other Priorities

The other priorities component reflects the attractiveness of alternative activities and the pressing nature of other responsibilities over continued sport participation. Alternatives include opportunities such as joining a band or club instead of continuing with sport. This component evaluates the desirability of these alternatives in relation to an athlete’s current sports participation, thus presenting athletes with an ongoing choice between sport and other activities (Scanlan et al., 1993a). The influence of this component increases as athletes age, as the time and financial demands of sport grow alongside other life responsibilities, making the decision to remain in sport more complex and consequential (Carpenter, 1993; Scanlan, Russell, Beals, & Scanlan, 2003b).

Additionally, the component encompasses pressing responsibilities such as educational or career obligations, as well as family commitments (Scanlan et al., 2003b). As illustrated in Figure 1, the impact of this component can be nullified if an athlete views sport as their top priority, with no competition from other pursuits (Scanlan et al., 2003b, 2009). However, balancing priorities is challenging, as life circumstances constantly evolve. For example, a student-athlete may be wholly dedicated to their sport, but academic deadlines can shift their focus temporarily, impacting their SC. Similarly, older athletes contemplating retirement may find their professional careers or family commitments increasingly attractive compared to sport, thereby affecting their SC (Scanlan et al., 2003b, 2016).

3. Personal Investments

The personal investment component refers to the resources - such as time, money, and physical and mental effort - that an athlete has devoted to their sport,

which cannot be recovered if participation ceases (Scanlan et al., 1993a). The significance of this component varies depending on the individual athlete's perception of their investment and circumstances (Scanlan et al., 1993a, 1993b). Generally, the more an athlete perceives themselves to have invested in sport, the greater the influence of this component on their SC (Scanlan et al., 2003b, 2009).

This component also introduces a layer of complexity regarding whether an athlete perceives their past investments as a reason to persist. Some athletes may not view their investment as a loss and instead feel satisfied with their past contributions. If so, the component has little influence on their SC. However, if an athlete believes their investments would be wasted if they ceased participation, this perception strengthens their SC (Scanlan et al., 2003b, 2013, 2016).

4. Social Constraints

The social constraints component reflects the social expectations or perceived obligations that create a sense of pressure to remain in sport. These pressures can come from teammates, family members, or expectations set by elite programmes (Scanlan et al., 1993a; Casper & Andrew, 2008; Scanlan et al., 2016). The influence of this component is strongest when athletes feel they have limited or no personal control over their sporting experience, such as in highly structured elite programmes. Conversely, when athletes feel in control of their sporting participation, their personal expectations take precedence, reducing the influence of external social constraints (Carpenter, 1993; Scanlan et al., 2003b; Casper & Andrew, 2008; Scanlan et al., 2009, 2013).

5. Valued Opportunities

This component is defined as the important and valued opportunities that are only achievable through continued involvement in sport (Scanlan et al., 1993a, 2013, 2016). Sport offers a variety of rewarding experiences for athletes at all levels, from recreational to elite (Scanlan & Simons, 1992; Woods, 2011). These opportunities can include skill mastery, social connections, travel experiences, or achieving long-held competitive goals, such as making a national team or winning a championship (Scanlan et al., 1993a, 2016).

The component focuses on the anticipation and belief in these opportunities rather than their actual occurrence. However, past experiences that have fulfilled these expectations strengthen an athlete's belief that such valued opportunities will continue

to arise, further reinforcing their SC (Carpenter, Scanlan, Simons & Lobel, 1993; Scanlan et al., 1993a, 2016).

6. Social Support

Social support is defined as “the support and encouragement the athlete perceives significant others provide for their involvement in sport” (Carpenter, 1993, p. 59). This component encompasses all social connections and sources of encouragement that contribute to an athlete’s SC. Support can come from various sources, including family, friends, teammates, coaches, and even broader communities such as sports clubs or national governing bodies (Carpenter, 1993; Carpenter & Coleman, 1998; Scanlan et al., 2003b, 2009, 2016).

The influence of social support on SC depends on both general feelings of support and specific examples of tangible assistance. It can be further categorised into three types:

- a. Emotional support, often provided by family and close friends, reflecting the emotional encouragement given to athletes.
- b. Informational support, which includes guidance and advice from significant others such as coaches or mentors.
- c. Instrumental support, involving tangible assistance such as financial resources, training facilities, or logistical help (Scanlan et al., 2016).

Notably, social support only impacts SC if the athlete perceives it as valuable. For example, emotional support from a sports community may have little influence unless the athlete personally values that support, whereas encouragement from a close friend might significantly impact their SC (Scanlan et al., 2016).

7. Desire to Excel

The desire to excel component is defined as “wanting or striving to achieve excellence through mastery and social achievement behaviours” (Scanlan et al., 2013, p. 531). This component encompasses two aspects:

- a. Mastery achievement, which relates to the athlete’s desire to improve their skills and reach their full potential.
- b. Social achievement, which refers to the drive to outperform others, including teammates and opponents (Scanlan et al., 2013, 2016).

This component aligns closely with the psychological concept of competitiveness (Woods, 2011). Athletes with a strong desire to excel are more likely to remain committed to their sport and put in additional effort to achieve their goals.

The greater an athlete's drive to excel, the more influence this component has on their SC. Conversely, as their drive diminishes, the component's impact lessens, potentially weakening their overall SC (Scanlan et al., 2016).

As previously stated, an athlete's SC comprises both an enthusiastic and constrained element (Wilson et al., 2004; Scanlan et al., 2016). As shown in Figure 1, these two types of commitment derive from unique component sources, the same component sources with similar effects, and even the same component sources with opposite effects. This means that the seven components all have notable effects on both forms of commitment (Scanlan et al., 2016).

Enthusiastic commitment reflects an athlete's positive psychological attachment to a sport and their willingness to overcome obstacles to continue participating for as long as possible. This element of commitment is positively influenced by the sport enjoyment, valued opportunities, desire to excel, and social support components, whereas the other priorities component diminishes it (Young & Medic, 2011; Scanlan et al., 2016).

Conversely, constrained commitment emphasises an athlete's sense of obligation or compulsion to remain in the sport. It includes feelings of being trapped or perceiving that continued participation is a necessity. This form of commitment is positively reinforced by the other priorities, personal investments, and social constraints components, while sport enjoyment and valued opportunities lessen it (Young & Medic, 2011; Scanlan et al., 2016).

Although the influence of each component on SC varies between individual athletes (Scanlan et al., 1993a, 1993b), research - both quantitative and qualitative - consistently finds sport enjoyment to be the most dominant component of an athlete's SC (Scanlan et al., 1989; Scanlan & Simons, 1992; Scanlan et al., 1993a; Carpenter et al., 1993; Carpenter & Coleman, 1998; Scanlan et al., 2003b, 2009, 2016). Following this, the valued opportunities component is the next most dominant (Carpenter et al., 1993; Carpenter & Scanlan, 1998; Scanlan et al., 2003b, 2009, 2016), followed by personal investments (Scanlan et al., 1993a; Carpenter et al., 1993; Scanlan et al., 2003b, 2009). The social support component, although a more recent addition to the SCM, has also demonstrated a strong influence over SC (Carpenter & Coleman, 1998; Scanlan et al., 2003b, 2009, 2013). However, findings regarding the social constraints component have been more inconsistent, with some studies finding no significant influence on SC (Scanlan et al., 1993a, 2003b, 2009), while others report small positive effects (Casper & Andrew, 2008) or negative effects (Carpenter et al., 1993). A similar trend is observed with the other priorities component (Scanlan et al., 1993a; Wilson et al., 2004; Scanlan et al., 2009). The final component, desire to excel, lacks depth of background

research as it is the most recent addition to the SCM (Scanlan et al., 2013). However, its encompassing nature within the established achievement motivation concept of 'competitiveness' (Woods, 2011) highlights its robustness, pervasiveness, and consistency as an SC component (Scanlan et al., 2013, 2016).

A noteworthy finding from SCM research is that elite athletes and those of a higher skill level tend to report lower sport enjoyment values compared to their recreational counterparts and athletes of lower skill levels. However, they report significantly higher values in the areas of valued opportunities, personal investments, and social constraints, resulting in overall SC being higher than that of recreational athletes (Casper & Andrew, 2008). This suggests that although elite athletes may still be enthusiastically committed to their sport, they are also more likely to feel constrained by their commitment than their lower-level counterparts (Casper & Andrew, 2008). These findings support the usefulness of the SCM, as it reveals the vast range of differing psychological states among athletes, despite similar, equal, or widely different levels of commitment, thereby illustrating the underlying meaning behind their SC (Scanlan & Simons, 1992).

From the discussion above, an insightful profile of an athlete's SC emerges. The more an athlete enjoys their sporting experience and values the opportunities it provides, the greater their resolve to continue participation and the less they feel forced to remain (Scanlan & Simons, 1992; Scanlan et al., 1993a, 1993b; Carpenter et al., 1993; Carpenter & Scanlan, 1998; Carpenter & Coleman, 1998; Scanlan et al., 2003b, 2009; Young & Medic, 2011; Scanlan et al., 2016). The more they strive to improve and achieve mastery in their sport, and surpass their counterparts, the stronger their determination to persist (Scanlan et al., 2009, 2013, 2016). Additionally, the more they feel encouraged and supported by those who matter to them, the greater their desire to persist in their sport (Carpenter & Coleman, 1998; Scanlan et al., 2003b; Wilson et al., 2004; Scanlan et al., 2009, 2013, 2016).

However, if the attractiveness or pressing nature of other activities or responsibilities is not successfully managed by the athlete, their will to continue in sport diminishes, and feelings of constrained obligation increase (Scanlan et al., 1993a, 1993b, 2003b; Wilson et al., 2004; Scanlan et al., 2016). Furthermore, athletes feeling pressured by external expectations to remain in sport are more likely to feel constrained, particularly if their sense of personal control is diminished (Scanlan et al., 1993a, 1993b; Carpenter et al., 1993; Wilson et al., 2004; Casper & Andrew, 2008; Scanlan et al., 2016). Additionally, the personal resources an athlete has already invested in their sport increase feelings of obligation to persist if they perceive those resources to be lost should they discontinue participation

(Scanlan et al., 1993a, 1993b; Carpenter et al., 1993; Scanlan et al., 2003b; Wilson et al., 2004; Scanlan et al., 2016).

Ultimately, as an athlete progresses to higher levels of skill mastery and competitive performance, they may experience decreases in sport enjoyment; however, they often become even more committed due to the increasing value they anticipate from their sporting experience and their growing sense of obligation to continue (Casper & Andrew, 2008).

Given this, the composition and significance of an athlete's SC are clear. Progressing from a novice sportsperson to an elite athlete requires intense SC - an unwavering commitment to maximising their abilities over time and a sustained resolve to achieve their goals through both triumphs and challenges. Moreover, such commitment extends beyond sports training and competition; it necessitates profound lifestyle changes, including adjustments to diet, sleep patterns, social interactions, and educational or professional pursuits (Greenaway et al., 2020; Lochbaum et al., 2022).

When examined through an SIA, it becomes evident that the foundation of this commitment lies in the athlete's SI, particularly their strong AI and other dominant GM related to their sport. The most salient identities within an athlete exert the greatest influence on their psychology and behaviour, shaping their perception of and approach to daily life (Haslam et al., 2020; Greenaway et al., 2020; Lochbaum et al., 2022). Dominant GM identities, such as AI, not only explain how athletes maintain consistent commitment to sport-related processes within the sporting context but also influence their behaviour beyond it. Athletes fundamentally perceive and engage with the world through the lens of their AI. The more salient these sport-related identities are, the greater the effort they will invest in maintaining their commitment to the behaviours expected of an athlete or sporting group (Haslam et al., 2020; Greenaway et al., 2020; Lochbaum et al., 2022; Stephen et al., 2023).

Furthermore, applying the SIA to the SCM demonstrates that SI plays a crucial role in shaping an athlete's SC. By its very definition, SI salience is reflected in an athlete's persistence in sport through their dedication to their SI sporting groups (Haslam et al., 2020; Stephen et al., 2023). The dual nature of SC - both functional and obligatory (enthusiastic and constrained) - is also explained through an SIA. Athletes are committed to their sport because they strongly identify as athletes and with other sport-related groups, such as their sport, team, or programme. This identification results in a profound transformation of their thought processes and behaviours. These groups value SC, and thus, so does the athlete (Schmidt & Stein, 1991; Rees et al., 2015; Haslam et al., 2020; Greenaway et al., 2020). Athletes remain committed because they feel connected to these groups, experience a sense of belonging, and

derive positive self-worth from their association. They value being part of the group and continuously strive to justify their group's prominence (Haslam et al., 2020).

Additionally, athletes experience a sense of obligatory commitment because these groups are deeply internalised into their self-identity. Losing connection to these groups would equate to losing a fundamental part of themselves (Schmidt & Stein, 1991; Rees et al., 2015; Haslam et al., 2020). This perspective provides insight into why elite athletes often exhibit high SC despite experiencing lower sport enjoyment (Casper & Andrew, 2008). Their strong identification with their sport-related groups compels them to remain engaged, as their SI is heavily centred around these groups. Athletes with a highly narrow SI, where sport-related groups are their sole or primary identity, may face significant mental health and identity crises if they are forced to disengage (Cruwys et al., 2020; O'Halloran & Haslam, 2020).

Moreover, SI significantly influences the nature and strength of the seven components of SC. Each component is fundamentally shaped by the athlete's internalised group identities and their perceptions (Scanlan & Simons, 1992; Rees et al., 2015; Haslam et al., 2020). For instance, sport enjoyment, defined as the extent to which athletes derive joy from their sporting experience, is heavily influenced by SI. The degree of enjoyment and satisfaction an athlete experiences is contingent upon their capacity to internalise relevant sporting identities, such as AI, into their self-identity. The stronger these identities, the greater the enjoyment and fulfilment derived from sport and being an athlete (Brewer et al., 1993; Burns et al., 2012; Haslam et al., 2020; Greenaway et al., 2020; O'Halloran & Haslam, 2020; Stephen et al., 2023). Thus, SI determines the potential scope and strength of an athlete's sport enjoyment component.

An SIA also reveals that the opportunities and experiences an athlete values are shaped by their SI. Athletes may highly value opportunities that allow them to interact with their most salient groups and members, as these experiences reinforce their group membership. Additionally, what an athlete values within sport is inherently dictated by their GM. The extent to which they identify with a group that prioritises certain opportunities directly influences the significance they attach to those opportunities (Haslam et al., 2020; Greenaway et al., 2020; Stephen et al., 2023). Consequently, SI shapes the valued opportunities component and determines its level of influence.

The relationship between SI and the social support component is equally significant. The sources from which an athlete derives social support are entirely determined by their SI. This is evident in the fact that social support influences SC only when the athlete values the

source of support - meaning they identify with that source (Scanlan et al., 2016). Athletes consistently demonstrate a preference for feedback and support from groups they belong to and fellow group members (Salvatore et al., 2020; Stephen et al., 2023). Furthermore, the various GM an athlete possesses serve as social resources, with a SIA highlighting that GM are the foundation of the social support component. The more GM an athlete incorporates into their SI, the greater their perceived social support. The emotional significance of these groups also influences the perceived level of support, with stronger and more numerous GM resulting in higher perceived support (Haslam et al., 2020; Cruwys et al., 2020; Stephen et al., 2023). SI, therefore, determines the nature, sources, and strength of the athlete's social support component.

The role of SI in the desire to excel component is also clear. An athlete's ambition to achieve excellence through mastery and social achievement behaviours is shaped by their SI and the GM they have internalised, as well as the extent of this internalisation. Strong sport-related identities, particularly AI, result in subsequent sport achievement-related behaviours, as the athlete aligns their actions with the expectations of their groups (Brewer et al., 1993; Haslam et al., 2020). Furthermore, as previously discussed, the more an athlete identifies with these groups, the greater their desire to engage with them- both within and outside the regular sporting environment. This increased identification leads to greater effort and persistence in training and skill development (Haslam et al., 2020; Stephen et al., 2023). Additionally, sporting GM, such as AI, may inherently include behaviours related to striving for excellence and outperforming opponents, rivals, and teammates. Sport programmes may also place value on intra-team competitiveness during training. Consequently, athletes will pursue these social achievement behaviours, further strengthening their desire to excel and highlighting the importance of SI in this component (Haslam et al., 2020; Stephen et al., 2023). Thus, SI underpins the strength of an athlete's desire to excel component.

The impact of SI on the other priorities component is significant and multifaceted. This component encompasses all other GM within an athlete's SI that are unrelated to sport, their importance, and their compatibility with sport-related GM, such as AI. Strong and salient sporting GM that are dominant over, and compatible with, other identities can minimise or even nullify the influence of this component on SC, as sporting GM take precedence over all other aspects (Scanlan et al., 2016; Haslam et al., 2020). Conversely, GM that are incompatible with sporting GM may be entirely dropped due to the dominating influence and demanding nature of sport (O'Halloran & Haslam, 2020). Alternative GM that are valued but unrelated to sport may create competing demands on an athlete's SC,

necessitating a careful balance to ensure compatibility. Moreover, as social contexts change, these priorities shift accordingly (Scanlan et al., 2016), which aligns with the understanding that SI is highly responsive to environmental influences and athletes can regulate their GM salience (Rees et al., 2015; Haslam et al., 2020). A SIA suggests that the dominance of certain GM and their resultant behaviours may conflict with sport, as athletes adapt to what is most appropriate in their social context. For instance, an athlete's SC may decrease as academic priorities take precedence, leading them to identify primarily as a student rather than an athlete. Similarly, family responsibilities may take priority, or social engagements may become more attractive than sporting commitments. An athlete's SI, therefore, reflects the extent, nature, and composition of their other priorities component and determines its potential influence on SC.

The personal investments component affects an athlete's SC only if they perceive their investment of resources - such as time, money, and effort - as losses should they cease participation in sport (Scanlan et al., 2016). An athlete with a strong AI may not perceive their investments as losses but rather as necessary steps in fulfilling their identity as an athlete. Conversely, an athlete who has heavily invested resources in the pursuit of a specific goal, such as winning a national title, may view quitting as a waste and experience a heightened sense of obligation to continue. Ultimately, an athlete's attachment to their past investments is influenced by the values of their internalised groups. If their sporting GM value the investment, the athlete is more likely to perceive it as a loss upon discontinuation, reinforcing their SC (Rees et al., 2015; Haslam et al., 2020). Thus, SI determines the nature and influence of the personal investments component on an athlete's SC.

A SIA provides insight into the influence of social constraints on SC. Athletes may perceive their sport-related GM as having impermeable group boundaries, making it difficult to leave and reinforcing their continued commitment (Casper & Andrew, 2008; Rees et al., 2015; Haslam et al., 2020). The stronger an athlete perceives these boundaries, the greater their feelings of obligation to remain. Furthermore, athletes with a narrow SI, where sport-related GM dominate their identity, may experience an intensified sense of social obligation due to a lack of alternative identities. This can lead to a diminished sense of personal control over their lives, further reinforcing the influence of social constraints on SC (Casper & Andrew, 2008; Young & Medic, 2011; O'Halloran & Haslam, 2020). The expectations associated with being a group member, such as meeting performance standards and adhering to group values, also contribute to feelings of obligation. The more highly an athlete values their GM, the stronger their sense of obligation to remain (Haslam et al., 2020). Alternatively,

an athlete who genuinely values their sport-related groups may create an internal sense of obligation, driven by their desire to remain a part of the group (Rees et al., 2015; Haslam et al., 2020). Thus, SI explains the nature and significance of an athlete's social constraints component and its influence on SC.

In conclusion, the overarching influence of SI on an athlete's motivation and SC is clear. SI serves as the fundamental foundation that not only shapes the sources and processes of motivation and SC, but also determines their potential strength and capacity to drive behaviour and enhance performance. SI, therefore, acts as the platform and fuel that propels an athlete's motivation and SC forward. Any changes in SI could lead to profound shifts in their sporting motivation and long-term commitment.

2.6 Athlete Stress and Mental Health

Stress and Underpinning Mechanisms

Another notable area of SI research, particularly in sport, revolves around stress and athlete stress. Stress is typically defined as an imbalance between the demands placed on an individual and their perceived ability to meet those demands, where failure to do so carries substantial and important consequences. Stress, therefore, results in a behavioural response aimed at restoring this internal balance (Seggar, Pedersen, Hawkes, & McGown, 1997; Woods, 2011; Buckworth, Dishman, O'Connor & Tomporowski, 2013; Chiu, Lu, Lin, Nien, Hsu & Liu, 2016; Weinberg & Gould, 2019). It is the symptom of both the body and mind's reaction to environmental stressors, which are perceived threats to the individual's 'status quo' (Schacter et al., 2016). Stressors produce changes in cognitive processes and physiological systems, influencing how people think, feel, and behave (Buckworth et al., 2013; Schacter et al., 2016; Weinberg & Gould, 2019). The severity of the mind and body's response differs significantly depending on whether a stressor is perceived as a threat (a stressor believed to be insurmountable) or a challenge (a stressor perceived as manageable with available resources). When a stressor is perceived as a threat, the resultant response is far more severe, and this response is typically what is known as 'stress' (Seggar et al., 1997; Buckworth et al., 2013; Schacter et al., 2016; Weinberg & Gould, 2019).

Stressors are specific events or pressures that place demands on an individual or threaten their well-being in some way. They can be viewed as a force or load acting upon both the body and mind (Woods, 2011; Buckworth et al., 2013; Schacter et al., 2016). Stressors vary in magnitude and frequency - ranging from significant, life-altering events to minor daily hassles, from short-term to long-term challenges - but they all share a common

feature: they pose a perceived threat to the individual or their routine. Anything that disrupts an individual's daily life and forces them to adapt can be considered a stressor (Seggar et al., 1997; Buckworth et al., 2013; Schacter et al., 2016; Weinberg & Gould, 2019). Regardless of one's lifestyle or environment, stress is inevitable (Schacter et al., 2016).

Athletes, in particular, encounter a wide array of stressors. In addition to common stressors such as strained relationships, overworking, financial troubles, academic pressures, and health-related concerns (Seggar et al., 1997; Schacter et al., 2016; Chiu et al., 2016; Weinberg & Gould, 2019; Lin, Lu, Chen, & Hsu, 2022), athletes face unique, sport-specific stressors, including:

1. Performance issues, such as concerns about meeting performance expectations, self-doubt about talent, selection and rejection challenges, performance-related disappointments, injury fears, and external pressures from parents, coaches, and spectators;
2. Environmental issues, such as financial burdens of the sport, travel demands, extensive training requirements, physical and mental demands, and transitions between teams or training centres; and
3. Organisational issues, such as leadership and communication challenges with coaches, interpersonal conflicts with teammates, balancing academic commitments, and managing dual careers (Seggar et al., 1997; Chiu et al., 2016; Weinberg & Gould, 2019; Cruwys et al., 2020; Lin et al., 2022).

The stress process consists of four interrelated stages, each leading to a specific outcome:

1. Environmental demand: The actual stressor;
2. Perception of demand: How the mind and body perceive and assess the stressor;
3. Stress response: The physiological and psychological reaction to the stressor; and
4. Behavioural consequences: The resultant behaviour and performance outcomes (Woods, 2011; Weinberg & Gould, 2019).

The body responds to stressors in several ways, and this response is what is termed as 'stress.' The most notable physiological reaction is the fight-flight-freeze response, which results in heightened physiological activation and increased muscular tension. This response may manifest as headaches, stomach upsets, elevated heart rate, high blood pressure, sweating, flushing, and dry mouth (Buckworth et al., 2013; Schacter et al., 2016; Weinberg & Gould, 2019). These physiological reactions are due to increased arousal levels triggered by the stressor (Woods, 2011; Schacter et al., 2016). However, it is important to note that

physiological arousal is neutral in nature - it is neither inherently positive nor negative - but rather a necessary bodily response for action, particularly in sports performance (Woods, 2011).

The mind plays a crucial role in determining whether a stressor and its associated arousal becomes a negative, unbalancing force. The cognitive appraisal process begins with perception (Salvatore et al., 2020). If the mind perceives a stressor as a threat, it results in imbalance and thus stress. Stressors perceived as uncontrollable, uncertain, or beyond available resources to manage are considered threatening (Seggar et al., 1997; Woods, 2011; Buckworth et al., 2013; Schacter et al., 2016; Greenaway et al., 2020). The perceived importance of a stressor further intensifies the mind's appraisal of it. Specifically, the cognitive appraisal process consists of two stages:

1. Primary appraisal: The initial evaluation of whether the stressor is a threat.
2. Secondary appraisal: An assessment of whether the individual has the resources and ability to cope with the perceived threat (Schacter et al., 2016).

Furthermore, the body's physiological response to stress is closely intertwined with the cognitive response - each influencing and exacerbating the other (Schacter et al., 2016). A negative perception of arousal can escalate stress and contribute to heightened state anxiety (Woods, 2011).

In summary, stressors perceived as uncertain, uncontrollable, and overwhelming—especially when considered highly important - lead to increased stress and state anxiety, a heightened psychological state closely linked with performance (Cohen, Kamarck & Mermelstein, 1983; Woods, 2011; Schacter et al., 2016; Weinberg & Gould, 2019; Salvatore et al., 2020).

The Long-Term Effects of Stress

The long-term effects of constant and continual stress are notable and potentially devastating for both athletes and the general population. A stressor by itself does not result in immediate disorder or disease, but it takes a cumulative toll on the body and mind. The relatively small immediate effects of stress, when prolonged and combined with additional stressors, begin to accumulate, and can pose serious detriments to health (Seggar et al., 1997; Buckworth, et al 2013; Schacter et al., 2016).

Perhaps the most significant consequence of prolonged and accumulated stress is a compromised immune system, leading to slower wound healing, ulcers, a heightened risk of infections and illnesses, a reduction in white blood cell count, and even the suppression of

immune system-related genes within DNA (Lee, 2012; Buckworth et al., 2013; Schacter et al., 2016; Lin et al., 2022). Additionally, the constant state of heightened physiological arousal in the body can result in an increased resting heart rate, elevated blood pressure, heightened cortisol levels, and an increased risk of heart disease, diabetes, and asthma (Lee, 2012; Buckworth et al., 2013; Schacter et al., 2016; Chiu et al., 2016).

Prolonged stress also has profound negative effects on mental health, most notably contributing to heightened trait anxiety and depression (Buckworth et al., 2013; Schacter et al., 2016; Chiu et al., 2016; Lin et al., 2022). It can lead to eating and sleeping disorders, increased social anxiety, a decreased ability to cope with life's challenges, and a reduced tolerance for frustration. Additionally, long-term stress can result in antisocial behaviours, such as aggression or social withdrawal (Seggar et al., 1997; Buckworth et al., 2013; Schacter et al., 2016; Chiu et al., 2016; Cruwys et al., 2020). Athletes experiencing prolonged stress may develop a persistent negative mindset towards performance, engage in chronic overthinking, and experience significant feelings of defeat and failure (Greenaway et al., 2020; Salvatore et al., 2020).

Managing Stress

Despite the negative consequences of stress, it can be managed and even mitigated. Since stress originates from the mind's cognitive perception and response to stressors, a significant part of stress management involves controlling the mind and altering perceptions (Seggar et al., 1997; Schacter et al., 2016). There are three primary strategies for controlling cognitive perception regarding stressors:

1. Repressive coping - Actively avoiding thoughts or situations that serve as reminders of the stressor while maintaining an artificially positive outlook. Although this may provide short-term relief, prolonged use can be harmful, as stressors cannot be entirely eliminated from life (Buckworth et al., 2013; Schacter et al., 2016).
2. Rational coping - Facing the stressor directly and working to overcome it. This approach involves acknowledging the stressor, exposing oneself to it, and gaining an understanding of its causes and potential solutions. While rational coping can ultimately lessen the stressor's impact, the process itself can be stressful (Buckworth et al., 2013; Schacter et al., 2016; Salvatore et al., 2020).
3. Reframing coping - Finding a new or creative way to view the stressor, thereby reducing its perceived threat. This involves actively shifting one's mindset to perceive

the stressor in a more manageable or non-threatening way (Buckworth et al., 2013; Schacter et al., 2016; Salvatore et al., 2020).

The cognitive processes involved in evaluating stressors can significantly impact an athlete's mindset and performance (Seggar et al., 1997; Salvatore et al., 2020). Increased stress and anxiety can lead athletes to revert to their most dominant responses, which may not always be optimal for performance (Schacter et al., 2016; Salvatore et al., 2020; Greenaway et al., 2020). Additionally, stress can create feelings of defeat and helplessness, leading to decreased effort in overcoming challenges and reinforcing a cycle of learned helplessness (Cohen et al., 1983; Weinberg & Gould, 2019; Greenaway et al., 2020).

In spite of the challenges with athletes experiencing stress, however, it is important to note that a certain amount of stress is necessary for optimal health and performance (Woods, 2011; Buckworth et al., 2013; Salvatore et al., 2020). For example, an important competition may be perceived as a negative threat, but it can also be reframed as a positive challenge - an opportunity for the athlete to demonstrate their abilities and test their limits. In essence, stressors are neither inherently good nor bad; it is the perception of the stressor that determines its impact. Managing stress effectively is, therefore, critical for athletes. The ability to regulate cognitive processes and maintain a positive outlook can significantly enhance performance (Salvatore et al., 2020). Stress management techniques such as goal setting, performance visualisation, trigger words, anchor phrases, and positive self-talk have been shown to help athletes maintain focus and composure under pressure (Woods, 2011; Salvatore et al., 2020). Furthermore, accurately framing past successes - even those influenced by external factors - can create an illusion of control, which can empower athletes to overcome future challenges and mitigate learned helplessness (Greenaway et al., 2020).

Consequently, striking the right balance between arousal and anxiety, driven by positive perceptions and evaluations of stressors, is crucial for athletes. Both over-responding and under-responding to stress can be detrimental to health and performance (Woods, 2011; Buckworth et al., 2013; Salvatore et al., 2020). When athletes have the right mindset and approach to performance demands, their behaviours are more likely to be optimal, thus enhancing performance outcomes (Schacter et al., 2016; Salvatore et al., 2020). Conversely, if an athlete believes they lack the necessary control or resources, their performance will likely suffer (Seggar et al., 1997; Schacter et al., 2016; Salvatore et al., 2020; Lin et al., 2022).

Athlete Stress and Social Identity

Ultimately, an athlete's stress is determined by their perception and cognitions. Athletes perceive a stressor, appraise it, and then react and behave in a manner they have determined to be appropriate (Seggar et al., 1997; Woods, 2011; Buckworth et al., 2013; Schacter et al., 2016; Salvatore et al., 2020). Stressors perceived as important, uncertain, uncontrollable, and overwhelming are considered threatening and lead to heightened arousal and state anxiety. This, in turn, impacts an athlete's cognitions, mindset, motivation, and ultimately, their performance and mental health (Cohen et al., 1983; Woods, 2011; Schacter et al., 2016; Weinberg & Gould, 2019; Greenaway et al., 2020; Salvatore et al., 2020). Consequently, an athlete's stress - its process and consequences - is significantly tied to and underpinned by their SI (Rees et al., 2015; Greenaway et al., 2020; Salvatore et al., 2020).

Through a SIA, it can be seen that within the four-stage stress process (Woods, 2011), both primary and secondary appraisals are structured by an athlete's SI. Cognitive processing is filtered through the athlete's GM, which shape their perception and response to stressors. Whether a stressor is perceived as threatening is partially determined by how an athlete defines themselves through their GM and SI (Rees et al., 2015; Salvatore et al., 2020; O'Halloran & Haslam, 2020). Furthermore, past experiences and prior encounters with stressful situations, which influence an athlete's appraisal and reaction to stress, are also underpinned by SI. The GM to which athletes belong serve as the arena in which these past experiences unfolded, continuing to influence their perception of similar stressors in the present (Haslam et al., 2020).

Moreover, SI groups shape the certainty and control that athletes feel towards any given situation; high identification with relevant groups promotes feelings of certainty and control (Haslam et al., 2020; Greenaway et al., 2020; Cruwys et al., 2020; O'Halloran & Haslam, 2020). Additionally, the support and resources athletes feel they can draw upon are dependent on their SI. The groups they identify with, the extent to which they have internalised these groups, and the relevance of the support and resources provided by these groups all heavily influence how athletes evaluate a stressor's threat and their ability to cope with it (Rees et al., 2015; Haslam et al., 2020; Cruwys et al., 2020; O'Halloran & Haslam, 2020).

As well as influencing how athletes determine stress, SI also affects the extent to which stress impacts their cognitions, motivation, and performance, as well as their ability to manage stress (Greenaway et al., 2020; Salvatore et al., 2020; Stephen et al., 2023). The way athletes interpret and behave in the world is largely determined by their most dominant GM,

which are contextually driven by the surrounding social environment (Haslam et al., 2020; Salvatore et al., 2020). Athletes may experience choking when they strongly identify with a source of threat - such as a sporting competition - and consequently overthink potential failures, focusing on the wrong aspects of performance, which impairs execution (Salvatore et al., 2020). Continued instances of choking and performance failures can negatively shape an athlete's identity, reinforcing a self-perception of being prone to failure, which in turn undermines motivation and future performances (Greenaway et al., 2020; Salvatore et al., 2020).

To combat these challenges, stress management techniques are commonly employed (Woods, 2011; Weinberg & Gould, 2019; Salvatore et al., 2020). However, these techniques are most effective when they align with, and become integrated into, an athlete's sense of self. A well-defined SI with clear, dominant GM enhances the effectiveness of stress management techniques when used in alignment with the behaviours expected of those groups. Furthermore, these techniques can become more effective when they are ingrained within the athlete's GM and SI, becoming a natural part of their routine and behaviour (Rees et al., 2015; Salvatore et al., 2020). A strong SI can also foster greater motivation, commitment, work ethic, self-control, self-confidence, and social support - all of which are beneficial for stress management (Haslam et al., 2020; Greenaway et al., 2020; Salvatore et al., 2020; Stephen et al., 2023).

However, an athlete's SI can itself be a source of internal stress. As already mentioned, this occurs when strong identities to multiple groups are incompatible with each other, such as the conflict between an AI and an academic identity. Athletes facing such conflicts may be forced to balance these identities by adjusting their group salience, manipulating their social context to accommodate both identities, or ultimately abandoning one identity entirely - each of which can be a stressful and identity-threatening process (Burns et al., 2012; Cruwys et al., 2016; Cruwys et al., 2020).

In summary, when an athlete's SI is stable and harmonious, it shapes what situations are perceived as stressful, to what extent, and how they can be managed. An athlete's SI significantly influences what they consider important, uncertain, uncontrollable, and overwhelming, as well as their strategies for coping with stress. Conversely, when an athlete's SI is incompatible or unstable, it can induce significant internal stress and distress. Consequently, SI emerges as a critical factor in both underachievement and overachievement, as well as optimal and threatened mental health. Ultimately, the influence of SI on stress plays a crucial role in shaping an athlete's sporting career.

2.7 Mental Health

As mentioned in the introduction, an athlete's psychological state and mental health are of vital importance not only for their wellbeing but also for their performance (Woods, 2011; Haslam et al., 2020; Greenaway et al., 2020; Cruwys et al., 2020; Salvatore et al., 2020). However, athletes are exposed to numerous risks to their mental health and wellbeing due to their lifestyle (Baker et al., 2009; Woods, 2011; Scanlan et al., 2016; Schacter et al., 2016; Weinberg & Gould, 2019; Haslam et al., 2020; Greenaway et al., 2020; Cruwys et al., 2020).

A SIA, through the SIMIC, provides valuable insights into an athlete's likely mental health state, as well as the factors that promote and protect it (Haslam et al., 2020; Cruwys et al., 2020). An athlete's SI plays a crucial role in determining their mental state and their ability to cope or thrive in their environment, regardless of the circumstances (Rees et al., 2015; Boen et al., 2020). Several factors significantly influence an athlete's mental wellbeing, including the number of GM within their SI, the compatibility of these groups, the significance of each group, the extent to which they are internalised, the quality of group membership, and the overall positivity of these groups in the athlete's life. In addition, GM serve as mental resources that protect against hardship and mental health issues, aid stress reduction, improve resilience, and enhance the ability to navigate life transitions (Cruwys et al., 2016; Haslam et al., 2019; Haslam et al., 2020; Cruwys et al., 2020; O'Halloran & Haslam, 2020; Stephen et al., 2023).

It is unsurprising that the significance and quality of GM within an athlete's SI profoundly impact their mental wellbeing. The more significant a group is to an athlete's identity and life, the more it becomes internalised into their sense of self. This, in turn, enhances its psychological impact by transforming perceptions, cognitions, and behaviour, while also increasing the joy, self-worth, control, competence, and confidence derived from group membership (Brewer et al., 1993; Burns et al., 2012; Boen et al., 2020; Haslam et al., 2020; Salvatore et al., 2020; Greenaway et al., 2020; Cruwys et al., 2020; O'Halloran & Haslam, 2020). Consequently, the more positive and supportive these groups are, the greater the benefit to the athlete's mental health (Cruwys et al., 2020).

Furthermore, different group identities play a key role in both improving and protecting an athlete's mental health and resilience. SI GM act as resources that athletes can draw upon whenever needed. They alleviate mental hardships, such as those caused by significant and persistent stressors, and protect against threats to mental health. In this way,

GM act as a buffer to mental health threats and burdens (Rees et al., 2015; Cruwys et al., 2020; Stephen et al., 2023). This is achieved through several mechanisms:

1. Social support and connectedness: Groups provide psychological support and help athletes combat challenges and threats by breaking psychological isolation.
2. Resource diversification: Multiple identities increase not only the stockpile of resources available but also their range and nature, addressing different aspects of an athlete's life and various situations.
3. Cognitive disengagement and refreshment: Different identities can help athletes shift focus from their current stressors, providing a sense of control and renewal. This is especially useful when AI and sport-related GM become sources of stress during specific periods of the sporting season. Without other identities to draw upon, athletes may struggle with feelings of helplessness and a loss of control (Rees et al., 2015; Cruwys et al., 2016; Haslam et al., 2020; Cruwys et al., 2020; O'Halloran & Haslam, 2020; Stephen et al., 2023).

Several mental health benefits have been linked with possessing and maintaining multiple GM, including greater life satisfaction, improved quality of life, reduced negative emotions and depression, and enhanced sports performance (Cruwys et al., 2016; Cruwys et al., 2020; Stephen et al., 2023). A broad and positive SI enhances resilience and recovery by providing a wide variety of coping resources, enabling athletes to bounce back from career setbacks more effectively (Cruwys et al., 2016; Haslam et al., 2020; Cruwys et al., 2020; Stephen et al., 2023). However, the multiple GM within an athlete's SI must be compatible. Incompatible identities can create significant stress, as athletes struggle to balance competing demands and commitments. Living two seemingly incompatible lives can drain psychological resources and compromise wellbeing. In such cases, rather than acting as a protective factor, these identities may contribute to psychological distress and strain (Cruwys et al., 2016; Cruwys et al., 2020; O'Halloran & Haslam, 2020).

In conclusion, an athlete's SI underpins their mental health outcomes and their ability to cope with hardships, transitions, and challenges. To achieve optimal mental health and wellbeing, an athlete's SI should include multiple, broad, and positive identities that are deeply internalised and compatible with one another. When these criteria are met, athletes are better equipped to maintain their mental health, safeguard against adversity, and enhance their overall performance. However, if any of these elements are compromised, the athlete's mental health and coping ability are likely to suffer (Haslam et al., 2020; Cruwys et al., 2020; O'Halloran & Haslam, 2020; Stephen et al., 2023). This highlights the inherent dilemma

faced by athletes. For optimal motivation, SC, and performance success, they must maintain extremely dominant and salient sporting GM, such as AI, which must be continually reinforced. However, for optimal mental health, stress management, and resilience, they must also cultivate a variety of other positive and compatible GM. While athletes have demonstrated the ability to adjust the salience of certain GM, such as AI, based on situational demands, maintaining this balance remains a constant challenge. The dominant nature of AI often seeks to overshadow other identities, while maintaining multiple broad GM may diminish its dominance, creating a tension that athletes must navigate throughout their careers.

2.8 Cross-Training

With the athlete's dilemma illustrated, it is clear that potential solutions for its successful navigation would be of vital usefulness to athletes. Such solutions could enhance their motivation, SC, stress management, ability to handle hardships and transitions, mental health protection, and ultimately, improve sports performance. One potential solution could be CT. As will be discussed, CT, by its nature, may serve as a compatible additional activity that athletes can internalise into their SI and could be considered a unique enough activity to form an additional GM separate from their primary sporting GM.

CT has an extensive and well-documented history of investigation. Over time, the definition of CT has evolved, but for the purposes of this study, CT is defined as an athlete combining training in other sport(s) and/or training additional components of their fitness simultaneously (such as endurance, strength, and flexibility) alongside their regular primary sports training (Stamford, 1991; Tanaka, 1994; Loy et al., 1995; Tanaka & Swensen, 1998; Godfrey, 1998; Millet et al., 2002; White, Dressendorfer, Muller & Ferguson, 2003; Grier, Canham-Chervak, Anderson, Bushman, & Jones, 2015; Yuvaraj & Vishnuvardhan, 2015). In principle, CT seeks to leverage the particular effectiveness of each alternative sport's training on the body and, due to the cross-transfer of training effects from one sport to another, enhance an athlete's overall training effectiveness. This enables them to achieve their main sport's specific goals while providing variety to their training regimen and physical conditioning (Stamford, 1991; Tanaka, 1994; Foster, Hector, Welsh, Schrager, Green, & Snyder, 1995; Millet et al., 2002; Yuvaraj & Vishnuvardhan, 2015).

CT is already widely adopted by elite athletes in two key areas: resistance training and aquatic training. Strength and conditioning (S&C) programmes are extensively utilised across nearly all elite sports (Godfrey, 1998). Although not typically regarded as CT, S&C aligns

perfectly with CT's definition, as it involves simultaneously training additional fitness components - such as strength, endurance, and power - alongside sport-specific training to enhance overall performance (Tanaka & Swensen, 1998). Due to its ability to simulate movement patterns used in many sports while reducing joint impact, aquatic training is another example of CT being effectively integrated into elite sports (Haff, 2008; Becker et al., 2008).

Cross-Training Physiology

There is a broad consensus regarding the physiological effects of CT on the body. Specifically, research has shown cross-transfer effects in the following areas across different sports and training modalities:

- Overall VO₂ max and its components (Pierce, Weltman, Seip & Snead, 1990; Loy, Holland, Mutton, Snow, Vincent, Hoffmann & Shaw, 1993; Tanaka, 1994; Foster et al., 1995; Millet et al., 2002; Yuvaraj & Vishnuvardhan, 2015).
- Lactate threshold improvement (Pierce et al., 1990; Loy et al., 1995; Tanaka, 1994; Millet et al., 2002).
- Performance skill and time improvements (Loy et al., 1993; Tanaka, 1994; Godfrey, 1998; Millet et al., 2002; Stangier, Abel, Mierau, Hollmann & Strüder, 2016).
- Carbohydrate oxidation and respiratory exchange ratio (Ruby et al., 1996).
- Hormonal and endocrine responses to training (Flynn, Carroll, Hall, Bushman, Brolinson & Weideman, 1998; Tanaka & Swensen, 1998).
- Ratings of perceived exertion (RPE; Foster et al., 1995; Flynn et al., 1998).
- Muscle fibre type, size, strength, and force production (Baker, 2003; Haff, 2008; Aspenes, Kjendlie, Hoff & Helgerud, 2009).
- Cognitive, perceptual, and movement skills (Baker et al., 2009; Moesch et al., 2011).
- Metabolic recovery times (Stangier et al., 2016).

These aspects of physiology were measured in alternative sports training and subsequently transferred to the athlete's primary sport (Pierce et al., 1990; Tanaka, 1994; Millet et al., 2002).

Furthermore, CT has been shown to significantly improve these physiological features, provided that the training sessions induce substantial physiological stress and muscle fibre recruitment. CT must be of similar intensity, frequency, and duration - if not greater - compared to an athlete's regular primary sport training sessions (Pierce et al., 1990;

Loy et al., 1993; Tanaka, 1994; Millet et al., 2002; Stangier et al., 2016). Additionally, the more similar the CT activity is to the athlete's primary sport, the better the transferability of the effects (Mutton et al., 1993; Tanaka, 1994; Godfrey, 1998; Millet et al., 2002; Baker, 2003; Becker et al., 2008).

Benefits of Cross-Training

CT does offer several benefits and applications. CT ensures that the entire body - not just select muscle groups - receives a workout, which, while not optimal for performance gains, contributes to overall physiological health (Stamford, 1991; Tanaka, 1994; Foster et al., 1995). Additionally, CT allows athletes to increase their training volumes to higher levels with a greatly reduced risk of overtraining and injury, as the training stress is distributed across various muscle groups while general CV improvement can still occur (Stamford, 1991; Loy et al., 1993; Mutton et al., 1993; Tanaka, 1994; Loy et al., 1995; Pizza et al., 1995; Flynn, Pizza & Brolinson, 1997; Flynn et al., 1998; Godfrey, 1998; Millet et al., 2002; White et al., 2003; Becker et al., 2008; Grier et al., 2015; Yuvaraj & Vishnuvardhan, 2015).

Furthermore, CT regimes have proven effective in maintaining an athlete's physiology and performance over 6–18-week periods, although they do not improve it (Loy et al., 1993; Tanaka, 1994; Foster et al., 1995; Flynn et al., 1997; Godfrey, 1998; Millet et al., 2002; White et al., 2003; Haff, 2008; Grier et al., 2015; Stangier et al., 2016). This is particularly useful during the off-season or recuperation phases of lower training volume, and most commonly during injury rehabilitation, when an athlete can still train without overloading the injured muscles primarily used in their sport (Tanaka, 1994; Foster et al., 1995; Loy et al., 1995; Pizza et al., 1995; Tanaka & Swensen, 1998; Godfrey, 1998; Millet et al., 2002; White et al., 2003; Haff, 2008; Becker et al., 2008).

It is important to note that CT should never be considered a replacement for an athlete's primary sport-specific training, but rather an additional supplement, incorporated 1-3 times a week unless the athlete is in rehabilitation (Godfrey et al., 1998; Becker et al., 2008; Stangier et al., 2016). Sport-specific training remains the cornerstone of elite athletic performance and is the only reliable method for improving or adequately maintaining sport-specific performance (Stamford, 1991; Tanaka, 1994; Loy et al., 1995; Godfrey, 1998; Millet et al., 2002; Stangier et al., 2016). However, CT serves as a valuable addition, allowing athletes to maintain and improve physiological attributes without the same risk of overtraining and injury. In this sense, CT acts as an additional building block towards eventual performance gains (Tanaka, 1994; Foster et al., 1995; Loy et al., 1995; Pizza et al.,

1995; Tanaka & Swensen, 1998; Godfrey, 1998; Millet et al., 2002; White et al., 2003; Haff, 2008; Becker et al., 2008; Stangier et al., 2016).

CT is also beneficial in enabling athletes to maintain training levels year-round, particularly in situations where their primary sport may not be feasible - such as winter sports athletes needing to train during summer months in temperate climates. This explains why CT is already widely used in elite sports (Stangier et al., 2016).

S&C is considered the most successful and widely used form of CT due to its ability to closely mimic sport-specific movements and improve key performance components such as work economy, ratings of perceived exertion, aerobic and anaerobic power, muscle fibre characteristics, endurance capacities, lactate threshold, performance speeds, and force production (Flynn et al., 1998; Tanaka & Swensen, 1998; Aspenes et al., 2009).

Limitations of Cross-Training

The primary physiological limitation of CT lies in the specificity principle of training, particularly at elite levels. Despite the well-documented cross-transfer effects of CT, overall performance enhancement is fundamentally dependent on both general and local cardiovascular (CV) systems. The general CV system improvements may enhance endurance and work economy, but the local muscular adaptations necessary for specific sports performance cannot be achieved through CT alone. This is because key performance adaptations occur at the cellular level and are specific to the muscles involved in the primary sport (Stamford, 1991; Loy et al., 1995; Ruby et al., 1996; Millet et al., 2002; Haff, 2008; Stangier et al., 2016). Muscle fibre type, number, and size; capillary density; mitochondrial function; local energy stores; and oxygen utilisation are all dependent on sport-specific training stimuli. As such, CT has limitations in its ability to fully replace or improve sport-specific performance due to the inability to replicate precise neuromuscular demands (Pierce et al., 1990; Stamford, 1991; Tanaka, 1994; Loy et al., 1995; Millet et al., 2002; Stangier et al., 2016).

Another key limitation is that CT can contradict the fundamental principle of training specificity and overload. Athletes require training that is sufficiently, adequately, and appropriately overloaded to stimulate adaptation. For performance improvements to occur, training must be as specific and closely tailored to the demands of the athlete's sport as possible. The adaptive process does not extend beyond the specific training stress it receives (Pierce et al., 1990; Stamford, 1991; Tanaka, 1994; Foster et al., 1995; Ruby et al., 1996; Tanaka & Swensen, 1998; Millet et al., 2002; Stangier et al., 2016).

In addition to CT being an inadequate training programme for actual performance gains, the physiological improvements that CT can facilitate never exceed those achieved through specific training over the same timeframes. In fact, CT improvements are often slightly less than those achieved by continuing specific training, meaning that sport-specific training will always be superior to CT for athletes aiming purely for physiological and/or performance improvement goals (Pierce et al., 1990; Stamford, 1991; Loy et al., 1993; Tanaka, 1994; Loy et al., 1995; Pizza et al., 1995; Godfrey, 1998; Millet et al., 2002; White et al., 2003; Stangier et al., 2016). Furthermore, several key physiological factors and performance determinants - such as the precise point of lactate accumulation - are only improved through sport-specific training. This is because sports are inherently different in many ways, and a training stimulus in one sport can never completely replace another (Tanaka, 1994; Godfrey, 1998).

In conclusion, in terms of physiology, the usefulness of CT for athletes is evident; however, specificity training remains of far greater importance and should constitute the backbone of an athlete's training regime. CT should be viewed as a supplementary strategy that complements primary training by reducing injury risk, maintaining fitness levels during recovery periods, and offering physiological variety to prevent burnout. When appropriately incorporated, CT serves as an effective tool in an athlete's holistic development.

Cross-Training Psychology

Despite the extensive body of literature on the physiological benefits of CT, the psychological aspects of CT in elite sports remain largely underexplored. Existing literature acknowledges the variety CT adds to an athlete's training programme, which is suggested to help 'break up' and prevent boredom, psychological training fatigue, and even staleness (Stamford, 1991; Tanaka, 1994; Loy et al., 1995; Pizza et al., 1995; Godfrey, 1998; Millet et al., 2002; Becker et al., 2008; Yuvaraj & Vishnuvardhan, 2015). It is further suggested that the variety introduced through CT enhances athletes' enjoyment of their training, sustains their motivation, and maintains their interest in training at a higher level. These factors are thought to contribute to greater adherence and increased effort within training programmes, indirectly improving performance outcomes (Stamford, 1991; Loy et al., 1993; Mutton et al., 1993; Tanaka, 1994; Godfrey, 1998; Becker et al., 2008).

Additionally, some studies propose that CT can effectively manage and reduce stress more efficiently than a main sports programme alone. CT is suggested to alleviate training-related stress that may arise from an athlete's primary sport (Stamford, 1991; Tanaka, 1994).

Furthermore, due to its capacity to introduce variety, alleviate boredom and staleness, and enhance enjoyment and motivation, CT has been speculated to reduce the likelihood of sport dropout and burnout (Godfrey, 1998; White et al., 2003). This hypothesis aligns with the SCM, which suggests that increased sport enjoyment leads to higher and more stable SC, reducing stress and the risk of dropout and burnout (Scanlan et al., 2016).

From a SIA and SIMIC perspective, the psychological benefits of CT become even more compelling. Engaging in additional sporting activities, potentially with different clubs and social groups, offers athletes opportunities to explore and incorporate new GM into their SI. These additional GM are likely to be valued, enjoyable, and compatible with the athlete's primary sport, making them feasible for integration into their existing AI (Haslam et al., 2019; Haslam et al., 2020; Cruwys et al., 2020; O'Halloran & Haslam, 2020). Therefore, the psychological benefits derived from having an additional GM through CT could serve as a mechanism for reducing stress, increasing motivation and enjoyment, and enhancing SC. Moreover, CT can provide athletes with a sense of renewal and help alleviate boredom or staleness. As previously discussed, additional GM offer athletes greater perceived control and resources, contributing positively to their mental health and motivation.

Despite suggestions as to the positive benefits of CT, limited evidence supporting these suggestions exists. One study, White (2003) indicated that athletes who engaged in CT enjoyed their training programmes more than those who did not. CT athletes described feeling 'refreshed' and 'eager to continue training for the season,' whereas athletes who did not participate in CT reported feeling 'leg-weary' and 'lacking enthusiasm' to commence more intensive training (White, 2003, p. 323). While this study lends some credence to the psychological benefits of CT, further empirical research is needed to substantiate these claims.

2.9 Research Rationale

In summary, at present, the psychological benefits of CT remain speculative and are largely inferred from general sport psychology literature and anecdotal evidence. No dedicated investigations have been conducted to assess these claims systematically. When viewed through a SIA and SIMIC lens, the potential psychological benefits of CT become evident. While the physiological benefits of CT are well-documented and firmly established within elite training programmes, the psychological effects remain uncertain due to the lack of a robust evidence base. Consequently, the true value and effectiveness of CT in elite sports programmes, particularly regarding its psychological impact, remain largely unknown.

However, the combination of CT's variety and its suggested psychological benefits hints at its potential utility in helping athletes navigate the athlete dilemma.

Further, introducing a CT GM into an athlete's SI offers distinct advantages over introducing entirely non-sporting groups such as hobbies, clubs, or lifestyle pursuits.

Athletes with a narrow SI and exclusive AI are especially vulnerable to identity foreclosure (Brewer et al., 1993; O'Halloran & Haslam, 2020). These individuals often struggle to adopt non-sporting GMs, even when such groups may be objectively compatible, as they perceive them to fall outside the boundaries of their self-concept (Haslam et al., 2019; Cruwys et al., 2020; O'Halloran & Haslam, 2020). CT offers a valuable middle ground. Although CT may not be part of an athlete's main sport, it remains rooted in the athletic role with physical training, discipline, and goal-oriented activity, as well as working towards main sport performance success (Stamford 1991; Tanaka, 1994; Godfrey, 1998). These familiar elements increase the likelihood of athletes engaging with CT and eventually integrating it into their SI as a psychologically meaningful group.

Moreover, for an additional GM to be beneficial to an athlete's SI, well-being, and overall performance, it must be perceived as compatible with their dominant identity structures — especially their AI and primary sport (Burns et al., 2012; Haslam et al., 2019; O'Halloran & Haslam, 2020). CT, by design, is complementary to primary sport training. It aligns with physical preparation, scheduling, and performance-related outcomes (Tanaka, 1994; Godfrey, 1998; Becker et al., 2008; Yuvaraj & Vishnuvardhan, 2015). Therefore, CT is uniquely positioned to offer athletes an additional GM that is both psychologically and practically compatible with their elite sport lifestyle. In contrast, other GM — such as purely social clubs or non-physical hobbies — are typically less likely to be as compatible and may also be seen as irrelevant, distracting, or even counterproductive, making them less likely to be adopted and internalised.

While other interventions to help solve the athlete dilemma such as psychological skills training, stress management workshops, or academic support groups are valuable (Weinberg & Gould, 2019), they often lack the embodied, social, and performance-related elements that resonate with elite athletes (Weinberg & Gould, 2019; Haslam et al., 2019). These approaches may be perceived as abstract, clinical, or disconnected from an athlete's day-to-day training. CT, on the other hand, retains the core values of discipline, performance progression, and physical exertion, while introducing variety and enjoyment in a less pressured environment. As such, CT offers a culturally familiar and identity-compatible route for enhancing athlete well-being and supporting SI development.

Therefore, this study aims to investigate the viability of CT as a potential solution to the described athlete dilemma, while also establishing some of the as-yet unexamined psychological effects of CT on elite athletes through an SIA and SIMIC framework. Specifically, the study will address the question: “What effects does cross-training have on elite athletes’ Social Identity (SI), Athletic Identity (AI), Sport Commitment (SC), and Stress?”. Particularly, this intervention-based study aimed to explore the psychological effects of a six-week CT programme on elite athletes’ SI, AI, SC, and stress. The study also sought to determine whether CT could facilitate positive mental health outcomes for elite-athletes. By addressing a gap in the literature, this research contributes to the growing field of SI in sport and investigates CT as a potential tool for mental health and performance enhancement.

3. Methodology

3.1 Methodology Overview and Underpinning Principles

This longitudinal study employed a mixed-methods, qualitative-quantitative approach, incorporating social identity mapping, semi-structured focus groups and interviews, and questionnaires to obtain a robust, reliable, and valid exploration of elite athletes' psychological experiences during a six-week cross-training (CT) block.

The primary justification for adopting a mixed-methods approach was its intuitive and practical response to the complex and multifaceted nature of the social world (Gibson, 2016). The use of both qualitative and quantitative methods enabled triangulation of the data, therefore providing a more comprehensive answer to the research aims and questions. By combining complementary qualitative and quantitative approaches, the study was able to cross-check and compare different data sources representing the same phenomena (Bryman, 2008; Jones, 2015; Gibson, 2016). This approach enhanced the likelihood of capturing rich, high-quality data on a larger scale, offering deeper insights and greater clarity into the investigated topic than either method could achieve independently (Bryman, 2008; Layder, 2013; Jones, 2015; Gibson, 2016).

Although mixed-methods research is not yet widely adopted within sports literature, there have been increasing calls for its use (Gibson, 2016). Researchers are encouraged to employ any and all approaches that can enhance insight into their investigations. However, challenges arise when different research frameworks, question-asking techniques, and evaluation methods are incompatible with the underlying assumptions regarding research aims, data quality assessment, and theoretical roles. Consequently, research methodologies and tools must be carefully selected, justified, and integrated in a thoughtful and respectful manner (Gibson, 2016).

To address these considerations, this study employed focus groups and questionnaires as research tools. The combination of qualitative focus groups and interviews with complementary quantitative questionnaires is the most common form of triangulation in mixed-methods research (Bryman, 2008; Jones, 2015). Their combined use enhances data confidence and robustness, improving the study's reliability, validity, and accuracy by examining the same phenomena through distinct methods that help mitigate each other's shortcomings (Scanlan et al., 2003b; Layder, 2013; Jones, 2015; Gibson, 2016). Furthermore, given the dynamic and complex nature of the concepts under investigation, such as identity and SC, existing literature recommends a mixed-methods and longitudinal approach to ensure

data accuracy and comprehensive understanding (Scanlan et al., 2003a; Scanlan et al., 2003b; Scanlan et al., 2013; Mirhosseini et al., 2013; Cruwys et al., 2016; Lochbaum et al., 2022).

Following recommendations from the literature, the study prioritised qualitative data as its primary and definitive source, with quantitative data serving to enhance analysis, results, and discussion (Bryman, 2008; Layder, 2013). The richness and complexity of detail, insight, and personal meaning obtained through qualitative methods were deemed particularly suitable for an SI and sport psychology-based study of this nature (Bryman, 2008; Layder, 2013; Boen et al., 2020). Quantitative questionnaire data contributed to a broader and more generalisable dataset, increasing the study's rigour and applicability to elite athlete populations. The integration of qualitative insights with quantitative findings strengthened the study's validity and provided a comprehensive understanding of the research topic (Bryman, 2008; Layder, 2013).

Additionally, this study adopted an interventionist approach through an SIA using the SIMIC framework. This framework allowed the study to take a group-centred perspective rather than an individualistic one. Data was analysed from the viewpoint of a group of athletes undergoing CT, which introduced additional group memberships into their lifestyles. As a result, athletes were no longer solely engaged in their main sport but were also participating in a secondary sport for social and recreational purposes. The SIA and SIMIC frameworks provided a clear direction and deeper insight into how the intervention affected the athletes' social memberships, values, SI, and broader psychological outcomes. This perspective offered a unique understanding that no other approach could provide (Boen et al., 2020; Haslam et al., 2019; Haslam et al., 2020).

3.2 Participants

Participants were selected using purposive sampling. The researcher purposively selected participants before approaching them to inquire whether they would be willing to volunteer for the study. Purposive sampling was employed to ensure that the athletes could provide rich, informative insights based on their experience and lifestyle as elite athletes. This approach facilitated better generalisation of the results to the broader 'elite athlete' population. The inclusion criteria, which participants were purposefully sampled based upon required participants to be:

- Aged 18 years or older
- A University of Stirling student

- Competing regularly at the national or international level
- Currently enrolled in the university's *International Sport Scholarship Program* (ISSP)
- Holders of a valid sports union and sports centre membership

The inclusion criteria were created in order to acquire the desired participants for the study, these being elite athletes that are training regularly and competing at a high truly elite level. The criteria was approved by the University's ethics board.

With the definition of what makes university athletes meet the standard of 'elite athlete' often vague, a clear standard was needed. The standard this study used was defined to be consistent with the literature. Specifically, Swann et al.'s (2015) model and the definitions utilised by Rees et al.'s (2016). Swann's et al (2015) categorisation model is a continuum of 'eliteness' that encompasses five different variables that measure both within-sport and out of sport comparisons (A. Highest standard of performance. B. Success at the highest level. C. Experience in years at highest level. D. Competitiveness of sport in the respected country. E. Global competitiveness of sport.) Athletes are considered along each variable and scored between 1 – 4, with scores of 1 being lower levels of eliteness and 4 being the highest levels. These five variable scores are then put through an equation – $[(A + B + C / 2) / 3] \times [(D + E/2)]$ – and the final score defines what level of 'elite athlete' the athlete is, from 'semi-elite' to 'world-class elite' (Swann et al, 2015, pg.10-11). Similarly, the definitions used by Rees (2016) are "elite (senior international level) or super-elite (Gold medallists at Olympics or World Championships)" (pg.1042). Together these standards for 'elite athletes' were utilised by the study in the creation of the inclusion criteria.

All athletes met Rees et al.'s (2016) standards for 'elite' and 'super-elite' (p. 1042). According to Swann et al.'s (2015) categorisation model, participants fell into the 'competitive elite,' 'successful elite,' or 'world-class elite' categories, with athlete scores ranging from 7 to 16 (pp. 10–11).

The University of Stirling's International Sport Scholarship Programme (ISSP) supports a small selection of athletes annually, representing a range of Olympic/Paralympic and wider sports. The programme offers tailored academic flexibility, strength and conditioning support, coaching, financial aid, and performance services. ISSP athletes have won major sporting medals and events ranging from Olympic and Commonwealth games to Wimbledon and the Open. (University of Stirling, 2024). All participants in this study were current ISSP athletes, selected based on national or international competition standards. This provided a well-defined, high-performance context for the research.

A total of 47 athletes initially volunteered for the study, comprising 32 males and 15 females, aged between 18 and 26 years. The participants represented a diverse range of sports, including swimming (39), karate (1), tennis (1), football (2), golf (1), para-skiing (1), fencing (1), and triathlon (1).

During the course of the study, seven participants - all of whom were swimmers - dropped out due to various reasons: unexpected injury (2), stepping back from elite sport (2), and a loss of interest in completing the study (3). Ultimately, therefore, 40 participants (26 males, 14 females) fully completed the study. This final sample size met the expected number of 25 participants and adhered to the suggested range of 30 - 50 participants for a study of this nature (Mason, 2010). These numbers also ensured compliance with the recommended number of focus groups (6 - 14), with the appropriate participant range within each group (3 - 12), as suggested in the literature (Guest, Namey & McKenna, 2017a; Bryman, 2008; Atkinson, 2012; Jones, 2015).

3.3 Data Collection Tools

The social world is complex and multifaceted, and capturing this complexity thoroughly and accurately presents a significant challenge for researchers. However, methods do exist to address this challenge. This study utilises three widely used tools from the current social research literature: *Social Identity Mapping* (SIM; Cruwys et al., 2016), the *Social Identity Questionnaire for Sport* (SIQS; Bruner & Benson, 2018a, 2018b), and the *Athletic Identity Measurement Scale* (AIMS; Brewer et al., 1993; Brewer & Cornelius, 2001). These measures were supplemented with semi structured focus groups with participants.

Social Identity Mapping (SIM)

SIM is a qualitative visual method used to represent and assess a person's subjective network of GM, providing insight into their social identity (Cruwys et al., 2016). SIM sessions required participants to construct a visual map that:

1. Identifies the groups to which they subjectively belong, as well as the psychological significance and dominance of these groups.
2. Highlights key aspects of these group memberships, including:
 - a. The degree to which a group membership was positive
 - b. How representative they felt of the group
 - c. The frequency of their involvement with the group
 - d. The duration of their membership

3. Illustrates the similarity and compatibility of these groups with each other (Cruwys et al., 2016).

SIM has been proven to have strong internal consistency, reliability, validity, and accuracy in investigating participants' social identities while being free from social desirability biases and simple to implement and analyse (Cruwys et al., 2016; Cruwys et al., 2020). The SIM session guide used in this study is provided in Appendix 1.

SIM was selected over alternative visual qualitative SI data collection tools, such as positionality mapping (Jacobson & Mustafa, 2019), due to the relevance of the data SIM provides in relation to the study's research aims. While positionality mapping collects data on factors such as class, age, and nationality (Jacobson & Mustafa, 2019), these aspects were deemed less relevant for this study. Although SIM may capture some irrelevant GM data, it provides a clear and concise visual representation of notable effects on sporting GM through CT, such as the addition of CT-related elements or changes in the athletes' primary sporting identities. Moreover, SIM effectively illustrates the salience of athletes' AI and other sporting identities, which positionality mapping may overlook or underemphasise.

Social Identity Questionnaire for Sport (SIQS)

The SIQS is a 9-item self-reported questionnaire rated on a 7-point Likert scale (1 = *strongly disagree* to 7 = *strongly agree*), assessing athletes' perceptions of their sporting GM (Bruner & Benson, 2018a, 2018b). It evaluates three dimensions of participants' social identity:

- **Ingroup ties** – perceptions of similarity, bonding, and belongingness with other group members.
- **Cognitive centrality** – the importance of being a group member.
- **Ingroup affect** – positive feelings associated with group membership.

The SIQS has proven to be internally consistent, reliable, and valid in measuring global SI or any of the three dimensions (Bruner & Benson, 2018a, 2018b). Given its brevity, the SIQS minimises participant burden and allows for efficient use across multiple time points, making it ideal for this longitudinal intervention study. Equally, the SIQS provides a more in-depth exploration of athletes' identification with their sport compared to other available measures. While the *Team Identity Scale* (Heere & James, 2007) offers insights into athletes' connections to their teams, the SIQS goes beyond this by examining their broader

sporting identities (Bruner & Benson, 2018a, 2018b), making it an ideal measure for this study. The full SIQS is provided in Appendix 2.

Athletic Identity Measurement Scale (AIMS)

The **AIMS** is a 7-item self-reported questionnaire rated on a 7-point Likert scale (1 = *strongly disagree* to 7 = *strongly agree*), designed to assess three aspects of athletic identity:

- **Social identity** – the extent to which being an athlete is a key part of their self-concept.
- **Exclusivity** – the degree to which an individual defines themselves solely through their athletic role.
- **Negative affectivity** – the emotional impact of the inability to participate in sport.

Higher AIMS scores indicate a stronger and more exclusive athletic identity (Brewer et al., 1993; Brewer & Cornelius, 2001). AIMS is widely recognised as a consistent, reliable, valid, and accurate measure of AI, applicable across different levels of competition, ages, genders, and cultural backgrounds (Brewer et al., 1993; Brewer & Cornelius, 2001; Lamont-Mills & Christensen, 2006; Visek et al., 2008; Lochbaum et al., 2022). Similarly, AIMS has consistently demonstrated its effectiveness in capturing the exclusive and salient aspects of AI, which are central to this investigation (Lochbaum et al., 2022). Alternative tools, while useful for broader SI exploration, may collect extraneous data outside the study's focus (Heere & James, 2007; Cheek & Briggs, 2013; Demir & Tuzcuoğlu, 2023; Jovanović, Lazić, Gavrilov-Jerković, Obradović, Šakan, Tomašević & Zotović-Kostić, 2024). This makes AIMS ideal for the current study. The full AIMS is provided in Appendix 3.

Sport Commitment Questionnaire 2 (SCQ-2)

Sport Commitment (SC) can be measured through the Sport Commitment Questionnaire (SCQ), which was developed alongside the Sport Commitment Model (SCM) through both qualitative and quantitative means. The SCQ has been continually refined to best represent and measure an athlete's SC as the SCM itself evolved over time (Scanlan et al., 1993a; Scanlan et al., 2016). The SCQ-2, the most recent iteration, is a 58-item questionnaire with 13 subscales measuring both enthusiastic and constrained commitment. It was designed to be applicable to all athletes across various sports and can measure commitment to sports generally or to a specific sport, team, squad, or programme.

Responses are rated on a 5-point Likert scale ranging from *strongly disagree* to *strongly agree* (Scanlan & Simons, 1992; Scanlan et al., 2016).

Studies outside of Scanlan and colleagues' own work have shown that the SCQ is an internally consistent, reliable, and valid measure of SC (Weiss, Kimmel & Smith, 2001; Alexandris, Zahariadis, Tsorbatzoudis & Grouios, 2002; Wilson et al., 2004; Mirhosseini et al., 2013). This further validates Scanlan and colleagues' findings regarding the SCQ's reliability and accuracy. Moreover, the SCQ has demonstrated its applicability across diverse athlete populations, including American youth male and female baseball and swimming athletes of various ages and ethnicities; American male youth footballers; non-American youth male elite cricketers; youth male and female tennis athletes; recreational fitness populations across a range of ages and ethnicities; elite male New Zealand rugby players of varying ages; elite professional and amateur male and female netball and rugby players in New Zealand; male and female master swimmers; Iranian student athletes from diverse sports; and American male and female student athletes participating in a variety of sports such as gymnastics, softball, water polo, swimming, baseball, and soccer (Scanlan et al., 1993a; Scanlan et al., 1993b; Raedeke, 1997; Carpenter & Scanlan, 1998; Carpenter & Coleman, 1998; Weiss et al., 2001; Alexandris et al., 2002; Wilson et al., 2004; Scanlan et al., 2003b; Scanlan et al., 2009; Scanlan et al., 2013; Young & Medic, 2011; Mirhosseini et al., 2013; Scanlan et al., 2016). Given this extensive applicability, it is reasonable to infer that the SCQ-2 is a valid and reliable measure for athletes across all sports, irrespective of ethnicity, gender, age, or competitive level, making it highly suitable for the elite athletes in this study. The full SCQ-2 can be found in Appendix 4.

The SCQ was chosen over other such tools like the Achievement Motives Scale and Sport Motivation Scale as the study was primarily interested in investigating specifically an athletes SC and its components, not their wider achievement motivation in sport (Lang & Fries, 2006; Mallett, Kawabata, Newcombe, Otero-Forero & Jackson, 2007).

Perceived Stress Scale (PSS)

Stress is a critical issue in elite sport and has received substantial attention in the literature. Several tools have been developed to measure athlete stress, with the Athlete Stress Inventory (Seggar et al., 1997) and the College Student-Athlete Life Stress Scale (Lu et al., 2012) being among the most notable. Both have consistently demonstrated reliability, validity, and appropriateness for assessing athlete stress (Seggar et al., 1997; Lu et al., 2012; Chiu et al., 2016). However, while effective, these tools are largely focused on athlete-

specific and competition-related stressors, making them less suitable for assessing an athlete's overall perceived stress and stress-related wellbeing, which is the focus of this study (Seggar et al., 1997; Chiu et al., 2016).

The PSS, developed by Cohen and colleagues (1983; 1994), is a global measure of perceived stress and is one of the most widely used tools in stress research (Lee, 2012). Although originally developed as a general stress measure unrelated to sport, the PSS has been shown to be robust, reliable, and valid across various populations and settings, including athletes and sports contexts (Cohen et al., 1983; Cohen, Kamarck & Mermelstein, 1994; Lee, 2012; Chiu et al., 2016).

There are three versions of the PSS: a 14-item, a 10-item, and a 4-item version, all of which are self-reported and scored on a 5-point Likert scale ranging from *never* (0) to *very often* (4) (Cohen et al., 1983; Cohen et al., 1994; Lee, 2012). This study used the 10-item version, as it has demonstrated superior psychometric properties compared to the 14-item and 4-item versions (Lee, 2012).

The PSS measures the extent to which individuals perceive their lives as unpredictable, uncontrollable, and overloading. The questions are broad and do not focus on any particular event or situation, making the PSS a suitable measure for assessing athletes' overall stress levels (Cohen et al., 1983; Cohen et al., 1994; Lee, 2012). Furthermore, the PSS serves as an outcome measure of experienced stress and is effective in capturing stress levels from two days up to four weeks post-assessment. Beyond this period, test stability declines, necessitating reassessment (Cohen et al., 1983; Lee, 2012). This feature made the PSS particularly suitable for this 6-week intervention study, as it allowed for tracking changes in stress over time. The full 10-item PSS used in this study is available in Appendix 5.

Semi-Structured Focus Groups (SSFG) and Semi-Structured Interviews (SSI)

SSFG were employed in this study to best capture the complex, fluid, and multifaceted nature of SI data in a flexible and detailed manner - capabilities unique to this qualitative approach (Bryman, 2008; Layder, 2012; Jones, 2015). **SSI** were also conducted with individual athletes who were unable to attend SSFG sessions, following the same discussion guide. SSFG and SSI are considered the 'gold standard' and are among the most widely used tools in qualitative research. They primarily focus on capturing participant's subjective perspective and in-depth experience, providing genuine insight through raw, authentic data, and enabling the discovery of new and unexpected insights due to their flexibility and richness (Bryman, 2008; Atkinson, 2012; Jones, 2015).

Given the exploratory nature of this study, which is grounded in the SIA and the SIMIC, the research aimed to understand how athletes assigned meaning to their experiences and perspectives of the CT intervention within their wider social context. Such nuanced data could only be best obtained through SSFG and SSI (Atkinson, 2012; Jones, 2015).

SSFG were chosen as the primary data collection tool over SSI for several reasons. Firstly, SSFG are an effective and valid means of gathering detailed, high-quality qualitative data from a larger sample in a shorter time frame compared to conducting individual interviews (Atkinson, 2012; Jones, 2015). Given the significant number of study participants and the resource and time constraints faced by the researcher, SSFG were not only a practical choice but also necessary to ensure an appropriate level of effective data collection and analysis (Bryman, 2008).

Additionally, SSFG differ from SSI in the type of qualitative data they provide; they are not interchangeable substitutes (Kaplowitz & Hoehn, 2001; Guest, Namey & McKenna, 2017b). SSFG foster participant interaction, allowing for agreement, disagreement, and deeper discussion, which can lead to richer insights and greater depth of analysis. SSFG prioritise intragroup discussions and collective conclusions, providing unique data on how group experiences and opinions evolve - something that SSI or even group interviews do not emphasise to the same extent (Bryman, 2008; Jones, 2015). While SSFG data reveal the 'what' (i.e., the perceived effects of CT on athletes), they also shed light on the 'why' - how and why participants reached their conclusions. This depth of understanding aligns well with the exploratory nature of this SIMIC-based study, further reinforcing the choice of SSFG as a primary tool (Bryman, 2008; Atkinson, 2012; Jones, 2015). Furthermore, SSFG have been shown to elicit more candid and controversial responses from participants than SSI (Kaplowitz & Hoehn, 2001; Guest et al., 2017b). This was particularly relevant to the study, as it explored the somewhat contentious issue of elite athletes engaging in additional sports training - an issue that can be divisive within the elite sporting community. The interactive nature of SSFG provided an environment where participants could explore and challenge ideas freely, encouraging the emergence of richer and potentially controversial data.

Despite the primary focus on SSFG, SSI were included in the study to ensure that valuable qualitative data was collected from participants who could not attend focus groups. SSI provided an opportunity to capture in-depth, discussion-based insights about the CT experience, maintaining the richness and depth of data required (Bryman, 2008; Atkinson, 2012; Jones, 2015).

A total of six SSFG were conducted, which, while at the lower end of the recommended range (6 - 14), ensured sufficient data saturation. It is important to note that data saturation does not necessarily require a large number of groups; rather, it is the richness and repetition of themes that indicate when saturation has been reached (Bryman, 2008; Mason, 2010; Guest et al., 2017a). Studies suggest that 80% of themes emerge within three focus groups, with 90% of dominant themes found within six groups. Given the homogeneity of the study sample - University of Stirling elite student-athletes - the six SSFG were deemed sufficient to capture meaningful themes and interpretations (Mason, 2010; Guest et al., 2017a). Resource and time constraints also played a role in determining the number of focus groups, ensuring a balance between data richness and feasibility (Bryman, 2008).

The composition of the SSFG was as follows: Group 1: 5 participants; Group 2: 6 participants; Group 3: 7 participants; Group 4: 4 participants; Group 5: 4 participants; and Group 6: 4 participants. Additionally, 4 SSI were conducted with athletes unable to attend the focus groups.

Both SSFG and SSI followed a loose guide comprising 10 broad discussion points relevant to the study, designed to prompt standardised yet flexible discussion (see Appendix 6 for the SSFG/SSI Guide). Participants were also provided with their pre- and post-intervention SIM maps to reflect upon during the sessions. This approach encouraged meaningful dialogue while ensuring consistency across groups and interviews, thereby increasing the reliability and comparability of data (Bryman, 2008; Atkinson, 2012).

The duration of the SSFG and SSI sessions ranged from a minimum of 30 minutes to a maximum of 45 minutes. The average SSFG duration was 34 minutes, which meets the 30-minute minimum recommended in the literature for effective qualitative data collection (Dicicco-Bloom & Crabtree, 2006; Atkinson, 2012).

The SSFG and SSI were conducted in a relaxed, discussion-based format, allowing participants to share their perspectives and experiences on their own terms. The researcher's role was limited to probing discussions for clarification, elaboration on key points, and guiding the conversation back to relevant topics when necessary. Efforts were also made to ensure that all participants had an opportunity to contribute and that discussions were not dominated by a few individuals, as recommended in the literature (Bryman, 2008; Atkinson, 2012; Jones, 2015).

Consistency was maintained across all SSFG and SSI environments via the use of the focus group and interview schedule, and audio recordings were transcribed as soon as possible following each session to ensure accuracy and reduce recall bias. Confidentiality

measures were also emphasised at the beginning of each session to enhance participant comfort and encourage honest responses (Atkinson, 2012; Jones, 2015).

3.4 Data Collection Procedure

Following ethical approval, the participant recruitment process began with the researcher approaching the University of Stirling's ISSP scholar programme, sports union, and sports centre to seek permission for the study to take place with their athletes and within their facilities. Approval was obtained to approach athletes through their team coaches and coordinators, as well as to collect their contact details.

Efforts to inform athletes about the study were then made by the researcher with athletes given 4 weeks within which to volunteer. Awareness and recruitment were carried out via multiple channels, including text messages sent to their respective sports team WhatsApp groups by the researcher, an ISSP scholar mass email, and in-person meetings with athletes after their training sessions. Athletes were provided with the researcher's email address to express their interest and ask any questions. Additionally, an 'Online Surveys' link was shared via WhatsApp and email, allowing athletes to register their interest and specify their preferred CT sport. Athletes were informed that their participation in the study was entirely voluntary and that their involvement was not an obligation or requirement of their programme's training commitments. This was made explicitly clear when inviting them to participate.

Once participants expressed their interest and provided their email addresses, they received the participant information sheets, consent forms, and unique participant numbers via email. They were given a further 2 weeks to return their electronically signed consent forms under their unique participant number to confirm their participation. The participant information sheets detailed the purpose of the study, participation requirements, required permissions, participant rights (including the right to withdraw without justification or penalty), anonymity and confidentiality protocols, and the deadline for data withdrawal requests. At this stage, athletes were again also reminded that their participation in the study was entirely voluntary.

One week before the CT block commenced, participants created their first social identity maps with the researcher during SIM sessions held at various locations and times. During the same week, participants completed the SIQS, AIMS, SCQ-2, and PSS questionnaires online via links provided through WhatsApp and email.

After completion of all relevant permissions and the initial data collection, the CT block took place. The 6-week block involved participants continuing their regular elite sports training within their teams / squads while also engaging in an additional weekly sports activity in a different sport. Participants selected their additional sport in advance from a pre-prepared list, which was finalised during their SIM sessions. Their chosen sport remained the same throughout the entire CT block. The list of available sports activities was curated based on consultations with the athletes' coaching staff, the university sports union, and the sports centre, ensuring alignment with available resources and compatibility with the athletes' primary sports.

At the end of week 6, the CT block concluded. The following week, participants completed another SIM session with the researcher. They also took part in a recorded SSFG or SSI, held at various locations and times, which were transcribed promptly by the researcher. During the SSFG and SSI, participants were presented with their pre- and post-CT SI maps for reflection and discussion. Participants were also again asked to complete the SIQS, AIMS, SCQ-2, and PSS questionnaires online via Online Surveys links provided at the beginning of the CT block.

3.5 Data Analysis

The data analysis involved visually comparing participants' pre- and post-CT SI maps to identify any changes. Specific attention was paid to the participants' main sport post-CT and the presence of any cross-training-related GM post-CT. Notable changes in size and placement (indicating significance), as well as rating scores (reflecting positivity and representativeness), were analysed. Rating scores were categorised as follows: 8+ (very high), 6-7 (high), 5 (neutral), 3-4 (low), and below 2 (very low). The spacing between main sport and cross-training post-its, as well as the lines connecting them, were analysed to determine perceived similarity and coexistence. This analysis not only provided insight into changes in participants' SI over the 6-week period but also helped the researcher gain familiarity with participants, which aided in moderating the SSFG and SSI and interpreting their findings.

Questionnaire data were first screened for errors and duplicates, which were either corrected or removed with appropriate labels. Cleaned data were exported to Microsoft Excel for calculation of overall questionnaire and subscale scores for each participant. These scores were subsequently uploaded to SPSS software, where paired-sample t-tests were conducted to analyse score means, standard deviations (SD), p-values, and percentage changes.

The assumptions for parametric testing for each set of questionnaire samples were assessed using the Shapiro–Wilk test, Q–Q plots, and histograms. The majority of variables demonstrated no significant deviations from normality ($p > .05$). However, two samples — Post CT AIMS and Pre CT SIQS — showed significant departures from normality ($p < .05$). Visual inspection indicated that the deviations were modest. As only 2 out of 8 tests showed non-normality, and histograms/Q–Q plots did not look very skewed, data analysis went ahead. Given the sample size and the robustness of t-tests to minor violations of normality, parametric analyses were retained.

In terms of SSFG and SSIs, audio recordings from each SSFG and SSI were transcribed immediately after the sessions, with participants identified only by their unique participant number. Transcribed data were reviewed multiple times to ensure the researcher's familiarity with the content and gain deeper insights. Data coding and analysis followed Saldaña's (2021) thematic analysis process over two cycles. In the first cycle, initial coding methods such as descriptive coding, 'In Vivo' coding, simultaneous coding, and structural coding were employed to identify key concepts and link data into categories. Code mapping was then used to collapse irrelevant or redundant codes, merge similar codes, and generate meaningful categories and subcategories. Relationships between categories were examined to form initial themes that were inferred from the relevant literature. The second coding cycle involved advanced reorganisation and reanalysis of the data to explore complexity and refine the emerging themes that lined up with the literature. Codes were further refined and synthesised into categories and overarching themes. The final step involved 'trinity testing' of the themes to ensure coherence with the research aims. Transcript data was revisited to verify the derived themes.

Thematic analysis was conducted using a deductive approach, in which themes were primarily derived from existing theory and literature relating to SI, AI, SC, and Stress. This orientation was chosen to examine how participant experiences aligned with established constructs from the SIA and SIMIC, which guided the structure of both the data collection tools and the analysis. While coding was data-led in the initial cycle (Saldaña 2021), theme generation was concept-driven (Boyatzis, 1998; Saldaña 2021), allowing the data to be interpreted in relation to the key psychological aims under investigation. This approach supported the study's aim of exploring CT as a theoretically informed intervention for elite athletes' SI development and wellbeing enhancement.

Higher-order themes were developed through triangulation of SSFG/SSI themes, SIM data, and quantitative findings. Main findings from each data set were lined up and

significant convergence (similar findings across datasets), divergence (contradictory findings), and complementarity (where one dataset added depth to another) data were sought for to identify notable points data across the 3 datasets. Main findings from SSFG/SSI themes, SIM data and quantitative data were plotted in a Venn diagram of three overlapping circles for trinity testing, with SSFG/SSI themes (as the primary data source) at the top and SI map and quantitative findings in the other circles. Upon reflection, relevant data that detailed the same or similar findings (whether convergent, divergent, or complimentary) was then attributed to the overlapping areas of the circles, findings supported across all three datasets were placed in the central overlap. These overlapping data plots matched the higher-order themes from Triangulation. This process was guided by the study's research aims, such that each Higher-order theme was 'trinity tested', systematically checked for coherence with (a) the qualitative themes, (b) supporting or contrasting SIM/quantitative evidence, and (c) its relevance to the research questions and aims. Transcript, SI map, and questionnaire data were revisited to verify the derived higher-order themes.

The results are presented through a detailed exploration of higher-order themes, reflecting the qualitative and theory-driven analytic orientation.

To ensure the rigour and trustworthiness of the qualitative analysis, several strategies were implemented in line with recommendations for qualitative research in sport psychology (Smith & McGannon, 2018). Credibility was enhanced through prolonged engagement with the data, including multiple rounds of coding and repeated transcript reviews. Confirmability and dependability were supported by maintaining an audit trail documenting coding decisions and theme development throughout the process, as well as repeated reviews and reflexive notes. Additionally, emergent themes were discussed with the researcher's primary supervisor to enhance reflexivity and reduce potential researcher bias. Transferability was addressed by providing rich, thorough descriptions of the context, participants, and procedures of data collection and analysis to enable assessment of applicability to other settings. These procedures were designed to promote a transparent and robust analytical process that aligned with the study's interpretive approach.

3.6 Researcher Positionality

The researcher was heavily involved in all stages of the study, from design and collection to analysis and write-up. Due to this, the positionality of the researcher should be highlighted (Holmes, 2020; Smith 2021). Explicitly situating the researcher within the study enhances this study's transparency and allows for critical assessment in how the researcher's

background may have shaped study process (Berger, 2015). By making these dynamics visible, the credibility and trustworthiness of the study is strengthened.

The researcher was a current ISSP scholar and elite swimmer at the University of Stirling, regularly engaged in CT, and also worked at the university's sports centre and sports union. These overlapping roles meant the researcher had strong rapport with ISSP athletes, staff, and the wider sports community on campus. This insider status provided unique benefits, including easier access to facilities for study design purposes, close working relationships with gatekeepers, and existing trust with staff and athlete participants, particularly in the SSFG. The shared experience allowed participants to speak openly, often leading to deeper insights (Dwyer & Buckle, 2009; Berger, 2015).

However, this dual role also presented challenges. The potential internal biases of the researcher as a CT elite athlete themselves and belief in the potential psychological benefits of CT should be noted. As a cross-training athlete themselves, there was a risk that the researcher might unintentionally interpret data in a way that confirmed pre-existing beliefs (Finlay, 2002). This was addressed through critical self-reflection during coding, regular consultation with supervisors, and a conscious effort to allow participant voices to lead the coding process (Finlay, 2002; Tracy, 2010). Although one sought to remain impartial, the researcher's positionality and resultant biases should be noted. Ultimately, reflexively acknowledging these dynamics is not only a safeguard against bias but also a methodological strength, as it contextualises findings and highlights how insider perspectives can generate deeper, more meaningful insights (Dwyer & Buckle, 2009).

4. Results

The following section presents key higher-order themes that emerged from the study, providing an in-depth exploration of the role of CT in athletes' experiences. These themes include the impact of CT on athletes' social identity, athletic identity, sport commitment, and psychological well-being. The findings will also explore how CT influenced athletes' perceptions of their self-concept, their integration of new social groups, and their ability to balance training demands. Additionally, the discussion will highlight the role of CT in enhancing motivation, managing stress, and fostering social connections, while also addressing the challenges associated with integrating CT into existing routines. Through both quantitative and qualitative perspectives, these higher-order themes offer a nuanced understanding of the complex interplay between CT and various aspects of athletes' lives.

4.1 Broadened Social Identity

The findings from this study indicate that the 6-week CT intervention had a significant impact on broadening athletes' SI. This broadening was most clearly illustrated through the SIM, which showed the addition of new group memberships in the post-CT assessments. The data revealed that 20 athletes incorporated at least one additional CT-related social group into their identity, with most of these new group memberships rated positively and perceived as compatible with their main sport (please see Table 1 and Table 2 for a more detailed breakdown of the changes).

The pre-CT social identity maps revealed that all 31 participants had their main sport post-it note (MSP) prominently placed, with 24 of these MSPs being the largest size and 26 positioned centrally or at the top of the maps, reflecting their significance in the athletes' identities. In contrast, the post-CT maps showed some changes, including alterations in the positioning and perceived importance of MSPs.

Notably, 3 athletes increased their MSP size, indicating a heightened sense of importance for their main sport, while 3 athletes reduced their MSP size, suggesting a possible redistribution of identity salience. Additionally, 2 athletes moved their MSP to a more central position, while 2 others moved it away from the central or top placements. In terms of positivity and representativeness, 6 athletes improved their MSP positivity ratings, with 1 increasing from below 8+ to above it, while 9 athletes experienced a decrease, with 3 dropping below 8+. Similarly, 9 athletes reported improved MSP representativeness scores, while 14 showed declines, with 4 decreasing to below 8+ (please see Table 1 for a more detailed breakdown of the changes).

Post-CT maps also indicated that 20 athletes added at least one cross training-related post-it note (CTP), with 2 athletes adding two and 1 athlete adding three. Among these, 16 CTPs were small, 6 were medium, and 2 were large in size. Placement of these CTPs varied, with 8 positioned very close to the MSP, 2 within the MSP, 3 at a medium distance, and 6 placed far from the MSP. In terms of connectivity, 18 athletes drew a straight line linking their CTP to their MSP, 5 used a wavy line, and 1 used a zig-zagged line, indicating varying degrees of perceived compatibility, but the majority finding their CT compatible. Furthermore, 10 athletes rated their CTP with a high positivity score of 8 or above (please see Table 1 for a more detailed breakdown of the changes).

Qualitative data from SSFGs and SSIs reinforced the SIM findings by illustrating how athletes internalised their CT experiences into their daily lives and personal identities. Many participants reported that CT had become an integral part of their weekly routines and a valued aspect of their overall schedule. As one participant described, “You just look forward to doing it. And I just. Just a part of me now. Seems like it’s part of my schedule now.” (Participant 17). Another athlete echoed this sentiment, stating, “I’ve added a few more on, like, Pilates...and yoga. Different social groups in my life now.” (Participants 29, 36).

Athletes frequently described CT as an enjoyable and fun experience that allowed them to break away from the pressures of their main sport. The light-hearted and voluntary nature of CT was consistently mentioned as a key reason for its positive integration. One athlete shared, “It [cross-training] was just a wee bit of fun that you didn’t have to think too hard about.” (Participant 5). Another participant noted, “I will say it [cross-training] was great fun. Great fun to go away and do something different where it was competitive. I enjoyed it. I looked forward to it every week.” (Participant 8).

Athletes also highlighted how CT provided opportunities for social interaction and connection, both with their existing teammates and with new social groups. Several athletes expressed how participating in CT allowed them to engage with different people in a relaxed setting, facilitating bonding and camaraderie. One athlete stated, “It helps you relax as well. A lot of catch up.” (Participant 43). Others observed, “It’s not swimming, so it’s nice to do something else. And it’s sociable for everyone else.” (Participants 14, 15, 26).

Overall, the results indicate that the 6-week CT intervention broadened athletes’ SI by integrating new social groups that were largely perceived positively and as compatible with their main sport. The broadened identity maps, coupled with athletes’ positive experiences and reflections, illustrate that CT served as a valuable addition to their training routine. The social and psychological benefits highlighted through focus groups and interviews highlight

the importance of CT as a tool for managing stress, enhancing enjoyment, and facilitating social connections.

Table 1.

Pre-Post Cross Training Block Main Sport Post-it-Note

Participant No.	Size		Positioning		Positivity		Represent	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
1	Large	Large	Centre	Centre	10	10	10	9*
2	Large	Large	Top	Top	8	8	10	8*
3	Medium	Medium	Left	Right*	7	7	7	9*
4	Large	Large	Left	Top	7	8*	9	8*
5	Large	Medium*	Centre	Centre	8	8	7	8*
6	Large	Large	Centre	Centre	8	7*	8	8
7	Large	Large	Centre	Centre	7	7	7	5*
8	Large	Large	Centre	Bottom*	10	9*	7.5	8*
10	Large	Large	Centre	Centre	8	8	9	8*
11	Large	Large	Top	Centre*	10	9*	7	6*
14	Large	Large	Centre	Centre	10	10	3	10*
15	Large	Large	Top	Top	10	10	7	10*
16	Medium	Large*	Top	Top	10	6.5*	9	9
17	Large	Large	Centre	Centre	10	10	10	10
18	Large	Large	Centre	Left*	10	8*	10	10
19	Large	Large	Centre	Centre	9	10*	10	10
20	Large	Large	Centre	Top*	9	9	10	8*
21	Medium	Large*	Centre	Centre	9	10*	9	10*
22	Large	Large	Left	Top*	10	10	10	8*
23	Large	Large	Top	Top	10	9*	10	10
24	Large	Large	Left	Top*	10	8*	8	8
25	Large	Medium*	Bottom	right*	3	6*	8	7*
26	Large	Large	Centre	Top*	10	10	8	10*
27	Large	Large	Top	Centre*	8	10*	10	10
29	Medium	Large*	Centre	Right	10	6*	10	8*
30	Large	Large	Centre	Centre	10	10	8	9*
35	Medium	Medium	Top	Centre	9	8*	8	6*
36	Medium	Medium	Right	Bottom*	8	9*	8	8
37	Large	Large	Centre	Centre	10	10	9	10*
39	Large	Large	Top	Top	10	10	9	8
40	Large	Small*	Right	Centre*	8	8	7	6

Note. * Represent a change from Pre-Post social identity maps

Size = Size of main sport post-it-note on social identity maps

Positioning = Placement position of main sport post-it-note on social identity maps

Positivity = Positivity score of main sport post-it-note on social identity maps

Represent = Representativeness score of main sport post-it-note on social identity maps

Table 2

Post Cross Training Block Cross Training Post-it-Note

Participant No.	Size	Positioning	Relation	Positivity	Represent
2	Medium	V.close	Straight	8	6
3	Small	Far	Straight	9	4
4	Small	Far	Wavy	5	2
5	Small	Near	Straight	8	2
8	Small	Near	Wavy	7	5
14	Large	V.close	Straight	10	10
15	Medium	V.close	Straight	8	4
16	Small	Near	Straight	2	2
17	Large	Within	Straight	7	4
17	Small	Far	Straight	6	4
18	Small	Near	Straight	9	6
19	Small	Near	Wavy	7	4
20	Small	Near	Straight	6	2
23	Small	Far	Straight	10	10
25	Medium	Medium	Straight	4	4
26	Small	Within	Straight	10	5
27	Medium	V.close	Straight	6	7
27	Small	V.close	Straight	7	8
29	Medium	Near	Wavy	2	6
29	Small	Medium	Straight	1	1
29	Small	Far	Zig-zig	1	8
35	Small	Medium	Wavy	3	2
36	Medium	Far	Straight	9	6
40	Small	Near	Straight	8	7

Note. Size = Size of cross-training post-it-note on social identity map post cross training block

Positioning = Placement position of cross-training post-it-note in relation to main sport post-it-note on social identity map post cross-training block

Relation = Connecting line drawn between cross-training post-it-note and main sport post-it-note on social identity map post cross-training

Positivity = Positivity score of cross training post-it-note on social identity map post cross-training block

Represent = Representativeness score of cross-training post-it-note social identity map post cross-training block

4.2 Social Connection and Team Dynamics

The findings from this study indicate that CT played a pivotal role in enhancing social connections and positively influencing team dynamics among athletes. The data from both the SIM and the qualitative insights gathered from the SSFGs and SSIs suggest that CT facilitated meaningful social interactions and fostered a sense of camaraderie among participants. These social benefits extended beyond the immediate context of the CT sessions, influencing athletes' relationships within their main sport teams and their broader social environment.

One of the most significant social benefits of CT was its capacity to strengthen existing relationships and build new ones. Many athletes reported that participating in CT

allowed them to connect with teammates in ways that their primary sport did not always facilitate. The less structured, more relaxed atmosphere of CT sessions provided an opportunity for informal interaction, helping to break down social barriers and foster a sense of unity within the team. As two participants stated, “Socialises with everyone, like away from what we, like not thinking about swimming [main-sport] at all. Just having a chance to chat with each other... A bit of a team bonding and that.” (Participant 6, 15). Other participants reflected, “It’s quite sociable, because we’re all in like teams and stuff. Like you’ve got to talk to everyone... It’s a lot more sociable than like being in the pool [main sport environment]. Or being in different racks in the gym... we switched partners and stuff and moved about the room, whereas we don’t do that really at any other time. It’s just completely unlike, completely unlike swim [main-sport] training, it’s just so different.” (Participant 3, 5).

The SIM data further reinforced this, as the addition of CTP positioned near or within the MSP suggested a perceived overlap between the two social groups. Many athletes viewed CT as an extension of their primary training experience, enriching their overall social experience within their sport. In several cases, participants noted that the social connections formed during CT sessions had positive carry-over effects into their main sport training, improving communication and cohesion within the team.

Beyond strengthening existing relationships, CT also provided athletes with opportunities to expand their social circles. Engaging in a different sport introduced them to individuals outside their primary sport, contributing to a broader social network and an enhanced sense of belonging within the wider athletic community. Several participants expressed excitement about meeting new people and interacting with athletes from different sporting backgrounds. One participant noted, “I think actually joining the social club was really nice ‘cause it just, well you get to meet people. Most times I was looking forward to it, so I made the effort to stay and be a part of the club.” (Participant 41). Another mentioned, “I’ve made a little more friends, like just talking to people, more than when I was playing football [main-sport] because I had more opportunity to talk when I was playing volleyball [cross-training].” (Participant 39).

For some athletes, these new social interactions served as a valuable source of support and encouragement. The opportunity to connect with individuals who shared similar experiences and challenges, albeit in different sports, provided a sense of solidarity and mutual understanding. This sense of belonging and support was evident in the SSFG

discussions, where athletes highlighted how CT helped them feel more integrated into the broader university sports community.

CT also played a role in improving team cohesion and communication within athletes' primary sport teams. Many participants reported that engaging in a different sport together allowed them to develop a better understanding of their teammates' personalities, strengths, and weaknesses, which in turn translated into improved teamwork during their main sport. One participant described the impact of CT on their team dynamics, stating, "It was good, the freshers [new teammates] came along one time [to cross-training], so they got to know people as well. It was good on the social aspect." (Participants 26).

Furthermore, CT sessions often provided opportunities for informal leadership development, with athletes taking on new roles and responsibilities that differed from those within their primary sport. These experiences contributed to the development of communication skills and a greater appreciation for teamwork and collaboration, which were later applied in their main sport environments.

The social connections formed through CT also had a significant impact on athletes' mental well-being. Many participants highlighted the role of CT in providing a supportive environment where they could share their experiences and challenges without the pressures associated with their primary sport. This sense of social support contributed to an overall improvement in mental health, with athletes reporting feeling more relaxed, motivated, and confident. Some participants noted, "It's a different activity. Again, gets my mind off swimming [main-sport]. You have other friends, social life... It takes your mind off... You're doing it [cross-training] with friends. You just get to interact with different people. I mean, obviously, if you're doing yoga or golf or cross-fit or tennis [all cross-training activities], it's just a different group of people to be around, which I think sometimes can be quite nice and can kind of recharge your social battery." (Participant 19, 25, 27).

In addition to the emotional support provided by their peers, athletes also reported feeling a greater sense of accountability and motivation as a result of their CT experiences. The social connections established during CT sessions encouraged them to stay committed to their training and maintain a positive mindset. As one participant explained, "It's very much been a case of right gym [cross-training], with my friends holding me accountable for that, they're like, right. I don't care if you don't enjoy it, you've got to do it. Which is very helpful, and it's something that eventually to be able to compete better and race [main-sport] better. They are pushing me." (Participant 40).

Despite the many social benefits associated with CT, some athletes faced challenges in fully integrating the social aspects of CT with their main sport. A few participants mentioned difficulties in balancing their commitments and feeling disconnected from their primary team due to time constraints. One athlete shared, “You get sort of disconnect from your own sport if you have a crap day and you can sort of turn it around a little. In that sense it [cross-training] was really positive. The only thing was the schedule, I did, I did skip some [cross] trainings just because I was tired and stuff. I’m tired, I just want to go home, but the times I do stay, I’m glad, like, it was worth it, it was fun.” (Participant 41). These findings highlight the importance of structuring CT programmes in a way that supports, rather than detracts from, athletes’ primary sport commitments. Additionally, differences in social dynamics between the CT and main sport teams occasionally created friction, with some athletes struggling to adapt to the contrasting team cultures and expectations. While many participants embraced the social diversity offered by CT, a few found it challenging to navigate the differences in training intensity and group dynamics. “I just do karate [main-sport] so it’s [cross-training] similar to what I do but it didn’t mean it was serious or anything like that. So, it didn’t really matter whether I trained a hundred percent or not. I didn’t really know if I should. I could just kind of have a wee bit of fun with it. Just do [Muay] Thai [cross-training] for the fun of it.” (Participant 37).

Overall, the findings suggest that CT had a profound impact on athletes’ social connections and team dynamics. By offering opportunities for athletes to build new relationships, strengthen existing ones, and develop better communication and teamwork skills, CT served as a valuable tool for enhancing social cohesion within and beyond their primary sport. The increased sense of belonging and social support derived from CT contributed to athletes’ overall mental well-being and motivation, reinforcing the importance of social factors in athletic success. However, the findings also highlight the need for careful integration of CT into athletes’ schedules to prevent potential conflicts with their primary sport commitments. Ensuring that CT complements rather than competes with their main sport activities is crucial for maximising its social benefits.

4.3 Athletic Identity

The impact of CT on athletes’ athletic identity (AI) was a significant aspect of this study. The results from the AIMS indicated no statistically significant changes in AI levels pre- and post-CT, with overall AIMS scores showing a minor increase from 40.65 ± 5.41 to 41.31 ± 6.22 ($p=0.70$). Subscale scores for social identity (AIMS-SI), exclusivity (AIMS-E),

and negative affectivity (AIMS-NA) remained stable. Overall and subscale effect sizes showed only very small effects ($g = 0.11$, 95% CI $-0.40, 0.63$). None of the AIMS scales or subscales showed statistically significant change, the inclusion of effect size estimates helps clarify the nature of the differences observed. Across all scales, effect sizes were very small (Hedges' $g < 0.15$), and confidence intervals crossed zero, suggesting minimal to no meaningful impact of the CT programme on Athletic Identity over the six-week period. (please see Table 3 for a more detailed breakdown of the scores). Similarly, results from SIQS demonstrated no significant changes in athletes main sport group membership pre- and post-CT with overall SIQS scores only showing minor increases from 49.48 ± 8.03 to 50.32 ± 6.26 ($p = 0.71$). Additionally, subscale scores for ingroup ties (SIQS-IT), cognitive centrality (SIQS-CC), and ingroup affect (SIQS-IA) also remained stable. Furthermore, effect sizes showed only very slight effects ($g = 0.11$, 95% CI $-0.43, 0.65$). All of this together further suggesting that the introduction of CT did not substantially alter how athletes perceived their main sport membership (please see Table 4 for a more detailed breakdown of the scores).

However, qualitative data from the SSFGs and SSIs provided deeper insights into the nuanced shifts in athletes' perceptions of their athletic identity and their main sport group. Qualitative findings indicated that athletes experienced a shift in their self-concept through CT, with many reporting an expanded perspective on their athletic identity. Rather than feeling that CT detracted from their main sport, athletes expressed that it provided a valuable opportunity to explore other facets of their identity. One participant reflected, "I've realised that there's more to life. But in a positive way though I would say. I feel like I've been able to get the benefits of something by it. Because I'm not as 100 percent head on to it [main-sport] all the time. I'm a bit more like chilled about it." (Participant 20). Another athlete similarly remarked, "think it [cross-training] improved my commitment to sport in general, it's like opened your eyes to there being other things to do once swimming's [main-sport] kind of come to an end. And so, I think it would make me more keen to go on to do other things." (Participant 22). These reflections suggest that athletes began to see themselves as more multidimensional individuals, with identities that extended beyond their primary sport.

This expanded self-perception was further supported by the SIM, where 20 athletes added CTP, placing them in close proximity to their MSP. Some participants even integrated their CTP within their MSP, indicating a perceived synergy between their primary and secondary sports experiences. As one participant explained, "I started doing it more, incorporating certain exercises from yoga [cross-training] into my pre pool [main sport

warm-up], for example. So, I think, although I don't associate myself in that group, it has kind of merged into my own swimming [main-sport] one, because it helps. So those are sub bubble." (Participant 25). More participants explained, "Yeah, but doesn't it feel like in the moment, when you hitting the racket [cross-training], it's special and fun, no regular swimming [main-sport]... But also, badminton [cross-training], is part of your swimming [main-sport] schedule...doesn't feel like a director or anything. Just part of swimming schedule to benefit swimming [main-sport]." (Participants 3, 4, 6). This suggests that CT was not perceived as a competing interest but rather as an extension of their sporting identity.

The findings also revealed that the voluntary and enjoyable nature of CT played a crucial role in how athletes integrated it into their self-concept. Participants consistently reported that CT provided a sense of freedom and fun, which contrasted with the often rigid and high-pressure environment of their main sport. One athlete shared, "The voluntary nature was important. It was a choice and not like you have to come to [cross-] training." (Participant 25), while another stated, "I went from a high-pressure environment where everything matters to the opposite. Nothing matters, we're just here for the fun. The people leading the volleyball [cross-training] sessions are very supportive. But in tennis [main-sport], everyone's just doing their own thing and we have too. So that was nice, having this fun option." (Participant 41). The ability to choose their CT activity fostered a sense of autonomy, which contributed to the positive way athletes incorporated it into their athletic identity.

Moreover, athletes found that the inclusion of CT offered them a sense of relief from the physical and mental demands of their primary sport. Several participants described how CT helped them manage stress and provided an opportunity to step back from the intensity of their main sport without completely disengaging. One participant remarked, "I feel like it took a lot of stress off my body. I was quite relaxed and just chilled out. Mentally, like a good refresh. Other participants similarly reflected, "Yeah, I think it [cross-training] was a good thing to have, because it took my mind off things to an extent... I found mine quite distracting. It distracted me from everything going on around. Because it's like a different group, different environment. It really helped me get away from everything else I've done." (Participant 35. 36).

These qualitative insights align with findings from the SIM, where some athletes improved their MSP positivity ratings following the CT intervention, suggesting that the added variety contributed to their overall well-being and enjoyment. The maps indicated that 6 athletes reported improved positivity scores, while 9 athletes experienced a decrease,

highlighting the diverse impact of CT across the cohort (please refer back to table 1 for more detail).

Participants further reported that CT provided them with an opportunity to achieve better balance in their training schedules by reducing the monotony of their routines. The qualitative findings indicated that many athletes found CT to be a refreshing change from their primary sport, offering a mental and physical break. One participant commented, “It [cross-training] just added some variety into my week, which was great. It was refreshing (Participant 17). More athletes expressed similar sentiments, stating, “You’re going away and doing something else. It’s a nice change because you can get your mind right. You come out and you feel fresh... Swimming [main-sport] is very much you to yourself a lot, it’s very repetitive, so, something else is refreshing... I know that I’m doing it just for like being like refreshing the mind, you know, stay in nice and healthy within the brain.” (Participants 21, 24, 30).

However, despite the perceived benefits, some athletes highlighted challenges in balancing CT with their primary sport commitments. Several participants noted difficulties in finding the time and energy to accommodate CT within their existing schedules. One participant remarked, “If I was to do it [cross-training] at nine o’clock in the morning, then I’d probably pick the sleep. But if it’s like in the middle of the day, like, three. I probably think the benefits of that would probably be bigger than having a sleep, but other times rest for swimming is more important.” (Participants 17). Another athlete reflected on the logistical aspects, saying, “It was such a busy schedule with swimming [main-sport] and university work. If I am getting to a certain point in the season where it’s getting really hard, I’ll go nap for an hour instead. So, it’s like probably more beneficial but then maybe there’s times I’m not so busy when there’s not as much university work or it’s the start of season when there’s not as many training sessions. I think that would be a better time to do it.” (Participant 20).

These insights highlight the importance of structuring CT programs in a way that complements, rather than conflicts with, an athlete’s primary sport. Athletes indicated that when CT was positioned conveniently within their schedules, it was more likely to be embraced as a beneficial addition rather than a burden. Additionally, athletes acknowledged that the voluntary and non-competitive nature of CT contributed to its positive impact, further reinforcing the notion that CT can be an effective tool for maintaining athletic balance when properly integrated.

Overall, the findings suggest that CT had a predominantly positive effect on athletes' AI, fostering a broader and more balanced perspective on their self-concept. While the quantitative analysis showed no significant changes in AIMS and SIQS scores, qualitative data demonstrated that CT provided athletes with an opportunity to expand their identity, maintain motivation, and enhance their sense of enjoyment and autonomy, which many capitalised on. Athletes perceived CT as a valuable complement to their primary sport, helping them maintain motivation and avoid burnout without diminishing their main sport identity. However, the findings also highlight the importance of structuring CT programmes to align with athletes' existing commitments and performance goals to ensure they enhance, rather than conflict with, their training.

Table 3

Difference between AIMS and AIMS subscale scores Pre-Post Cross Training Block

Scales	Pre Cross- Training Score	Post Cross- Training Score	Significance (p)	Hedges' g	95% CI
Overall AIMS	40.65±5.41	41.31±6.22	0.70	0.11	-0.40, 0.63
AIMS-SI	19.15±1.87	19.15±2.10	1.00	0.00	-0.53, 0.53
AIMS-E	10.58±2.80	10.88±2.72	0.70	0.11	-0.42, 0.64
AIMS-NA	10.92±2.56	11.27±2.62	0.64	0.14	-0.39, 0.66

Note. Data shows scores mean±SD (2.d.p)

AIMS-SI = AIMS social identity subscale

AIMS-E = AIMS exclusivity subscale

AIMS-NA = AIMS negative affinity subscale

Table 4

Difference between SIQS and SIQS subscales scores Pre-Post Cross-Training Block

Scales	Pre Cross- Training Score	Post Cross- Training Score	Significance (p)	Hedges' g	95% CI
Overall SIQS	49.48±8.03	50.32±6.26	0.71	0.11	-0.43, 0.65
SIQS-IT	17.08±4.11	17.16±2.27	0.93	0.02	-0.52, 0.56
SIQS-CC	13.84±3.26	14.40±3.63	0.57	0.17	-0.37, 0.70
SIQS-IA	18.56±2.84	18.76±2.00	0.79	0.08	-0.45, 0.61

Note. Data shows scores mean±SD (2.d.p)

SIQS-IT = SIQS ingroup ties subscale

SIQS-CC = SIQS cognitive centrality subscale

SIQS-IA = SIQS ingroup affect subscale

4.4 Sport Commitment

The impact of CT on athletes' sport commitment was a key focus of this study. Quantitative results from the SCQ-2 revealed no statistically significant changes in overall SC levels pre- and post-CT, with scores showing a slight decline from 229.64 ± 13.85 to 226.72 ± 17.61 ($p=0.53$). Subscale scores for enthusiastic commitment (SCQ-EC), constrained commitment (SCQ-CC), social support (SCQ-SSE), and sport enjoyment (SCQ-SE) remained relatively stable, indicating that the introduction of CT did not produce measurable changes in athletes' commitment levels to their primary sport. Effect sizes also showed little change. The overall SCQ effect was very small and negative ($g = -0.18$), with a wide CI crossing zero. Most subscales showed negligible or very small changes, with no statistically significant effects. The two subscales that showed the largest effects were the PIQ ($g = -0.34$, 95% CI $-0.87, 0.19$) and SSI ($g = -0.32$, 95% CI $-0.85, 0.21$), although these scores are still small (see Table 5 for a more detailed breakdown of the scores). These results indicate no reliable changes in athletes perceived commitment levels during the six-week CT intervention, though some subscales (PIQ, SSI) showed small effect sizes that could warrant further investigation.

However, again, qualitative data from the SSFGs and SSIs provided more in-depth insights into how CT influenced athletes' subjective experience of sport commitment. Participants frequently reported that engaging in CT provided a renewed sense of motivation and enthusiasm for their primary sport. Many described CT as a valuable break from their usual training routine, which allowed them to return to their main sport feeling refreshed and more focused. One participant reflected, "Switching off from it [main-sport] was good. I was enjoying it [main sport] more. I wasn't like overthinking it [cross-training]. I was like coming in and actually enjoying what I was doing. But then actually like, because I was so relaxed, I was focusing more and like thinking about it [main-sport] in more detail and stuff." (Participant 24). Similarly, another athlete noted, "Yeah, it's just a sense of refreshing, well in my mind anyway. It's [cross-training] like a de-stressor. It gets me more excited to go back to training [main-sport]." (Participant 40). These reflections suggest that CT served as a useful tool to prevent monotony and promote long-term commitment to sport.

The qualitative findings also emphasised that the voluntary and enjoyable nature of CT contributed to maintaining motivation. Many athletes expressed appreciation for the autonomy they had in selecting their CT activities, which allowed them to explore new interests while maintaining their dedication to their main sport. One participant highlighted, "But when you swim [main-sport] you don't get the opportunity to try out new sports, so you

kind of think that this is it. But that's kind of changed now. I can try new things." (Participant 22). This sense of autonomy appeared to enhance their overall satisfaction and engagement in both their primary and secondary sport activities.

One of the most frequently discussed benefits of CT was its potential to mitigate feelings of burnout. Several participants indicated that engaging in a different activity provided them with both a physical and mental break from the intense demands of their primary sport. One athlete stated, "I used it [cross-training] very much as a tool for getting away, not procrastinating, but having a break from doing other things that are slightly more stressful, like my tennis [main sport]." (Participant 40). Another participant echoed similar sentiments, noting that CT acted as a necessary reprieve, helping them to manage stress and maintain their motivation, "It [cross-training] was a bit of an escape. Just an escape from the life of being an athlete and a uni student, so then could more on them." (Participant 19).

The qualitative data also suggested that CT had an indirect effect on training adherence and effort in athletes' primary sports. Some participants found that having a varied routine with CT helped them maintain consistency in their main sport by preventing feelings of stagnation. One participant mentioned, "I put all my energy into swimming [main sport], which is almost like a good thing because sometimes you kind of get too into it and too obsessed. It's nice to take a step back, obviously you're seeing commitment and discipline there, but you're not worried about it. You're not focusing as much on all the time. Which then therefore has a lot of benefits because you're so much more relaxed about it. There's a new capacity to try harder." (Participant 20). This suggests that the introduction of CT contributed to sustaining their enthusiasm and effort levels during regular training sessions.

Another important theme that emerged was the potential of CT to support long-term sport participation and commitment. Several athletes reported that their engagement with CT helped them envision a future beyond their primary sport, fostering a more enduring connection to physical activity. Two participants stated, "And I feel like I wanna do that [cross training] when I've like stopped swimming [main-sport] as well. I wanna carry on doing after retirement. I'm already making plans now... Because when I stop swimming [main-sport] eventually, I'm going to want to do other sports to keep fit. And also, just explore. The world is my oyster." (Participant 26, 36). These responses suggest that CT may play a valuable role in promoting sustained engagement in sport even after athletes' competitive careers come to an end.

Despite these benefits, a few athletes initially expressed concerns about balancing their CT activities with their primary sport. Some participants struggled to find time for both,

feeling that it added an additional burden to their already packed schedules. One participant shared, “My Mondays were kind of screwed and then that [cross-training] didn’t help. Mondays were already stressful. I’m going to be honest; I think it actually made me more stressed because of the timings.” (Participant 21). These concerns highlight the importance of implementing CT in a way that complements, rather than competes with, primary sport training demands. Similarly, some athletes reported that while they enjoyed CT, they occasionally felt overwhelmed by the additional physical and mental demands. Another participant remarked, “As the season progresses, we have to make the performance decision to be like, right, we’re either f---ed from a 50K [swim 50km in main sport] week and we’re just not going to go and play golf [cross-training] or, we shouldn’t because we need to be regening [resting and regeneration].” (Participant 30). These differing experiences highlight the need for personalised CT programmes that consider individual training capacities and goals.

Overall, the findings suggest that while CT did not produce statistically significant changes in athletes’ SC levels, it played a valuable role in maintaining and enhancing their subjective experience of commitment. The qualitative insights revealed that CT acted as a buffer against burnout, provided a refreshing break from routine training, and fostered long-term engagement with sport. Athletes viewed CT as a complement to their primary training, enhancing their overall experience and helping to sustain motivation and effort. However, the findings also highlight the need for careful planning and implementation of CT programmes to ensure they do not conflict with primary training demands. While many athletes found CT to be a beneficial addition, some experienced challenges in balancing the two, suggesting that individual preferences and training schedules should be considered when incorporating CT into athletic programmes.

Although qualitative data suggested subtle shifts in athletes’ motivation and commitment, quantitative SCQ-2 scores showed no statistically significant changes. Effect size estimates were small across all subscales (Hedges’ g ranging from -0.34 to $+0.26$), and confidence intervals all included zero, indicating a lack of measurable change. The discrepancy between qualitative and quantitative findings highlights a complexity in sport commitment and its interaction with identity and motivation.

Table 5

Difference between SCQ-2 and SCQ-2 subscales scores Pre-Post Cross-Training Block

Scales	Pre Cross- Training Score	Post Cross- Training Score	Significance (p)	Hedges' g	95% CI
Overall SCQ	229.64±13.85	226.72±17.61	0.53	−0.18	−0.72, 0.35
SCQ-EC	27.20±3.20	26.48±3.79	0.49	−0.20	−0.73, 0.33
SCQ-CC	12.12±4.55	11.20±4.17	0.40	−0.21	−0.75, 0.32
SCQ-SE	22.48±3.28	22.20±3.15	0.77	−0.09	−0.62, 0.44
SCQ-VO	17.68±1.91	17.84±1.82	0.80	0.09	−0.44, 0.62
SCQ-OP	11.32±3.98	12.28±3.47	0.35	0.26	−0.27, 0.79
SCQ-PIL	18.88±4.57	18.36±4.80	0.69	−0.11	−0.65, 0.42
SCQ-PIQ	19.44±0.92	19.12±0.97	0.31	−0.34	−0.87, 0.19
SCQ-SC	13.08±3.42	12.84±3.36	0.80	−0.07	−0.60, 0.46
SCQ-SSE	16.44±2.57	16.24±2.20	0.78	−0.08	−0.61, 0.45
SCQ-SSI	20.76±2.57	19.80±3.40	0.35	−0.32	−0.85, 0.21
SCQ-DEM	28.00±2.36	28.08±1.96	0.90	0.04	−0.49, 0.57
SCQ-DES	22.24±2.83	22.28±2.21	0.96	0.01	−0.52, 0.54

Note. Data shows scores mean±SD (2.d.p)

SCQ-EC = SCM enthusiastic commitment subscale

SCQ-CC = SCM constrained commitment subscale

SCQ-SE = SCM sport enjoyment subscale

SCQ-VO = SCM valued opportunities subscale

SCQ-OP = SCM other priorities subscale

SCQ-PIL = SCM personal investment loss subscale

SCQ-PIQ = SCM personal investment quantity subscale

SCQ-SC = SCM social constraints subscale

SCQ-SSE = SCM social support emotional subscale

SCQ-SSI = SCM social support informational subscale

SCQ-DEM = SCM desire to excel mastery achievement subscale

SCQ-DES = SCM desire to excel social achievement subscale

4.5 Psychological Benefits of Cross-Training

The psychological benefits of CT were a recurring theme throughout the study, as athletes consistently reported how engaging in a secondary sport positively influenced their mental well-being. Both the qualitative and quantitative data highlighted the role of CT in reducing stress, providing mental refreshment, and enhancing overall psychological resilience. Although the PSS data did not indicate a statistically significant reduction or effect in stress levels pre- and post-CT (mean increase of 1.93 points, 7.88%, $p > 0.05$, $g = 0.25$, 95% CI = −0.28, 0.77), qualitative findings suggested that athletes perceived CT as a valuable tool in managing their psychological demands (please see Table 6 for a more detailed breakdown of the scores).

A common narrative among participants was the stress-alleviating effect of CT. The repetitive and high-pressure environment of their primary sport often led to mental fatigue

and stress accumulation, which CT helped alleviate by providing a much-needed break from their regular training routines. Athletes frequently described CT as a refreshing change, offering a sense of escape from the intense demands of their main sport. As one participant noted, “This was the approach basically. If I’ve got something, or a lot, to escape by going volleyball [cross-training] or another sport, just to clear my mind off from stress.”

(Participant 39). Similarly, another athlete commented, “Because you’re doing something else, right? Because every day you’re just swimming [main-sport]. And if you’re doing something else, it’s just, you’re not swimming. It’s an escape. Yeah, I think it helps to do something else. Because otherwise you can just end up just thinking about it too much.” (Participant 7).

The break CT provided from the monotony of their primary training was often highlighted as a key contributor to maintaining a positive mental state. The change in training dynamics, social environment, and physical setting allowed athletes to mentally reset, resulting in a renewed focus and motivation when returning to their primary sport. One participant explained, “It’s a good balance, going from on your own, or with other tennis [main-sport] players, to being with completely different people [in cross-training] who have got nothing to do with tennis. Who are a different level, and train differently. All of these things are quite refreshing. It has helped me sort of let loose a little because I can be kind of uptight sometimes. I think it has helped me shift a little into a more easy-going mindset.” (Participant 41). These findings highlight the psychological benefits of introducing variety into an athlete’s training routine.

Another significant psychological benefit of CT was the enhanced enjoyment and intrinsic motivation athletes experienced. The voluntary and non-competitive nature of CT allowed them to engage in sport purely for enjoyment, without the pressures of performance expectations. Many participants noted how the fun and light-hearted aspect of CT contributed to their overall sense of well-being. One participant described, ““It [cross-training] was just, just different to anything so there wasn’t anything important. It’s a different and non-important, less pressure environment. It just wasn’t something that I needed to perform for. It didn’t really matter whether I mucked around or not, because it wasn’t for an end goal. So, I could just have fun.” (Participant 37), while others stated, “There was no competitive aspect to it, there was no pressure on us to do it to a certain level, or like, to get better... In the grand scheme of things. It didn’t mean anything. It was just a lot of fun to go about and do it.” (Participants 17, 18).

This sense of enjoyment translated into a positive impact on their primary sport as well. Athletes reported feeling more motivated and enthusiastic about their main training sessions after participating in CT. A participant highlighted, “Yeah, I was enjoying it [main-sport] more. I wasn’t overthinking it. I was like coming in and actually enjoying what I was doing. I was so relaxed, I was focusing more and thinking about training in more detail.” (Participant 20). The novelty factor of CT activities appeared to act as a motivational booster, helping to combat the mental fatigue associated with prolonged exposure to a single sport.

For many athletes, CT served as a valuable coping mechanism for dealing with the high-performance expectations associated with elite sport. Several participants acknowledged that their primary sport often induced anxiety and pressure, particularly around competitions and key training periods. Engaging in a different, non-performance-oriented activity allowed them to relieve this pressure and adopt a more relaxed mindset. Some athletes reflected, “It [cross-training] was good fun. You have no pressure to go hard. No expectations either not to be bad... No expectations yeah, just chill, nothing like swimming [main sport]. It helps you relax in general. Like, resetting.” (Participant, 16, 25).

Furthermore, athletes reported that CT provided an outlet for emotional expression and mental decompression. The absence of performance expectations in CT allowed them to engage in sport without fear of judgment, which contributed to improved psychological resilience. One participant noted, “I liked that for once I could make mistake and no one would be mad about it, which is the big difference. I would never be mad at myself doing mistaken volleyball [cross-training] because I never really played before, but still the fact that they’re supporting. Just trying to learn new things, have fun, if I was doing the same mistake in football [main-sport], it wouldn’t be as, as nice.” (Participant 39).

The social aspect of CT emerged as a crucial psychological benefit, with many athletes emphasising how it enhanced their sense of belonging and support. Participants frequently highlighted the opportunity to interact with new social circles, which provided an additional layer of emotional support beyond their main sport. One participant stated, “I hang out with volleyball [cross-training] and, they’re just very nice. Because volleyball is at a lower level, they’re not super intense. Because I feel with the tennis team [main-sport], all they do is tennis, tennis, like all day, tennis, everything is tennis. So, it’s refreshing. I like to have new people, new friends that aren’t just hyper focused on just one thing, because I do consider myself to be quite versatile now.” (Participant 41). This exposure to diverse social groups contributed to their overall well-being by fostering a sense of community and reducing feelings of isolation that can sometimes accompany elite sport.

CT also played a role in fostering self-confidence and facilitating identity exploration beyond the athlete role. Participants reported feeling a greater sense of self-efficacy and personal growth as a result of mastering new skills in their CT activities. For instance, one participant reflected, “I do really like the sport [main-sport], and I do want to get better at it, but I don’t place my entire identity on it. Not I’m a tennis player, and that’s it. I can be more.” (Participant 41). This broader perspective allowed athletes to explore aspects of their identity outside of their athletic career, which contributed to a healthier self-concept and a more balanced perspective on their sporting journey. As one participant noted “I found that even outside of the swimming [main-sport], like after my swimming career, I wanted to expand into other things more because of it [cross-training]. I feel like it’s shown you a life outside of the one you know. So after, I’m done swimming, I would most definitely be more inclined now than I was before to doing another sport.” (Participant 25).

Despite the numerous psychological benefits associated with CT, some participants faced challenges in adapting to the additional training demands. A few athletes expressed concerns over balancing CT with their existing commitments, which sometimes resulted in increased stress levels rather than relief. One participant mentioned, “Well, when I was doing it [cross-training], it was fine, it was good. But sometimes the stress of going was bad, it wasn’t an easement to go. Because just unfortunately all my [main-sport] trainings in the evening. I think it would have been better if I was able to do something that wasn’t on the same day or was after my own training. But it’s just difficult.” (Participant 37). This highlights the importance of structuring CT programmes in a way that complements rather than competes with an athlete’s existing workload.

Overall, the findings suggest that CT provided athletes with a range of psychological benefits, including stress reduction, enhanced motivation, improved social support, and increased self-confidence. While quantitative data did not reflect a significant decrease in global stress levels, this may have been impacted by wider contextual factors outside of the study that the qualitative data highlighted as will be discussed. Additionally, the qualitative data strongly indicated that athletes felt better equipped to manage the psychological demands of their sport and wider life. The enjoyment derived from CT, along with its potential as a coping tool, highlight its value as an essential component of an elite athlete’s training regimes. However, careful planning and management are crucial to ensuring that the additional training does not become a source of undue stress.

Table 6

Difference between PSS scores Pre-Post Cross-Training Block

Scale	Pre Cross- Training Score	Post Cross- Training Score	Significance (p)	Hedges' g	95% CI
PSS	24.48±7.22	26.41±8.03	0.24	0.25	-0.28, 0.77

Note. Data show scores mean±SD (2.d.p)

All scores calculated on a 1-5 scale instead of 0-4

4.6 Cross-Training and Performance Perceptions

The findings from this study reveal that CT had a multifaceted impact on athletes' perceptions of their performance in their primary sport. While quantitative data from the Sport Commitment Questionnaire (SCQ-2) and other performance-related metrics showed no statistically significant changes pre- and post-CT (mean decrease of 2.92 points, 1.72%, $p > 0.05$; please refer too Table 5 for a more detailed breakdown of the scores), qualitative insights from SSFGs and SSIs provided a deeper understanding of how athletes perceived the influence of CT on their overall performance, motivation, and physical capabilities.

Many athletes reported that CT provided a welcome change from their regular training routines and contributed to their overall sense of well-being and motivation, which they believed indirectly benefited their performance in their main sport. The variety introduced by CT was seen as a valuable tool to break the monotony of routine training and enhance overall athletic engagement. One participant stated, "I'm also just using it [cross-training] because I know in the back of my head that it's what's best for me and to help me improve in my sport" (Participant 40).

In addition to the psychological benefits, several participants felt that CT contributed to their physical preparedness. Athletes highlighted how they felt engaging in a different sport improved their overall fitness and provided new physical challenges that complemented their primary training. For example, a swimmer remarked, "You can definitely see the physical benefits if we do it [cross-training] for a longer period of time. Like more flexible, injury prevention in shoulders and stuff" (Participant 30). Another participant shared, "This is what I should have done to improve that performance. Speaking to coaches, they're like right we should do is that, you just need to do a load of let's say core strength work and it [cross-training] helped with that." (Participant 40). These findings suggest that athletes perceived CT as an effective supplementary tool that enhanced their physical abilities and contributed to a holistic approach to training.

Athletes expressed mixed opinions on the degree to which skills acquired through CT translated into improved performance in their main sport. Some participants identified clear benefits, noting how certain movements and conditioning exercises from CT sessions directly enhanced their capabilities in their primary sport. One participant, for instance, reported, “I think because I play tennis [main sport], Like I have good reflexes and the technique is similar, so I wasn’t horrible at it. So that’s why I also kind of enjoyed it, because I was okay. I really like spiking [volleyball technique], just because it’s like a smash [tennis technique] and during [cross-]training we always do, hitting lines [training drill]. So that, that helped me get a bit better, I would say for hitting lines in tennis.” (Participant 41).

However, other athletes felt that the transferability of CT benefits was limited, especially when the CT activity was vastly different from their primary sport. One athlete commented, “That’s the issue though. I don’t think any other sport can benefit us, really. I think swimming is too unique.” (Participant 21). These observations highlight the importance of selecting CT activities that align with the specific demands of an athlete’s primary sport to maximise potential benefits.

Furthermore, the SIM data supported these qualitative findings. Athletes who placed their CTP close to their MSP were more likely to report perceived benefits, suggesting they viewed CT as directly contributing to their primary sport performance. Conversely, athletes who positioned their CTP farther away often described their CT experiences as enjoyable but not necessarily performance-enhancing.

Overall, the findings suggest that athletes perceived CT as a valuable tool for enhancing their overall training experience, with perceived benefits in areas such as motivation, physical conditioning, and psychological well-being. However, the extent to which CT translated into tangible performance improvements in their primary sport varied among participants. Equally, as outlined earlier, factors such as the type of CT activity, its compatibility with primary sport training, and the athlete’s individual goals played a significant role in shaping their perceptions.

4.7 Summary

In summary, the results of this study highlight the multifaceted impact of CT on athletes, encompassing their SI, AI, SC, psychological well-being, and performance perceptions. The findings suggest that CT serves as a valuable tool for broadening athletes’ social circles, enhancing their sense of identity, and providing a welcome break from the demands of their primary sport. Athletes reported that CT contributed to their motivation,

stress management, and overall enjoyment of training, reinforcing its role as a complementary activity that supports long-term commitment to sport. However, the integration of CT into existing routines presented challenges, with some athletes struggling to balance their primary sport commitments and additional training demands. While quantitative data did not reveal significant changes in identity or commitment levels, qualitative insights provided a deeper understanding of the nuanced ways in which athletes experienced and internalised the benefits of CT. Overall, the results highlight the importance of carefully structuring CT programmes to align with athletes' needs, ensuring that they complement rather than compete with their primary sport, ultimately fostering a more balanced and fulfilling athletic experience.

This integration of qualitative and quantitative findings informed the structure of the subsequent discussion, which presents results within theoretically grounded thematic domains.

5. Discussion

This study explored the psychological and social effects of a six-week cross-training programme on elite athletes, with a particular focus on SI, AI, stress management, and SC. The findings contribute to both the SI and CT literature by demonstrating that CT has the potential to broaden athletes' identities, foster social connections, and be a valuable resource for managing stress and transitions. While the results align with existing theoretical frameworks, such as the SIMIC, they also provide novel insights into the mechanisms through which athletes integrate CT into their self-concept and sporting lives. Importantly, the study highlights the nuanced relationship between CT and AI, demonstrating that engaging in an additional sport does not necessarily diminish an athlete's primary sporting identity but can instead complement and reinforce their broader sense of self. Furthermore, findings suggest that the benefits of CT are contingent upon its compatibility with athletes' main sporting commitments and its ability to provide a positive and enjoyable experience. The following sections discuss these findings in greater depth, considering their implications within the existing literature and outlining areas for future research.

5.1 Discussion of Findings

Broadened Social Identity

The study's findings indicate that the six-week CT block led to the adoption of additional CT identities among most athletes. This aligns with existing literature, as the SIMIC framework suggests that when athletes are presented with a positive additional group that is compatible with their existing groups, they are likely to engage with it and eventually incorporate it into their social identity (Haslam et al., 2019; Boen et al., 2020; Haslam et al., 2020; Cruwys et al., 2020; O'Halloran & Haslam, 2020). Within the six-week study, most athletes resonated with their chosen CT activity and integrated it into their sense of self.

Additionally, regardless of the specific activity, athletes consistently described their CT experience as enjoyable and fun. This enjoyment stemmed from the non-serious, non-mandatory nature of CT, as well as the variety it introduced and the differences in physical, social, and training environments. The high levels of enjoyment reported further support the idea that athletes internalised the CT groups as part of their identity. The literature suggests that the more one identifies with a group, the greater the sense of value and enjoyment derived from participation (Haslam et al., 2020; Greenaway et al., 2020; O'Halloran & Haslam, 2020; Stephen et al., 2023). Initially, athletes may have enjoyed CT due to its novelty and contrast with their main sport; however, over time, this enjoyment evolved as

they developed a passion for their CT activity, anticipated their sessions, and attributed meaning and value to their participation. Consequently, CT enjoyment became more stable—not merely a result of novelty, but because athletes had fully incorporated the activity into their lives and sense of self.

Social Connection and Team Dynamics

CT groups proved to be useful tools for enhancing athletes' social interactions. Increased socialisation occurred both among existing teammates and through the formation of entirely new friendship circles. This, in turn, strengthened the utility of CT groups as resources for managing hardship. One reason why GMs are considered effective in mitigating hardship is the social interaction and support they provide (Rees et al., 2015; Cruwys et al., 2016; Haslam et al., 2020; Cruwys et al., 2020). Humans are inherently social beings, requiring interaction with fellow group members to thrive mentally, and such interactions can serve to protect against and alleviate stress (Rees et al., 2015; Cruwys et al., 2016; Boen et al., 2020; Haslam et al., 2020; Cruwys et al., 2020). Athletes in this study recognised this dynamic, viewing their CT groups as valuable opportunities for social interaction and team bonding. CT provided a designated time to engage with teammates and friends outside the pressures of their primary sporting and academic environments, allowing them to connect in a more relaxed and informal setting within their otherwise demanding schedules.

Managing Stress and Hardship

The findings of this study suggest that the 6-week CT block aided athletes in managing stress and hardship. Given that CT participation broadened athletes' SI and increased their social interactions, these results align with existing literature. GMs function as social resources that individuals utilise for various purposes, with stress management being among the most prominent (Cruwys et al., 2016; Haslam et al., 2019; Haslam et al., 2020; Cruwys et al., 2020; O'Halloran & Haslam, 2020; Stephen et al., 2023). Furthermore, social groups have been found to enhance individuals' perceived sense of control over their lives (Haslam et al., 2020; Greenaway et al., 2020; Cruwys et al., 2020; O'Halloran & Haslam, 2020). The sense of escape and refreshment that athletes reported experiencing through CT may be attributed to an increased perception of control facilitated by the new CT group.

Several factors may explain why CT groups had these beneficial effects on stress management. Firstly, athletes consistently described CT as non-serious and enjoyable, which likely contributed to the positive perception of these groups. The absence of performance-

related stress and the inherently fun nature of CT allowed athletes to disengage from external pressures (Scanlan & Simons, 1992; Scanlan et al., 1989; Scanlan et al., 2016). Additionally, CT groups were markedly different from athletes' primary sport in terms of structure, environment, and expectations. This contrast enabled athletes to mentally separate their CT participation from their main sporting commitments, allowing CT to function as an effective psychological resource. The independence of CT groups from athletes' primary sport and AI meant that they could function as a means of alleviating stressors arising from their main GMs such as sport, academic demands, and other life challenges (Rees et al., 2015; Cruwys et al., 2016; Haslam et al., 2020; Cruwys et al., 2020; O'Halloran & Haslam, 2020; Stephen et al., 2023).

However, an interesting paradox emerged in athletes' perceptions of CT. Despite recognising CT as distinct from their primary sport, many athletes still framed their CT group within the broader context of their main sporting identity. Some even viewed CT as an extension of their primary sport, reinforcing the idea that CT participation could indirectly contribute to their athletic performance. The value athletes placed on CT was often tied to its perceived impact on their primary sport, aligning with the broader conceptualisation of CT as a supplementary training tool rather than a wholly independent activity (Stamford, 1991; Tanaka, 1994; Godfrey, 1998; Grier et al., 2015; Yuvaraj & Vishnuvardhan, 2015). Most athletes appeared to recognise the psychological benefits of CT and consequently integrated it into their identity and training programme to support their broader sporting ambitions.

Despite these positive qualitative findings, PSS scores showed no significant difference and minimal effect size between pre- and post-CT block testing. This result appears contradictory, given the stress-reducing effects that athletes attributed to CT and their reported adoption of an additional sporting identity. However, when viewed in the broader context of the study timeline, this finding offers further insight into CT's potential role in managing hardship. The pre-CT testing occurred in the first week of the university term, coinciding with the early stages of the sporting season when academic and athletic demands were relatively low, and excitement levels were high. In contrast, post-CT testing took place at the end of week six, coinciding with 'reading week' - a period marked by increased academic pressure due to impending assignments and tests. Additionally, this phase of the sporting calendar was characterised by intensified training and preparation for key winter competitions. The combination of heightened academic and athletic demands, coupled with the challenges of the winter training period - such as cold weather, reduced daylight, early morning and late-night training sessions, and increased susceptibility to illness - likely

contributed to elevated stress levels during post-CT testing (Seggar et al., 1997; Lu et al., 2012; Schacter et al., 2016; Chiu et al., 2016; Weinberg & Gould, 2019; Cruwys et al., 2020; Lin et al., 2022).

Given these external stressors, the fact that athletes' global stress scores did not significantly increase over the six-week period may be a notable finding in itself. It suggests that despite escalating pressures, participation in CT may have played a role in helping athletes manage these challenges. While the quantitative data did not indicate a measurable reduction in stress levels, the qualitative data strongly supported the idea that CT provided athletes with an effective coping mechanism, helping them navigate the demands of their sporting and academic commitments. The divergence between the qualitative and quantitative findings highlights the complexity of the dataset. While potentially meaningful, these patterns lie beyond the explanatory scope of this exploratory study. Nonetheless, it is reasonable to suggest that CT had beneficial effects on athletes' global perceived stress.

Transitions

Athletes in this study identified both injury-related and retirement-related transitions as significant themes emerging from their CT experiences. With regard to injuries, these findings align with the predictions of the SIMIC. The adoption of a new CT group appeared to serve as a coping mechanism and confidence-building resource, enabling athletes to maintain a connection to sport and retain a key part of their identity through injury. Additionally, CT provided a transitional pathway that facilitated athletes' return to full participation in their primary sporting group(s) (Haslam et al., 2019; Cruwys et al., 2020; O'Halloran & Haslam, 2020). This represents a notable contribution to the CT literature, as CT is already well established as a physiological rehabilitation tool. The present study extends this understanding by highlighting its psychological benefits - specifically, its capacity to enhance confidence and preserve identity during injury recovery. These findings further reinforce the viability of CT as an effective rehabilitation method (Tanaka, 1994; Foster et al., 1995; Loy et al., 1995; Godfrey, 1998; Millet et al., 2002; Becker et al., 2008).

More prominently, however, CT experiences prompted increased awareness and self-reflection regarding sports retirement. Engaging in CT led athletes to reconsider their self-concept, as they recognised not only that life existed beyond their primary sport, but also that they were capable of engaging in and enjoying activities outside of their athletic specialisation. Some athletes reported having given greater thought to their post-sporting future, with a few even beginning to formulate preliminary retirement plans. Notably, some

athletes expressed a newfound sense of enthusiasm for retirement, viewing it as an opportunity to participate more fully in their CT group or explore additional recreational sporting activities. These reflections align with existing literature, as the adoption of new CT groups appeared to broaden athletes' SIs, reducing their reliance on a single, sport-dominant identity. This process may be particularly valuable in preventing identity foreclosure - a phenomenon in which athletes' self-concept becomes overly tied to their sport, making retirement transitions more challenging (Cruwys et al., 2020; O'Halloran & Haslam, 2020).

Furthermore, these newly adopted CT groups were not simply perceived as independent recreational activities; rather, many athletes viewed them as transitional resources. As athletes approached key transition points, such as injury or retirement, these CT groups provided an alternative GMs that could gradually increase in salience as their primary sporting identity diminished (Haslam et al., 2019; Cruwys et al., 2020; O'Halloran & Haslam, 2020). In this way, CT groups functioned as a scaffolding mechanism, allowing athletes to maintain a connection to sport while gradually adapting to life beyond elite competition. Some athletes anticipated increasing their engagement with their CT group post-retirement or even branching out into additional non-serious, recreational sports. This demonstrates a clear application of the first and second pathways of the SIMIC model, in which the maintenance of meaningful group memberships plays a crucial role in navigating identity transitions (Haslam et al., 2019; Cruwys et al., 2020; O'Halloran & Haslam, 2020).

Athletic Identity

When discussing their CT experiences and participation in CT groups, athletes consistently emphasised the primacy of their main sport. Their perceptions of CT were framed through the lens of their AI and primary sporting commitments, demonstrating a strong and salient AI (Brewer et al., 1993; Brewer & Cornelius, 2001). The extent to which athletes viewed CT as beneficial was largely determined by its impact - whether direct or indirect - on their main sport. For instance, most athletes reported that CT provided an opportunity to mentally disengage from their primary sport, allowing them to clear their minds and return feeling refreshed. Others found that CT facilitated relaxation and alleviated academic or sporting stress, enabling them to maintain better focus during training sessions.

This framing further illustrates that, while CT may have been intrinsically enjoyable, its perceived value was contingent on its compatibility with athletes' primary sporting commitments. If CT was seen as conflicting with or detracting from their main sport in any way - such as by introducing scheduling conflicts or causing fatigue - its overall positivity

was significantly diminished. This aligns with the broader SI literature, which suggests that when social groups are perceived as incompatible, they are less likely to be positively integrated into an individual's social identity (Haslam et al., 2019; Cruwys et al., 2020; O'Halloran & Haslam, 2020).

The quantitative findings of the current study support this perspective, as there were no significant differences in athletes' AI scores, as measured by the AIMS and SISQ questionnaires, between pre- and post-CT assessments. This only being made clearer by the very small effect size changes. This suggests that despite participating in CT and incorporating an additional GM into their SI, athletes' identification with their main sport and team remained stable. Further subscale analysis reinforced this finding, highlighting that AI remained central to athletes' self-concept and continued to exert a profound influence over their perceptions and experiences (Brewer et al., 1993; Brewer & Cornelius, 2001; Bruner & Benson, 2018a; 2018b).

Sport Commitment

The findings regarding SC align with earlier discussions on athletes' broadened SI and their realisation that there is more to life beyond their sport. Some athletes reported feeling less constrained and tied to their primary sport, as their identity was no longer solely defined by it (Scanlan et al., 2016; Haslam et al., 2020; Cruwys et al., 2020; O'Halloran & Haslam, 2020). Their sense of self was more diversified, no longer being entirely structured around their commitment to sport (Brewer et al., 1993; Cruwys et al., 2020; O'Halloran & Haslam, 2020). Athletes specifically commented on improvements in key SC components, including enjoyment, social support, valued opportunities, and desire to excel, while simultaneously experiencing a reduction in constrained commitment to their main sport. These changes appeared to stem from personal reflection prompted by their ongoing CT experiences. Engaging in an alternative sporting activity, whether alongside existing teammates or with an entirely new group, seemed to result in positive self-reflection on their primary sport and overall identity.

Through the SCM, it can be inferred that some athletes experienced an increase in their commitment to their main sport. This was reflected in positive changes in some SC components, increased overall motivation, and a decrease in the feeling of being constrained by their sport. These findings expand upon existing CT literature, which suggests that CT can enhance motivation and 'training eagerness' for the main sport (Stamford, 1991; Loy et al., 1993; Mutton et al., 1993; Tanaka, 1994; Godfrey, 1998; White et al., 2003; Becker et al.,

2008), and they offer insight into the mechanisms by which CT exerts these effects on athletes.

However, the SCQ-2 results showed no significant changes in sport commitment levels and effect sizes were mostly very small or negligible. This is another example of the qualitative and quantitative data differing and suggests that the relationship between CT and SC is complex and requires further exploration. What can be stated with relative certainty is that CT does not significantly diminish athletes' overall SC or its individual components. This finding is logical within the broader literature and study findings, as CT was often viewed by athletes as an extension of their primary sport. CT was framed as a means to achieve the same overarching goal - performance success - rather than a competing or distracting activity (Stamford, 1991; Tanaka, 1994; Godfrey, 1998; Grier et al., 2015; Yuvaraj & Vishnuvardhan, 2015). Since CT was perceived as a complementary rather than conflicting activity, it did not diminish SC (Schmidt & Stein, 1991; Scanlan et al., 1993a; Scanlan et al., 2016).

Small observed effects in subscales 'personal investment quantity' and 'informational social support' may warrant closer examination in follow-up studies. Determining whether CT increases athletes' SC is complex and beyond the scope of this exploratory study, given that the findings include evidence both for and against the effect. This suggests the need for further, more in-depth research. . With the quantitative and qualitative findings not always aligning (such as with findings relating to perceived stress and sport commitment), the divergence highlights the complexity of athlete experiences and suggests that different data types may capture different dimensions of the psychological impact of cross-training.

It is worth noting that CT may have an immediate and consistent impact on the 'other priorities' component of SC, as it represents an additional commitment that athletes must balance (Scanlan et al., 2013; Scanlan et al., 2016). However, when CT is designed to be non-intrusive, flexible, and integrated into an athlete's schedule as a secondary yet complementary activity, it is unlikely to negatively affect SC. The findings suggest that athletes were highly adaptable in how they framed CT, ensuring its compatibility with their existing SCs.

Psychological Impacts of Cross-Training

Overall, the study's findings align with existing literature on the psychological benefits of CT, particularly in its role in increasing variety, alleviating boredom and staleness, enhancing enjoyment, and reducing stress and maybe even burnout (Stamford, 1991; Tanaka, 1994; Loy et al., 1995; Pizza et al., 1995; Godfrey, 1998; Millet et al., 2002; White et al., 2003; Becker et al., 2008; Yuvaraj & Vishnuvardhan, 2015). This study provides empirical

support for these claims by identifying the psychological mechanisms underpinning these benefits. The findings also align with White's (2003) post-study observations, expanding on them further. Specifically, a structured CT programme appears to significantly enhance athletes' enjoyment and provide a sense of refreshment - not only at the conclusion of the programme but on a week-to-week basis. This effect is largely attributed to CT's ability to foster the adoption of an additional, separate GM, which offers social, psychological, and transitional resources while also increasing athletes' perceived control over their experiences.

Another key psychological impact of CT for elite athletes relates to the athlete dilemma - the challenge of balancing a broadened SI with the maintenance of a strong AI. The study findings suggest that CT is an effective resource for broadening SI while also delivering immediate and significant mental health benefits. This is primarily due to the capacity of CT groups to aid in managing hardships and facilitating transitions, both of which are critical for long-term athlete well-being.

However, SI broadening alone is only one side of the athlete dilemma. While multiple GMs can provide psychological resilience and mitigate stress, a strong and salient AI - characterised by high SC and a strong drive for performance success - remains essential for elite athletes. Broadening identities are expected to dilute this singular focus, raising concerns about potential negative effects on motivation and commitment. Contrary to these concerns, the findings of the current study indicate that CT did not diminish AI, main sport identification, or SC in this way. Instead, athletes continued to maintain their SI and associated motivations, despite engaging in CT and adopting new SIs. This was supported by both qualitative and quantitative data. This suggests that CT does not inherently reduce an athlete's dedication to their primary sport but rather enhances their psychological resilience by allowing them to balance their commitments more effectively. As a result, CT appears to offer a potential solution for athletes navigating the athlete dilemma, as it supports both identity broadening and commitment maintenance, satisfying both sides of the equation.

Compatibility

The final key finding of this study concerns the compatibility of CT with athletes' primary sport and broader lifestyle. The results suggest that while CT can offer substantial psychological and social benefits, these positive effects are contingent on compatibility. If CT aligns well with an athlete's main sporting commitments and AI, its benefits are maximised. However, if CT becomes even slightly inconvenient or misaligned with an athlete's primary

sporting demands, its impact can quickly shift from being positive to becoming a source of stress and disruption.

These findings are consistent with the SI literature, which suggests that the value of a GM is highly dependent on its compatibility with an individual's existing identity structures (Haslam et al., 2019; Cruwys et al., 2016, 2020; O'Halloran & Haslam, 2020). Athletes in this study largely embraced CT because they perceived it as an extension of their sporting experience rather than a competing commitment. However, for some athletes, when CT became difficult to integrate into their schedules or introduced conflicting demands, its perceived value diminished significantly.

Ultimately, for CT to be an effective resource, it must remain convenient and complementary to an athlete's existing commitments. If CT activities are incompatible with athletes' main sport or wider sporting identity, they risk becoming an additional source of internal conflict and stress, rather than a beneficial support mechanism. Therefore, when implementing CT programmes, careful consideration must be given to ensuring alignment with athletes' primary sport, training schedules, and overall lifestyle to maintain its positive impact.

5.2 Study Implications

The findings of this study suggest that a CT programme for elite athletes can offer perceivable mental health benefits. Engaging in an additional, non-serious, enjoyable, and socially based sporting activity may help athletes redefine their self-concept and adopt a new GM. As a result, athletes may develop a greater ability to protect against, manage, and cope with stress-inducing hardships across different aspects of their lives, including those stemming from their main sport.

Therefore, elite sporting programmes aiming to support athletes' mental well-being should consider implementing socially oriented, non-mandatory alternative sporting activities. Additionally, providing education and encouragement on the mental health benefits of such initiatives could increase acceptance and participation among athletes. Beyond the intrinsic value of improving well-being, the introduction of CT groups may also indirectly enhance performance through mechanisms outlined in the performance hypothesis. In this way, CT presents a potential solution to the athlete dilemma, which remains a persistent challenge in elite sport.

This study also contributes to the growing body of research on SI in sport, offering new insights into how athletes integrate additional GMs into their AI. A key finding is that

athletes can creatively frame new GMs within their AI and primary sporting groups, while still perceiving them as separate entities, provided that these groups contribute to their overall sporting goals. Additionally, the study finds that adopting additional sporting groups does not necessarily or significantly diminish athletes' main sporting identities or AI salience. Instead, it appears to broaden self-concept, reinforcing the notion that it is possible for elite athletes to develop multiple group memberships without weakening their primary athletic identity. Importantly, the findings suggest that exposure to additional sporting groups may help break identity foreclosure, a common risk associated with the intense specialisation required in elite sport.

Furthermore, this study strengthens existing evidence on the value of multiple GMs in promoting mental well-being, alleviating hardship, and facilitating transitions. The findings may also provide an explanation for Rees's (2016) conclusion that elite athletes are more likely to become super-elite when they engage in a social sport pairing. The psychological benefits of CT suggested to include stress reduction, enhanced motivation, and improved social support, could contribute to this performance advantage.

This study also helps address a gap in the psychological investigation of CT, providing empirical evidence to support previously hypothesised psychological benefits. The findings confirm and expand upon existing suggestions regarding CT's positive effects on well-being and identity development, offering deeper insights into how and why these effects occur. As a result, the CT literature now demonstrates a more comprehensive understanding of its benefits, potential drawbacks, and optimal conditions for implementation, accounting for physiological and psychological health and development.

Finally, this study further highlights CT's potential role as a rehabilitation method for injured athletes. In addition to its well-established physiological benefits, the findings suggest that CT can enhance confidence, provide a sense of identity continuity, and serve as a mental stepping stone during the transition back to full sporting participation. This further reinforces the viability of CT as a valuable tool in injury rehabilitation programmes.

These findings are insightful, however, should be interpreted with caution given the exploratory nature of the study and the limited sample size. Nonetheless, they offer preliminary insights into the potential psychological effects of cross-training on elite university athletes, warranting further investigation.

This study illustrates how meaningful psychological and identity-related changes can occur in the absence of statistically significant quantitative effects—underscoring the value of mixed-methods designs.

5.3 Study Limitations and Recommendations for Future Research

While this study provides valuable insights into the effects of CT on elite athletes' SI and AI, several limitations must be acknowledged. These limitations primarily relate to sample size, participant composition, methodological constraints, and potential biases in data collection. To build upon these findings, future research should aim to address these limitations through methodological refinements and broader participant recruitment strategies.

One major limitation was the insufficient number of athletes completing the AIMS, SIQS, PSS, and SCQ-2 questionnaires at both pre- and post-intervention stages. As a result, the statistical power of these measures was not sufficient to detect significant effects that may have been present. Given the complexity of SI, AI, and SC, larger sample sizes with higher retention rates in questionnaire completion would be necessary to derive more robust and generalisable findings. To mitigate this issue, future studies should seek to extend the duration of the research beyond six weeks, allowing for a longer-term assessment of how CT impacts athletes' SI, AI, and SC over time. Extending the timeframe would help differentiate between short-term novelty effects and more stable, enduring changes in identity and psychological well-being.

Additionally, two questionnaire samples demonstrated departures from normality, which may have affected the precision of parametric analyses. Future studies should consider using non-parametric tests or data transformations where appropriate.

The scheduling and logistical constraints of both the researcher and participants influenced the composition and depth of the SSFG discussions. All SSFGs were conducted with athletes from the same sport and squad, often consisting of individuals undergoing the same CT activity. This structure was largely dictated by availability - sessions were frequently scheduled immediately before or after training, as this was the most practical time to gather participants. However, this approach restricted the diversity of perspectives, as athletes were discussing CT within the familiar context of their existing teammates, rather than interacting with individuals from different sports. As a consequence, the SSFG discussions may have lacked contrasting viewpoints, particularly regarding how different sporting backgrounds might influence perceptions of CT. Future research should aim to recruit participants from a wider range of individual and team sports, facilitating focus groups that incorporate athletes from different disciplines. This would provide a more holistic

understanding of how CT is perceived across different sporting contexts and enhance the generalisability of findings. Additionally, cross-sectional research involving athletes who already participate in CT - such as those who engage in a primary sport alongside a secondary, non-serious social sport - could offer further insights into how CT identities are internalised over extended periods.

A further limitation was the disproportionate representation of swimmers within the study sample. While athletes from various sports were included, a significant majority were swimmers, meaning that the study's findings were heavily influenced by the experiences and perspectives of this specific athletic group. Swimmers often operate in individual but team-supported environments, train in a physically demanding and regimented manner, and experience intense seasonal fluctuations in workload and competition schedules. These factors could shape their unique experiences with CT, which may not be fully representative of athletes from team sports, contact sports, or other individual disciplines such as athletics or combat sports. To enhance the generalisability of findings, future studies should aim for a more diverse sample of elite athletes across a broader range of sports. This would allow researchers to examine whether team-based athletes experience CT differently from individual-sport athletes and whether the psychological and social benefits of CT differ based on training structures, competition schedules, and sport-specific demands.

The study utilised a voluntary recruitment process, meaning that athletes who were predisposed to viewing CT favourably were more likely to participate. Those with negative perceptions of CT, or those who viewed it as incompatible with their main sport, may have been less inclined to engage in the study. This self-selection bias could have led to an overestimation of CT's benefits, as the participant pool was likely composed of athletes who were already open to, or interested in, alternative training approaches. Additionally, the voluntary nature of recruitment may have excluded athletes facing extreme time constraints, high performance pressures, or those experiencing injury-related restrictions, thereby limiting the study's ability to capture the full spectrum of experiences and challenges associated with CT. To address this limitation, future research should adopt a more structured recruitment strategy, potentially incorporating random sampling methods or working directly with elite sport organisations and coaches to ensure a more balanced range of participant perspectives. Additionally, greater efforts should be made to educate athletes and coaching staff on the indirect benefits of CT, as greater awareness could increase athlete participation and reduce potential resistance from coaching staff concerned about CT's impact on main sport performance.

A final limitation of this study is that the implementation of CT programmes varied across participants, with differences in frequency, duration, and intensity of CT engagement. Although athletes provided valuable insights in the SSFGs and SSIs regarding optimal CT programme design, these findings were not formally tested within a controlled experimental intervention. Future research should draw on these athlete insights (see Appendix 7) to design structured CT interventions that systematically evaluate how programme characteristics influence psychological outcomes. For example, future studies could compare mandatory vs. voluntary CT participation, team-based vs. individual CT activities, or low vs. high-intensity CT sessions to determine which approaches are most effective in promoting SI, AI, and mental well-being.

5.4 Conclusions

This study explored the impact of a 6-week CT programme on elite athletes' SI and AI, as well as any associated changes in SC and perceived stress. The findings suggest that CT holds potentially favourable psycho-social value for elite athletes, with the potential to enhance well-being, support identity development, and address key challenges faced by those operating in high-performance sport.

A central finding was that CT appeared to broaden athletes' SI, with many participants adopting their CT group into their sense of self. Despite being framed as 'nonserious' and socially oriented, these additional group memberships were not superficial; they were internalised and valued, and often creatively positioned within or adjacent to athletes' dominant sport-related identities. This identity broadening occurred without diminishing their AI, which remained strong and salient throughout. The compatibility of CT with athletes' primary sporting lives appears crucial in enabling this dual identity integration.

The CT experience also provided athletes with versatile psychosocial resources. CT groups were perceived as enjoyable, flexible, and environmentally distinct from athletes' main sport contexts. These characteristics allowed athletes to use CT as a form of mental respite, helping them to relax, de-stress, and refresh both cognitively and emotionally. Importantly, these effects extended to improved social interaction, increased feelings of control, and greater resilience to stress and hardship - aligning closely with established group membership literature.

Moreover, CT appeared to serve as a transitional resource. Athletes reflected on injury and retirement transitions, with several participants describing how their CT group offered confidence, continuity, and even future direction beyond their athletic careers. This suggests

that CT may support athletes in managing identity foreclosure and life after sport, providing scaffolding for a more adaptive transition.

Findings related to SC were complex. While some athletes reported renewed motivation, increased enjoyment, and reduced constrained commitment, SCQ-2 data revealed no significant change. However, the qualitative data point to a nuanced reality: CT may support SC indirectly by encouraging self-reflection and allowing athletes to re-engage with their sport with greater balance and perspective. Crucially, CT did not appear to negatively affect commitment or diminish motivation, likely because athletes framed CT as complementary rather than competitive with their primary sport.

The study also highlights the importance of compatibility. When CT was seen as aligned with athletes' sport identities, values, and routines, its benefits were increased. However, when CT became inconvenient or misaligned, participants reported frustration or disengagement. Thus, for CT to be an effective tool for athlete well-being and performance, it must be carefully tailored to fit individual schedules, preferences, and performance demands.

In summary, this exploratory study provides promising evidence that CT can positively influence elite athletes' SI, support mental well-being, and enhance commitment without undermining their core athletic identity. Ultimately, with appropriate design and implementation, CT holds potential as a practical and psychological tool that helps athletes navigate the complex demands of elite sport - supporting performance, well-being, and identity development in tandem. The findings align with existing SI and CT literature and offer new insights into the mechanisms through which these benefits arise. However, further research is needed to explore the long-term stability of these effects, assess outcomes across a broader range of sports, and develop evidence-informed guidelines for integrating CT into elite sport environments.

Reference List

- Alexandris, K., Zahariadis, P., Tsorbatzoudis, C., and Grouios, G. (2002). Testing the sport commitment model in the context of exercise and fitness participation. *Journal of Sport Behavior*, 25(3), 217-230.
- Aspenes, S., Kjendlie, P. L., Hoff, J., and Helgerud, J. (2009). Combined strength and endurance training in competitive swimmers. *Journal of Sports Science & Medicine*, 8(3), 357-365.
- Atkinson, M. (2012). *Key concepts in sport & exercise research methods*. Sage.
- Baker, J. (2003). Early specialization in youth sport: a requirement for adult expertise?. *High ability studies*, 14(1), 85-94.
- Baker, J., Cobley, S., and Fraser-Thomas, J. (2009). What do we know about early sport specialization? Not much!. *High Ability Studies*, 20(1), 77-89.
- Becker, B. E., Lindle-Chewning, J. M., Huff, K., Sherlock, B. W., Sherlock, L. A., Stolt, M., and Haff, G. G. (2008). Aquatic cross training for athletes: Part ii. *Strength & Conditioning Journal*, 30(3), 67-73.
- Berger, R. (2015). Now I see it, now I don't: Researcher's position and reflexivity in qualitative research. *Qualitative research*, 15(2), 219-234.
- Boen, F., Fransen, K., and Haslam, S. A. (2020). Towards a new psychology of sport and exercise. In S. A. Haslam, K. Fransen and F. Boen (Eds.), *The new psychology of sport and exercise: The social identity approach*. Sage.
- Boyatzis, R. E. (1998). *Transforming qualitative information: Thematic analysis and code development*. Sage.
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative research in psychology*, 3(2), 77-101.
- Brewer, B. W., Van Raalte, J. L., and Linder, D. E. (1993). Athletic identity: Hercules' muscles or Achilles heel?. *International Journal of Sport Psychology*, 24(2), 237-254.
- Brewer, B. W., and Cornelius, A. E. (2001). Norms and factorial invariance of the Athletic Identity Measurement Scale. *Academic Athletic Journal*, 15(2), 103-113.
- Bruner, M. W., and Benson, A. J. (2018). Social Identity Questionnaire for Sport (SIQS). *APA PsycTests*. (b)

- Bruner, M. W., and Benson, A. J. (2018). Evaluating the psychometric properties of the Social Identity Questionnaire for Sport (SIQS). *Psychology of Sport and Exercise*, 35, 181-188. (a)
- Bryman, A. (2008). *Social research methods* (3rd ed.). Oxford University Press.
- Buckworth, J., Dishman, R. K., O'Connor, P. J., and Tomporowski, P. D. (2013). *Exercise psychology* (2nd Ed.). Human Kinetics. 93-99.
- Burns, G. N., Jasinski, D., Dunn, S. C., and Fletcher, D. (2012). Athlete identity and athlete satisfaction: The nonconformity of exclusivity. *Personality and Individual Differences*, 52(3), 280-284.
- Carpenter, P. J. (1993). Staying in sport: Young athletes' motivations for continued involvement. *Unpublished Doctoral Thesis*. University of California.
- Carpenter, P. J., and Coleman, R. (1998). A longitudinal study of elite youth cricketers' commitment. *International Journal of Sport Psychology*, 29(3), 195–210.
- Carpenter, P. J., and Scanlan, T. K. (1998). Changes over time in the determinance of sport commitment. *Pediatric Exercise Science*, 10, 356-365.
- Carpenter, P. J., Scanlan, T. K., Simons, J. P., and Lobel, M. (1993). A test of the sport commitment model using structural equation modelling. *Journal of Sport and Exercise Psychology*, 15(2), 119-133.
- Casper, J. M., and Andrew, D. P. (2008). Sport commitment differences among tennis players on the basis of participation outlet and skill level. *Journal of Sport Behavior*, 31(3), 201-219.
- Cheek, J. M., and Briggs, S. R. (2013). Aspects of Identity Questionnaire (AIQ-IV). Measurement instrument database for the social science. Retrieved from www.midss.ie.
- Chiu, Y. H., Lu, F. J. H., Lin, J. H., Nien, C. L., Hsu, Y. W., and Liu, H. Y. (2016). Psychometric properties of the Perceived Stress Scale (PSS): measurement invariance between athletes and non-athletes and construct validity. *PeerJ*, 4, 1-20.
- Cohen, S, Kamarck, T., and Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior*, 24(4), 385-396.
- Cohen, S., Kamarck, T., and Mermelstein, R. (1994). Perceived stress scale. Measuring stress: A guide for health and social scientists. *Mind Garden*, 10(2), 1-2.

- Cruwys, T., Steffens, N. K., Haslam, S. A., Haslam, C., Jetten, J., and Dingle, G. A. (2016). Social Identity Mapping: A procedure for visual representation and assessment of subjective multiple group memberships. *British Journal of Social Psychology*, 55(4), 613-642.
- Cruwys, T., Stevens, M., Haslam, S. A., and Olive, L. (2020). Mental health and resilience. In S. A. Haslam, K. Fransen and F. Boen (Eds.), *The new psychology of sport and exercise: The social identity approach*. Sage.
- Demir, İ. H. & Tuzcuoğlu, A. S. (2023). Social Identity Scale: A validity and reliability study. *TRC Journal of Humanitarian Action*, 2, 111-122.
- Demirden, A. (2021). The critical examination of social identity theory. *Politik Psikoloji Dergisi*, 1(2), 39-56.
- Dicicco-Bloom, B., Crabtree B.F., (2006). The qualitative research interview. *Medicine Education*, 40(4), 314-321.
- Dwyer, S. C., & Buckle, J. L. (2009). The space between: On being an insider-outsider in qualitative research. *International journal of qualitative methods*, 8(1), 54-63.
- Ellemers, N., and Haslam, S., A. (2012). Social identity theory. In P. A. M. Van Lange, T. E. Higgins and A. W. Kruglanski (Eds.), *Handbook of theories of social psychology* (2nd ed., 379-398). Sage.
- Feeley, B. T., Agel, J., and LaPrade, R. F. (2015). When is it too early for single sport specialization?. *The American Journal of Sports Medicine*, 44(1), 234-241.
- Finlay, L. (2002). "Outing" the researcher: the provenance, process, and practice of reflexivity. *Qualitative health research*, 12(4), 531-545.
- Flynn, M. G., Carroll, K. K., Hall, H. L., Bushman, B. A., Brolinson, P. G., and Weideman, C. A. (1998). Cross training: indices of training stress and performance. *Medicine and Science in Sports and Exercise*, 30(2), 294-300.
- Flynn, M. G., Pizza, F. X., and Brolinson, P. G. (1997). Hormonal responses to excessive training: influence of cross training. *International Journal of Sports Medicine*, 18(3), 191-196.

- Foster, C., Hector, L. L., Welsh, R., Schrager, M., Green, A. M., and Snyder, A. C. (1995). Effects of specific versus cross-training on running performance. *European Journal of Applied Physiology and Occupational Physiology*, 70(4), 367-372.
- Gibson, K. (2016). Mixed-Methods research in sports & exercise. In B. Smith and A. C. Sparkes (Eds.), *Routledge handbook of qualitative research in sport and exercise*. Routledge.
- Godfrey, R. J. (1998). Cross-training. *Sports Exercise and Injury*, 4(1), 50-55.
- Gould, D. (1987). Understanding attrition in children's sport. In D. Gould and M. R. Weiss (Eds.), *Advances in pediatric sciences: Behavioral issues* (2nd Ed., 61-85). Human Kinetics.
- Gould, D. (2010). Early sport specialization: A psychological perspective. *Journal of Physical Education, Recreation & Dance*, 81(8), 33-37.
- Gould, D., and Petlichkoff, L. M. (1988). Participation motivation and attrition in young athletes. In F. L., Smoll, R. A., Magill and M. J. Ash (Eds.), *Children in sport* (3rd ed., 161-178). Human Kinetics.
- Greenaway, K. H., Sankaran, S., Wolf, S. A., and Mitchell, J. (2020). Motivation. In S. A. Haslam, K. Fransen and F. Boen (Eds.), *The new psychology of sport and exercise: The social identity approach*. Sage.
- Grier, T., Canham-Chervak, M., Anderson, M. K., Bushman, T. T., and Jones, B. H. (2015). The effects of cross-training on fitness and injury in women. *US Army Medical Department Journal*, 2015(2), 23-31.
- Guest, G., Namey, E., and McKenna, K. (2017). How Many Focus Groups Are Enough? Building an Evidence Base for Nonprobability Sample Sizes. *Field Methods*, 29(1), 3–22. (a)
- Guest, G., Namey, E., Taylor, J., Eley, N., and McKenna, K. (2017). Comparing focus groups and individual interviews: findings from a randomized study. *International Journal of Social Research Methodology*, 20(6), 693-708. (b)
- Haff, G. G. (2008). Aquatic Cross Training for Athletes: Part I. *Strength & Conditioning Journal*, 30(2), 18-26.

- Haslam, C., Steffens, N. K., Branscombe, N. R., Haslam, S. A., Cruwys, T., Lam, B. C., Pachana, N. A., and Yang, J. (2019). The importance of social groups for retirement adjustment: evidence, application, and policy implications of the social identity model of identity change. *Social Issues and Policy Review*, 13(1), 93-124.
- Haslam, S. A., Fransen, K., Boen, F., and Reicher, S. (2020). The social identity approach to sport and exercise psychology. In S. A. Haslam, K. Fransen and F. Boen (Eds.), *The new psychology of sport and exercise: The social identity approach*. Sage.
- Heere, B., and James, J. D. (2007). Stepping outside the lines: Developing a multi-dimensional team identity scale based on social identity theory. *Sport Management Review*, 10(1), 65-91.
- Holmes, A. G. D. (2020). Researcher Positionality - A Consideration of Its Influence and Place in Qualitative Research--A New Researcher Guide. *Shanlax International Journal of Education*, 8(4), 1-10.
- Hornsey, M. J. (2008). Social identity theory and self-categorization theory: A historical review. *Social and personality psychology compass*, 2(1), 204-222.
- Huddy, L. (2001). From social to political identity: A critical examination of social identity theory. *Political psychology*, 22(1), 127-156.
- Jacobson, D., and Mustafa, N. (2019). Social identity map: A reflexivity tool for practicing explicit positionality in critical qualitative research. *International Journal of Qualitative Methods*, 18, 1-12.
- Jones, I. (2015) *Research methods for sport studies* (3rd ed.). Routledge.
- Jovanović, V., Lazić, M., Gavrilov-Jerković, V., Obradović, V., Šakan, D., Tomašević, A. and Zotović-Kostić, M. (2024). Aspects of Identity Questionnaire-IV: An Examination of Structural Validity, Gender Invariance, and Relationships with Mental Health and Basic Psychological Needs Among Adolescents. *Journal of Personality Assessment*, 1–13.
- Kaplowitz, M. D., and Hoehn, J. P. (2001). Do focus groups and individual interviews reveal the same information for natural resource valuation?. *Ecological Economics*, 36(2), 237-247.
- Kelley, H. H. (1983). Love and commitment. In H. H. Kelley, E. Berscheid, A. Christensen, J. H. Harvey, T. L. Huston, G. Levinger, E. McClintock, L. A. Peplau, and D. R. Peterson (Eds.), *Close relationships* (265-311). W.H. Freeman.

- Lamont-Mills, A., and Christensen, S. A. (2006). Athletic identity and its relationship to sport participation levels. *Journal of Science and Medicine in Sport*, 9(6), 472-478.
- Lang, J. W., and Fries, S. (2006). A revised 10-item version of the Achievement Motives Scale. *European Journal of Psychological Assessment*, 22(3), 216-224.
- Layder, D. (2013). *Doing excellent small-scale research*. Sage.
- Lee, E. H. (2012). Review of the psychometric evidence of the perceived stress scale. *Asian Nursing Research*, 6(4), 121-127.
- Lin, C. H., Lu, F. J., Chen, T. W., and Hsu, Y. (2022). Relationship between athlete stress and burnout: a systematic review and meta-analysis. *International Journal of Sport and Exercise Psychology*, 20(5), 1295-1315.
- Lochbaum, M., Cooper, S., Limp, S. (2022). The Athletic Identity Measurement Scale: A Systematic Review with Meta-Analysis from 1993 to 2021. *European Journal of Investigation in Health, Psychology and Education*, 12, 1391–1414.
- Loy, S. F., Hoffmann, J. J., and Holland, G. J. (1995). Benefits and practical use of cross-training in sports. *Sports Medicine*, 19(1), 1-8.
- Loy, S. F., Holland, G. J., Mutton, D. L., Snow, J., Vincent, W. J., Hoffmann, J. J., and Shaw, S. (1993). Effects of stair-climbing vs run training on treadmill and track running performance. *Medicine and Science in Sports and Exercise*, 25(11), 1275-1278.
- Mallett, C., Kawabata, M., Newcombe, P., Otero-Forero, A. and Jackson, S. (2007). Sport motivation scale-6 (SMS-6): A revised six-factor sport motivation scale. *Psychology of sport and exercise*, 8(5), 600-614.
- Mason, M. (2010). Sample Size and Saturation in PhD Studies Using Qualitative Interviews. *Forum: Qualitative Social Research*, 11(3), 1-8.
- Millet, G. P., Candau, R. B., Barbier, B., Busso, T., Rouillon, J. D., and Chatard, J. C. (2002). Modelling the transfers of training effects on performance in elite triathletes. *International Journal of Sports Medicine*, 23(1), 55-63.
- Mirhosseini, M., Hadavi, F., and Mozaffari, A. (2013). Validity and reliability of sport commitment model among athletic students. *Journal of Sport Management*, 4(15), 105-121.

- Moesch, K., Elbe, A. M., Hauge, M. L., and Wikman, J. M. (2011). Late specialization: the key to success in centimetres, grams, or seconds (cgs) sports. *Scandinavian Journal of Medicine & Science in Sports*, 21(6) 282-290.
- Mutton, D. L., Loy, S. F., Rogers, D. M., Holland, G. J., Vincent, W. J., and Heng, M. (1993). Effect of run vs combined cycle/run training on VO₂max and running performance. *Medicine and Science in Sports and Exercise*, 25(12) 1393-1397.
- Oakes, P. (2002). Psychological groups and political psychology: A response to Huddy's "critical examination of social identity theory". *Political Psychology*, 23(4), 809-824.
- O'Halloran, L. M., and Haslam, C. (2020). Career transitions. In S. A. Haslam, K. Fransen and F. Boen (Eds.), *The new psychology of sport and exercise: The social identity approach*. Sage.
- Pierce, E. F., Weltman, A., Seip, R. L., and Snead, D. (1990). Effects of training specificity on the lactate threshold and VO₂ peak. *International Journal of Sports Medicine*, 11(4), 267-272.
- Pizza, F. X., Flynn, M. G., Starling, R. D., Brolinson, P. G., Sigg, J., Kubitz, E. R. and Davenport, R. L. (1995). Run training vs cross training: influence of increased training on running economy, foot impact shock and run performance. *International Journal of Sports Medicine*, 16(3), 180-184.
- Raedeke, T. D. (1997). A sport commitment perspective. *Journal of Sport & Exercise Psychology*, 19, 396-417.
- Rees, T., Hardy, L., Güllich, A., Abernethy, B., Côté, J., Woodman, T., Montgomery, H., Laing, S., and Warr, C. (2016). The great British medalists project: a review of current knowledge on the development of the world's best sporting talent. *Sports Medicine*, 46(8), 1041-1058.
- Rees, T., Haslam, S., Coffee, P., and Lavalley, D. (2015). A social identity approach to sport psychology: Principles, practice, and prospects. *Sports Medicine*, 45(8), 1083-1096.
- Roberts, G. C. (1992). *Motivation in sport and exercise*. Human Kinetics.
- Ruby, B., Robergs, R., Leadbetter, G., Mermier, C., Chick, T., and Stark, D. (1996). Cross-training between cycling and running in untrained females. *The Journal of Sports Medicine and Physical Fitness*, 36(4), 246-254.

- Rusbult, C.E. (1983). A longitudinal test of the investment model: The development (and deterioration) of satisfaction and commitment in heterosexual involvements. *Journal of Personality and Social Psychology*, 45, 101-117.
- Salvatore, J., Sankaran, S., and Cole, D. (2020). Cognition and performance. In S. A. Haslam, K. Fransen and F. Boen (Eds.), *The new psychology of sport and exercise: The social identity approach*. Sage.
- Scanlan, T. K., and Simons, J. P. (1992). The construct of sport enjoyment. In G. C. Roberts (Ed.), *Motivation in sport and exercise* (199-214). Human Kinetics.
- Scanlan, T. K., Carpenter, P. J., Simons, J. P., Schmidt, G. W., and Keeler, B. (1993). An introduction to the sport commitment model. *Journal of Sport and Exercise Psychology*, 15(1), 1-15. (a)
- Scanlan, T. K., Carpenter, P. J., Simons, J. P., Schmidt, G. W., and Keeler, B. (1993). The sport commitment model: Measurement development for the youth-sport domain. *Journal of Sport and Exercise Psychology*, 15(1), 16-38. (b)
- Scanlan, T. K., Chow, G. M., Sousa, C., Scanlan, L. A., and Knifsend, C. A. (2016). The development of the sport commitment questionnaire-2 (English version). *Psychology of Sport and Exercise*, 22, 233-246.
- Scanlan, T. K., Russell, D. G., Wilson, N. C., and Scanlan, L. A., (2003). Project on Elite Athlete Commitment (PEAK): I. Introduction and Methodology. *Journal of Sport & Exercise Psychology*, 25(3), 360-376. (a)
- Scanlan, T. K., Russell, D. G., Beals, K. P., and Scanlan, L. A. (2003). Project on elite athlete commitment (PEAK): II. A direct test and expansion of the sport commitment model with elite amateur sportsmen. *Journal of Sport and Exercise Psychology*, 25(3), 377-401. (b)
- Scanlan, T. K., Russell, D. G., Scanlan, L. A., Klunchoo, T. J., and Chow, G. M. (2013). Project on Elite Athlete Commitment (PEAK): IV. Identification of new candidate commitment sources in the Sport Commitment Model. *Journal of Sport and Exercise Psychology*, 35(5), 525-535.
- Scanlan, T. K., Stein, G. L., and Ravizza, K. (1989). An in-depth study of former elite figure skaters: II. Sources of enjoyment. *Journal of Sport & Exercise Psychology*, 11(1), 65–83.

- Scanlan, T.K., Carpenter, P.J., Simons, J.P., Keeler, B., and Schmidt, G.W. (1990). A model of sport commitment' *Paper presented at the annual meeting of the North American Society for the Psychology of Sport and Physical Activity*. Houston.
- Schacter, D., Gilbert, D., Wegner, D., and Hood, B. (2016). *Psychology* (2nd Euro Ed.). Palgrave.
- Schmidt, G. W., and Stein, G. L. (1991). Sport commitment: A model integrating enjoyment, dropout, and burnout. *Journal of Sport and Exercise Psychology*, 13(3), 254-265.
- Seggar, J. F., Pedersen, D. M., Hawkes, N. R., and McGown, C. (1997). A measure of stress for athletic performance. *Perceptual and Motor Skills*, 84(1), 227-236.
- Simons, J. P., Scanlan, T. K., Carpenter, P. J., and Schmidt, G. W. (1990). A test of the sport commitment model. *Paper presented at the annual meeting of the North American Society for the Psychology of Sport and Physical Activity*. Houston
- Smith, R. E. (1986). Toward a cognitive-affective model of athletic burnout. *Journal of Sport Psychology*, 8, 36-50.
- Smith, B., & McGannon, K. R. (2018). Developing rigor in qualitative research: Problems and opportunities within sport and exercise psychology. *International Review of Sport and Exercise Psychology*, 11(1), 101–121.
- Smith, J., Blevins, B., Werse, N. R., & Talbert, S. (2021). Researcher positionality in the dissertation in practice. In J. Smith, B. Blevins, N. R. Werse, and S. Talbert (Eds) *Practice-based and practice-led research for dissertation development* (pp. 43-63). IGI Global.
- Stamford, B. (1991). Exercise adviser: Task-Specific Training Vs Cross Training. *The Physician and Sports Medicine*, 19(7), 113-114.
- Stangier, C., Abel, T., Mierau, J., Hollmann, W., Strüder, H. K., (2016). Effects of Cycling Versus Running Training on Sprint and Endurance Capacity in Inline Speed Skating. *Journal of Sports and Science Medicine*, 15(1), 41-49.
- Stephen, S., Coffee, P., Habeeb, C., Morris, R., and Tod, D. (2023). Social identity in sport: A scoping review of the performance hypothesis. *Psychology of Sport and Exercise*, 67, 1-11.

- Swann, C., Moran, A., & Piggott, D. (2015). Defining elite athletes: Issues in the study of expert performance in sport psychology. *Psychology of sport and exercise*, 16, 3-14.
- Tajfel, H. (1972). Social categorization. In S. Moscovici (Ed.). *Introduction a`la psychologie sociale* (272–302). Larousse.
- Tajfel, H., and Turner, J. C. (1979). An integrative theory of intergroup conflict. In W. G. Austin, and S. Worchel (Eds.), *The social psychology of intergroup relations* (33–47). Brooks-Cole.
- Tanaka, H. (1994). Effects of Cross-Training. *Sports Medicine*, 18(5), 330-339.
- Tanaka, H., and Swensen, T. (1998). Impact of resistance training on endurance performance: A new form of cross-training?. *Sports Medicine*, 25, 191-200.
- Theory Hub. (2024). Social Identity Theory. <https://open.ncl.ac.uk/academic-theories/9/social-identity-theory#:~:text=Social%20Identity%20Theory%20has%20the,form%20positive%20identities%20for%20themselves>
- Thibaut, J. W, and Kelley, H. H. (1959). *The social psychology of groups*. Wiley.
- Tracy, S. J. (2010). Qualitative quality: Eight “big-tent” criteria for excellent qualitative research. *Qualitative inquiry*, 16(10), 837-851.
- Turner, J. C. (1982). Towards a cognitive redefinition of the social group’ In H. Tajfel (Ed.), *Social identity and intergroup relations* (15–40). Cambridge University Press.
- Turner, J. C. (1985). Social categorization and the self-concept: A social cognitive theory of group behaviour. In E. J. Lawler (Ed.), *Advances in group processes* (77-122). JAI Press.
- Turner, J. C., Hogg, M. A., Oakes, P. J., Reicher, S. D., and Wetherell, M. S. (1987). *Rediscovering the social group: A self-categorization theory*. Blackwell.
- University of Stirling. (2024). *Performance sport*. <https://www.stir.ac.uk/student-life/sport-at-stirling/performance-sport/>
- Vissek, A. J., Hurst, J. R., Maxwell, J. P., and Watson, J. C. (2008). A cross-cultural psychometric evaluation of the athletic identity measurement scale. *Journal of Applied Sport Psychology*, 20(4), 473-480.

- Weinberg, R. S., and Gould, D. (2019). *Foundations of sport and exercise psychology* (7th Ed.). Human Kinetics.
- Weiss, M. R., Kimmel, L. A., and Smith, A. L. (2001). Determinants of sport commitment among junior tennis players: Enjoyment as a mediating variable. *Pediatric Exercise Science*, 13(2), 131-144.
- White, L. J., Dressendorfer, R. H., Muller, S. M., and Ferguson, M. A. (2003). Effectiveness of cycle cross-training between competitive seasons in female distance runners. *Journal of Strength and Conditioning Research*, 17(2), 319-323.
- WHO, World Health Organisation. (2014). *Mental health atlas 2014* (4th Ed.). World Health Organisation.
- Wilson, P. M., Rodgers, W. M., Carpenter, P. J., Hall, C., Hardy, J., and Fraser, S. N. (2004). The relationship between commitment and exercise behavior. *Psychology of Sport and Exercise*, 5(4), 405-421.
- Woods, B. (2011). *Applying psychology to sport*. Hodder Arnold.
- Young, B. W., and Medic, N. (2011). Examining social influences on the sport commitment of Masters swimmers. *Psychology of Sport and Exercise*, 12(2), 168-175.
- Yuvaraj, D., Vishnuvardhan, K. R. (2015). Effects of Cross-Training on Selected Physical Fitness, Physiological and Skill performance of School Football Players. *International Journal of Law, Education, Social and Sports Studies*, 2(3), 47-49.

Appendix 1 - Social Identity Mapping (SIM) Session Guide and Procedure

Cruwys, T, Steffens, N.K, Haslam, S.A, Haslam, C, Jetten, J, and Dingle, G.A. (2016) 'Social Identity Mapping: A procedure for visual representation and assessment of subjective multiple group memberships' British Journal of Social Psychology, Vol 55, pp.613-642. doi:10.1111/bjso.12155

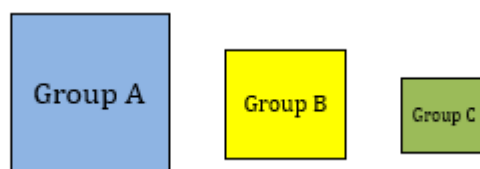
A. Understanding Your Groups

1. Identifying your groups

Please think about all the groups that you belong to. These groups can take any form, for example, they could be broad opinion-based or demographic groups (e.g., feminist; Australian); leisure or social groups (e.g., book group or gardening group); community groups (e.g., church group); sporting groups (e.g., rugby or tennis club); work groups (e.g., sales team); professional groups (e.g., trade union); or any others you can think of.

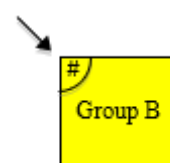
2. How important is each group to you?

Now, please write down the name of each group on a separate post-it note according to how important each group is to you. Please write down the name of each very important group on a large post-it note, the name of each moderately important group on a separate medium-sized post-it note, and the name of each less important group on a separate small post-it note.



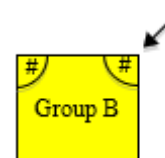
3. How positive do you feel about being a member of each group?

On a scale ranging from 1 (not at all positive) to 10 (very positive), please indicate the extent to which you feel positive about being a member of each group in the top left corner of each post-it.



4. In a typical week, how many days would you engage in activities related to each group?

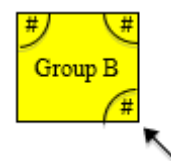
Please indicate the number of days in a typical week that you engage in activities related to each group (ranging from 0 to 7 days). Write this in the top right corner of each post-it.



IF days a month is more appropriate, instead write "0." Before the number

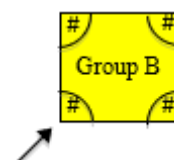
5. How representative are you of the group as a whole?

On a scale ranging from 1 (not at all) to 10 (very well), please indicate the extent to which you feel you are representative of the group (i.e., exemplify what it means to be a member of the group) in the bottom right corner of each post-it



6. For how many years have you been a member of each group?

Please indicate the number of years that you have belonged to each group in the bottom left corner of each post-it (you can also use a decimal; e.g., if you have belonged to a particular group for 6 months, it would be 0.6).

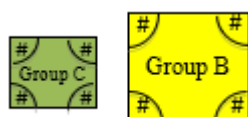


B. Mapping your Groups in Relation to Each Other

7. How different are the groups from each other?

Please arrange your groups on the provided A3 sheet of paper such that the distance between the groups indicates how different the groups are from each other. If you feel two groups are very different from each other (e.g., they do different things, it feels different being a member of each, they have different members), place these far from each other on the provided sheet. If two groups are very similar to each other, place these close to each other.

For example, if Group B and Group C are very similar, place these close to each other as shown below:



For example, if Group B and Group C are very different, place these far from each other as shown below:



8. How easy or difficult is it to be a member of your groups at the same time?

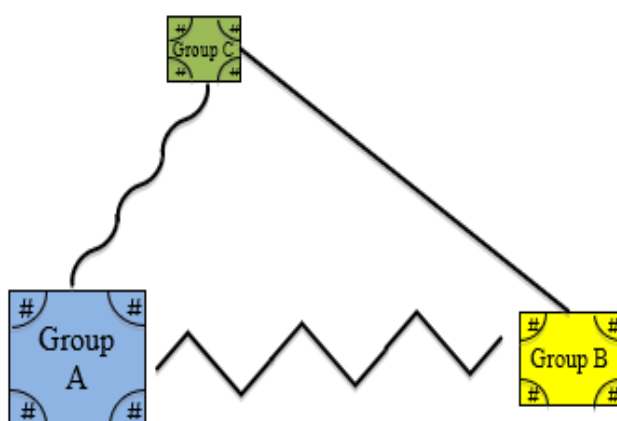
Please indicate how easy or difficult it is to be a member of two different groups (e.g., as a member of your chess club, it might be very easy to be a member of your family but not easy at all to be a member of your rugby club). As shown below, if it is very easy, please connect two groups by a straight line. If it is moderately easy, please connect two groups by a wavy line. If it is not at all easy, please connect two groups by a jagged line. See illustrations below:

very easy: 

moderately easy: 

not at all easy: 

See Figure below that shows how to connect your groups:



Appendix 2 - Social Identity Questionnaire for Sport (SIQS)

Bruner, M.W, and Benson, A.J. (2018) 'Evaluating the psychometric properties of the Social Identity Questionnaire for Sport (SIQS)' Psychology of Sport and Exercise, Vol 35, pp.181-188 ; Bruner, M. W, and Benson, A. J. (2018) 'Social Identity Questionnaire for Sport (SIQS)' [Database record]. APA PsycTests.

Participant Number:

Main Sport:

The following questions are designed to reflect how you feel about being a part of your sports team/squad.

Please answer a number from 1 (strongly disagree) to 7 (strongly agree) to indicate your agreement with each of the statements.

1. I feel strong ties to other members of this team/squad.
2. I find it easy to form a bond with other members in this team/squad.
3. I feel a sense of being “connected” with other members in this team/squad
4. Overall, being a member of this team/squad has a lot to do with how I feel about myself.
5. In general, being a member of this team/squad is an important part of my self-image.
6. The fact that I am a member of this team/squad often enters my mind.
7. In general, I’m glad to be a member of this team/squad.
8. I feel good about being a member of this team/squad.
9. Generally, I feel good when I think about myself as a member of this team/squad.

Appendix 3 - Athletic Identity Measurement Scale (AIMS)

Brewer, B.W, Van Raalte, J.L, and Linder, D.E. (1993) Athletic identity: Hercules' muscles or Achilles heel? International journal of sport psychology, Vol 24, No.2, pp.237-254 ; Brewer, B.W, and Cornelius, A.E. (2001) 'Norms and factorial invariance of the Athletic Identity Measurement Scale' Academic athletic journal, Vol 15, No.2, pp.103-113.

Participant Number:

Main Sport:

This scale is designed to reflect how strongly you identify yourself as an athlete

Please answer the questions with a number from 1 (strongly disagree) to 7 (strongly agree) to indicate your agreement with each of the statements.

1. I consider myself an athlete.
2. I have many goals refers to sport.
3. Most of my friends are athletes.
4. Sport is the most important part of my life.
5. I spend more time thinking about sport than anything else.
6. I feel bad about myself when I do poorly in sport.
7. I would be very depressed if I were injured and could not compete in sport.

Appendix 4 - Sport Commitment Questionnaire-2 (SCQ-2)

Scanlan, T.K, Chow, G.M, Sousa, C, Scanlan, L.A, and Knifsend, C.A.(2016) 'The development of the sport commitment questionnaire-2' (English version). Psychology of Sport and Exercise, Vol 22, pp.233-246.

Participant Number:

Main Sport:

Based on your main sport that you are currently training within, please rate how much you agree/disagree to each statement by answering each question with a number from 1 (strongly disagree) to 5 (strongly agree) using the scale given below. There are no right or wrong answers. We only want your honest opinion about the following statements.

1. Training this sport is fun
2. I have spent a lot of time in this sport
3. Other things in my life make it difficult to train in this sport.
4. I try to dominate in this sport.
5. In this sport, I am constantly trying to improve my skills.
6. The mental effort I have put into this sport makes it difficult to stop.
7. Staying in this sport is more of a necessity than a desire.
8. There are future events in this sport that I would really miss experiencing if I no longer trained.
9. I am being pulled away from this sport by other things in my life.
10. The physical effort I have put into this sport makes it difficult to stop training.
11. I like training in this sport.
12. I am dedicated to keep training in this sport.
13. Once I attain a goal in this sport, I challenge myself to continue improving.
14. I would really miss the travel experiences I have if I no longer trained and competed this sport.
15. People would be upset if I didn't keep training in this sport because they have invested so much.
16. In this sport, I strive for the perfect performance.
17. In this sport, I have put in a lot of training.
18. People would be disappointed if I didn't keep training in this sport.
19. I have a mentor who provides guidance in this sport.
20. People who are important to me attend the majority of my competitions in this sport.

21. I feel trapped in this sport.
22. People who are important to me are there for me after I perform poorly in this sport.
23. The time I have spent in this sport makes it difficult to stop training and competing.
24. I constantly try to learn from my mistakes in this sport.
25. When things get tough in this sport, people who are important to me provide comfort.
26. It is almost impossible to train in this sport because of other things in my life
27. People who are important to me teach me the strategies of this sport.
28. I love to train this sport.
29. In this sport, I strive to be better than my opponents.
30. I would really miss the things I learn in this sport if I didn't train.
31. I am willing to overcome any obstacle to keep training in this sport.
32. Although I think about quitting this sport, I feel I must keep training.
33. I push myself to win every time I compete in this sport.
34. I have put a great deal of mental effort into this sport.
35. People who are important to me teach me about the mental side of this sport.
36. There are other things in my life that limit my participation in this sport.
37. Because people who are important to me also train in this sport, it is assumed that I will keep training.
38. In this sport, I strive to improve every aspect of my performance.
39. I feel I am forced to keep training in this sport.
40. Other things in my life compete with training in this sport.
41. I push myself to reach my full potential in this sport.
42. It is difficult to stop training because of the personal discipline I have maintained in this sport.
43. I feel I have to keep training in this sport, even though I don't want to.
44. To improve in this sport, I push myself to achieve the goals that I have set.
45. Training in this sport is very pleasurable.
46. I am determined to keep training in this sport.
47. In this sport, I challenge myself to be better than everyone else.
48. I have put a great deal of physical effort into this sport.
49. I am very attached to this sport.

50. I would really miss the competition in this sport if I no longer trained and competed
51. When I compete in this sport, people who are important to me cheer me on.
52. People who are important to me expect me to keep training this sport.
53. I will continue to train in this sport for as long as I can.
54. People give me trustworthy advice about this sport.
55. Training this sport makes me happy
56. It is difficult to stop training because of the training I have already put into this sport.
57. In this sport, people provide useful instruction to improve my performance.
58. I am willing to do almost anything to keep training and competing this sport.

Appendix 5 - Perceived Stress Scale (PSS)

Cohen, S, Kamarck, T, and Mermelstein, R. (1994) 'Perceived stress scale. Measuring stress: A guide for health and social scientists' Mind Garden Vol 10, No.2, pp.1-2.

Participant Number:

Main Sport:

The questions in this scale ask you about your feelings and thoughts during the last month. In each case, you will be asked to indicate how often you felt or thought a certain way. Although some of the questions are similar, there are differences between them and you should treat each one as a separate question. The best approach is to answer each question fairly quickly. That is, don't try to count up the number of times you felt a particular way, but rather indicate the alternative that seems like a reasonable estimate.

For each question, please answer from the following alternatives:

- 0. never
- 1. almost never
- 2. sometimes
- 3. fairly often
- 4. very often

1. In the last month, how often have you been upset because of something that happened unexpectedly?

2. In the last month, how often have you felt that you were unable to control the important things in your life?

3. In the last month, how often have you felt nervous and "stressed"?

4. In the last month, how often have you felt confident about your ability to handle your personal problems?

5. In the last month, how often have you felt that things were going your way?

6. In the last month, how often have you found that you could not cope with all the things that you had to do?

7. In the last month, how often have you been able to control irritations in your life?

8. In the last month, how often have you felt that you were on top of things?

9. In the last month, how often have you been angered because of things that were outside of your control?

10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?

Appendix 6 - Semi-Structured Focus Groups (SSFG) and Interviews (SSI) Guide

This is a ROUGH schedule and also NOT a script. Not to be followed methodically or exactly or fully.

Underlined numbers = A distinct question/stage/prompt in discussion

Cambria font = Rough suggested prompts to try and stimulate/keep conversation relevant to want being investigated

“Quotation marks” = Suggested wording of questions/prompts, NOT to be exactly followed like a script

1. Short informal chat to get things started

“Hi, how are you all?” “How are things?” “How is uni?” “How is training?”

“Busy day ahead after this?” “Been up to much today before this?”

2. Brief description of Interview process

“I’m going to ask you all some quite broad open-ended prompts about your CT experiences over the past 6-weeks”; “No right or wrong answers”; “These are attempting to stimulate conversation and discussion between us all”; “Not a rigid interview, I just have some loose questions and prompts”; “Please all share your thoughts”; “We will try to make this last at least 30mins but it will keep under 45mins”

3. Double check have consent to record interview

“Are you all ok with this talk being recorded?”

“What will happen afterwards is I will listen over it again and transcribe what has been said to then be able to extract useful/insightful data, the recording itself will not be played or sent to anyone or published, although my supervisor will have access to it, is this all alright?”

****Start recording if participant has consented**

4. “How have you found these past 6-weeks of cross-training in your main sport and an additional one?/ How did CT affect you in regards to your main and wider athlete lifestyle”

“Has it been good? Bad? Do you enjoy it? Does it affect your main sport in any way?”; “How do you feel about having this new group/activity in your life?”; “Have your relationships with teammates changed?; improved/worsened?”; “Do you feel more a part of the squad?”; “More/less satisfied with training and the program?”; “Feel

competent (or better) in all training or worse?"; "Feel stronger?"; "Enjoy sport more/less?/ Value it more/less? Did cross-training conflict priorities? "Was it easy to complete the study? Difficult? Why?"

5. Discuss Social Identity Map

"You can see your social identity map pre & post cross-training here, tell me about some of the changes that have occurred"; "There doesn't appear to be any changes in your social identity maps despite your experience, why do feel/think that is?". Any additional social worlds? Explore. Any relations changed? Explore. Any priorities/importance of social worlds changed? Explore. Any worlds/relationships/priorities stayed exactly the same despite the changes in training? Explore.

6. Touch on Sport Commitment, try to integrate into discussion on previous 2 questions

Investigate the underlying factors of Sport Commitment (Sport Enjoyment, Valued Opportunities. Other Priorities, Social Support, Social Constraints, Personal Investments, Desire to Excel)

More/less enthusiastic about sport commitment? Feel more/less entrapped in elite sport?

Example for investigating Sport Enjoyment: "Have you had fun?;" Enjoyment lessened?; improved?; stayed same? Has enjoyment already gone back to 'normal' straight after cross-training ended? Has it continued to change in good/bad way? "Have you liked the cross-training?"

See if any of above link to social identity mapping and social identity experiences

7. Touch of perceived stress, try to integrate into discussion on previous questions

"Have you felt more/less in control of life?" Experienced more/less pressure? Felt release? Felt opportunity to 'escape'/relax/'turn off'

See if any of above link to social identity mapping and social identity experiences

8. Touch of previous notable points of piolet study

"Do you find it a good change of pace going from main sport to another? Refreshing? Why?" "Does it trigger any reflection about main sport?" "It is a distraction? Good or bad?"

9. Go back and explore any interesting/noteworthy points picked up on through interview if not fully explored already

"I just want to go back to something you said earlier.... [insert point here] ... tell me more about that/does anyone else have anything to say about that?"

10. Wrap up interview, thank participant for time and info and let them go on with their day

"That is us discussed everything I wanted to talk about." "Is there anything more you'd all like to add?" "Do you have any more questions for me?" "That's our time at 45mins so we will need to end here." "You are free to leave now."

Appendix 7 Programming CT

Programming CT:

Category encompassing codes related to participants thoughts and comments around optimal CT programming. Below are the codes that make up this category

Attendance flexible/voluntary

Code refers to participants commenting that CT attendance needs to be flexible and voluntary.

Desire convenient to MS/ Inconvenient CT is negative

Code refers to participants commenting that CT must be convenient with main sport timings and in terms of how physically draining it is in relation to main sport and that if inconvenient CT would be a negative.

Desire option variety

Code refers to participants commenting that CT must have a variety of options to choose from.

Desire CT pre-arranged

Code refers to participants commenting that CT should be pre-arranged by their sports program so they don't need to sign themselves up for, or organise anything.

Desire team activity/Nice by self

Code refers to participants commenting that CT should either be done as a team or was nice to do by self. This point appears to be more down to the individual, but their preference is important.

Placement in week matters/ Preferred scheduling individualistic

Code refers to participants commenting that CT placement in the week matters greatly however the exact scheduling during the week is very individualistic with strong feeling for beginning, middle, and end of week activities, however these preferences are very important.

Preferred duration individualistic

Code refers to participants commenting that the duration of CT activities is individualistic with preferences ranging from 30mins-2hrs.

Sport doesn't matter/any sport good/Freedom to choose

Code refers to participants commenting that CT sport doesn't wholly matter, just the freedom to choose a preference.

Cannot take away from MS/ Cannot exhaust

Code refers to participants commenting that CT cannot under any circumstances take anything away from their main sport and cannot exhaust them too much because of the energy requirements for their main sports training.

Prefer biweekly/ Once a week right amount

Code refers to participants commenting that CT should be either once a week or every 2 weeks, down to individual preference.

Post-injury rehab

Code refers to participants commenting that CT should be used as a post injury rehabilitation method.