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Sociocultural constraints and the athlete-environment relationship in a form of life

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**Sociocultural Constraints and the Athlete-Environment
Relationship in a Form of Life**

Martyn Rothwell

A thesis submitted in partial fulfilment of the requirements of
Sheffield Hallam University
for the Degree of Doctor of Philosophy (PhD)

August 2021

Candidate Declaration

I hereby declare that:

1. I have not been enrolled for another award of the University, or other academic or professional organisation, whilst undertaking my research degree.
2. None of the material contained in the thesis has been used in any other submission for an academic award.
3. I am aware of and understand the University's policy on plagiarism and certify that this thesis is my own work. The use of all published or other sources of material consulted have been properly and fully acknowledged.
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Abstract

From the theoretical perspective of ecological dynamics, skilful behaviour in performance contexts like sport and education is predicted on the establishment of a functional relationship between an individual and the environment. The strength of this relationship is shaped over time by the everyday values, beliefs, traditions, customs, and behaviours (sociocultural practices) within a specific organisation. A conceptualisation of these sociocultural practices is a *form of life*, which illustrates the relational and situated nature of the contexts within which skilful behaviour emerges under social, political, cultural, and historical constraints. It is important to identify these influential sociocultural and historical practices that emerge, exist and shape practices in sport cultures and organisations. However, little is known from an ecological realism perspective how these practices affect athlete support systems, pedagogical practices, talent development programmes and an athlete's engagement with affordances to develop a tightly knit athlete-environment relationship.

To provide a deeper understanding of the relationship between a form of life and skilful athlete behaviour this thesis adopts qualitative research designs and integrates ideas from a range of scientific sub-disciplines. More specifically, data from the experiential knowledge of practitioners and observations of practice programmes and contexts in a team sport are analysed through the theoretical tenets of James Gibson's ecological psychology. In adopting these research methods, the sociocultural practices of a British rugby league football academy are identified and interpreted to understand how they might shape an athlete's engagement with affordances in learning and development landscapes.

Results from the studies of this thesis suggest that forms of life are categorised by the complex interactions between many subsystems, where masculine, and disciplined behaviours were categorised as the dominant sociocultural pressures to constrain key actors

into ignoring the potential for athletes' self-organisation tendencies, and inhibited individuals' capacities to respond to opportunities in the micro-structure of practice. Finally, to advance our understanding of the practical situations in which athletes become responsive to opportunities for skilful engagement with affordances, an integrative framework is presented to unpack the situated and embedded notions of skilful athlete behaviour.

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To all the rugby league brethren who gave up their time to take part in the studies, thank you.

I also want to acknowledge the sport of rugby league, while at times, this thesis might seem critical of the sport, and the people who work tirelessly to ensure the sport runs in a challenging climate, that is not my intention. Rather, I wanted to develop a deeper understanding of the sport that has provided me with employment, lifelong friends, and great memories.

To Keith and Joe, for fostering a trusting and nurturing form of life.

Personal bibliography

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Abbreviations

CSAR	Contextualised skill acquisition research
ETP	England Talent Programme
LDRF	Learning in Development Research Framework
NBA	National Basketball Association
NCT	Niche construction theory
PPCT	Process-Person-Context-Time
RFL	Rugby Football League
RLFC	Rugby League Football Club
UCI	Union Cycliste Internationale
UK	United Kingdom
UKCC	United Kingdom Coaching Certificate

Chapter 1: Introduction and theoretical framework

1.1 Background and context

I was watching an under-10s game a few weeks ago. While the official game was being played, behind me another game was starting, probably the game many of us remember as kids. In this "unofficial game", a number of kids of all ages, shapes and sizes came together for an impromptu game of footy. The kid with the long blond hair and the football in his hands held court. "Do youse wanna play tip or tackle?" Most yelled out, "Tackle!", but immediately a couple said, "I don't wanna tackle". Another said: "I'm not tackling Yousef, he's too big." "OK," said the blond-haired kid, "Yousef, you can't run, you have to walk; and Jayson, Tom and Jack are playing touch footy; and the rest of us are playing tackle." "Hooray," said the group. Yousef argued: "I wanna run too; that's not fair." The blond kid conceded. "OK. But we only have to touch you with two hands, and you are not allowed to palm us off. OK?" Yousef nodded his agreement; happy he got something from the negotiation. "OK," said the blond kid, "we'll make that tree the sideline, the bins are the sideline on that side; you score past that bin over there and our try line is past that guy's chair. No play-the-balls, touch the ground and pass, three tackles and you have to kick." Rock paper-scissors decided who kicked off and the game was under way.

For the next 15 minutes I observed the two games being played. Out on the real field the players ran through the choreographed processes of the mod league rules. The referee barked instructions and kept them to the rule book. Parents and coaches screamed from the sidelines, and the players fought over who got next run and next kick. A couple of the better players were dominating the play, and as soon as the big No.10 for the team in green received the ball, everyone got out of his way and he scored another try. Some of the kids were enjoying themselves. A few of the others hardly got

a touch. In the other game, there was no referee, no coaches, no parents yelling from the sidelines, no field markings, a lot of talking, laughing. They even had one kid commentating the play as it happened in that distinctive Ray Warren impersonation. There was the odd spat over what was a knock-on or whether someone had been touched or not; but they sorted it out. The game kept moving, no penalties, some playing hard, others playing soft, everyone getting a fair go with the ball. The kids were experimenting with the chip kicks, long passes and flick passes they saw on TV. No one cared who scored and the result meant nothing. They were just playing footy. I saw beetroot-red faces from all the running and all the laughing. Big Yousef had just about stopped to a walk anyway; he was tired. I looked back at the main game. I saw a lot of kids looking a little stressed with their experience as they tried to please those yelling from the side-lines. I looked back at the game over on the side and everyone was having a great time. I thought: "We are missing something here."

(Phil Gould, 2011, p. 21/26, the most successful New South Wales rugby league coach in history).

This extract describes two very different experiences of participating in sport that are situated in diverse and complex sociocultural milieus. Prolonged exposure to either one of these environments can influence how individuals develop the skills and abilities to manage the demands of sporting competition (e.g., Roca & Ford, 2020). In the ‘unofficial’ game the young children had the autonomy to search for opportunities which can invite functionally relevant actions for competitive performance, engaging with physical, psychological, emotional, and social dimensions. In the ‘official’ game, play and experience were governed by authority, compliance to expectations, and socio-cultural-historical factors that led to many of the players to feel dissatisfied with the experience. Gould’s enlightenment

exemplifies the situated nature of skilful behaviour where sociocultural mechanisms exist to regulate interactions with the environment, including other people (Geertz, 1973). Brill's (2018) anthropological explorations of cultural diversity and motor behaviour is just one example of this, where differences have been identified in Indian Multani and French expert potting behaviours, pivot turn aesthetics between classical dancers in France and traditional dancers in Korea, load carrying styles of African women from two Kenyan ethnic groups (Luo and the Kikuyu), and the postural habits of individuals from France and Japan.

Although sociocultural factors (i.e., environmental constraints) are considered to influence an individual's engagement with the environment (Rietveld & Kiverstein, 2014), there has been little focus on this area of study within the sport science literature (for an exception see the work of Hassanin & Light, 2014; Hassanin et al., 2018; Uehara et al., 2016; Uehara et al., 2020; Uehara et al., 2021). Throughout this thesis I will argue that the social, cultural, and historical contexts, in which athletes develop an increasingly functional relationship with a performance context, are important constraints on expertise which are relevant for understand behaviours in sport. This category of constraints is currently lacking in substantive empirical research, especially with respect to its effects on the acquisition of expertise in sport (Uehara et al., 2016), although there are strong theoretical and philosophical ideas which implicate the importance of such contextual constraints in shaping behaviours (e.g., Juarrero, 2000). An important challenge for sport practitioners and sport scientists, therefore, is to elucidate the role of socio-cultural-historical constraints in the design of practice landscapes to enhance the development of sport expertise. In tackling this challenge, I argue that sport practitioners should position a powerful theoretical and methodological framework to guide the exploration of constraints to understand how they facilitate an athlete's utilisation of the multitude of opportunities for action to support skilled behaviour. As I will argue later, ecological dynamics provides such a framework to develop a

better understanding of the relationship between socio-cultural-historical constraints and the emergence of an athlete's skilled behaviours (Araújo, et al., 2010).

The paucity of research in this area can, perhaps, be attributed to the traditional view of the natural sciences, where scientific studies working in the positivist paradigm have dominated thinking about learning and athletic performance in sport. This particular attitude in sport is considered to reveal the world through what Weber (1978) termed *instrumental rationality*, where the quantification and precise measurement of athlete behaviour seeks casual and measurable relations between interventions and performance. For example, studies have explored and established the behavioural profiles of players (e.g., Hewitt et al., 2014; Macutkiewicz & Sunderland, 2011; Morley et al., 2014), and aimed to predict future performance on anthropometric measures and physical tests (e.g., Brocherie et al., 2014; Chaouachi et al., 2009; Petrakos et al., 2017). Some academics, such as Araújo and Davids (2011) and Phillips et al. (2010), have challenged this traditional thinking, arguing that models of human development and psychological scientific study, biased towards explanations inherent to the individual, has led to what Dunwoody (2006) termed, an *organismic asymmetry*. The concept of organismic asymmetry, emanating from the psychological sciences, attributes the regulation of behaviour to internal organismic structures and processes, and neglects the role of the environment in shaping behaviour. This dominant thinking in the sport science domain is demonstrated by the influence of the information processing paradigm in the traditional view of decision-making research, where Simon's (1956) notion of 'bounded rationality' implies that human action is limited by the cognitive system i.e., an individual's mental ability to process information through internal mechanisms.

Another challenge with the quantification of athletic behaviour and the enthusiasm for statistical analysis, is the objectification of the human body 'as though it were a machine, or

as though it ought to be a machine' (Hoberman, 1988 p. 206-7), rather than a neurobiological system. This type of analogy has existed in psychology for some time, perhaps encouraging mechanistic ideology. When mechanistic thinking proliferates into athlete development practices in sport, it can lead to disciplinary practices that normalise individuals and render them compliant and docile (Denison & Avner, 2011). The idea of athletes becoming docile in response to instrumental rationality is exemplified by the experiential insights of Groupama-FDJ's (UCI world level French cycling team) team manager, Marc Madiot (2021, p. 3), who expressed concerns over the prevalence of data in modern cycling.

There is permanent surveillance in the peloton, and it also exists in training. They've got their noses buried in their screens. We've even seen riders crash because they weren't looking at what was in front of them. There's no spontaneity anymore in the sporting act. I'm sorry to say it, but we're in the process of turning riders into robots. They recite a lesson that they've learned by heart, and we correct them constantly, in real time.

Empirical efforts have also identified the practical issues raised by Marc Madiot. Manley and Williams (2019) explored UK professional rugby union players' lived experiences of the day-to-day technologies and data analytics that were an integral part of being a professional rugby player. The findings revealed that surveillance mechanisms (e.g., performance analysis, global positioning systems, and mood score sheets) led to restricted player behaviours, financial fines for weight gain, and performance fatigue.

Sport science research and data that are embedded in the natural sciences have historically tended to ignore important and often undervalued socio-cultural-historical factors that influence athlete learning and development (Araújo et al., 2010; Denison et al., 2013). A growing body of research is starting to redress this imbalance to identify the ecological characteristics of successful talent development programmes (e.g., Henriksen et al., 2010a;

Henriksen et al., 2010b), environmental factors that contribute to the development of expertise (e.g., Uehara et al., 2021), and investigations that have aimed to describe the microstructure of practice (e.g., Low et al., 2013). However, although these research efforts have shed some light on the environmental factors that influence expertise. Reductionist explanations of athlete learning and development that only adopt organismic or environmentalist positions, limit our understanding of surrounding constraints that may be used by athletes to regulate their behaviours.

In a move away from these reductionist views, Davids et al. (2013) argued that skilful behaviour and talent emerges as an increasingly functional relationship developed over time by an athlete with a specific performance environment. From this perspective, 'talented' performance in sport, (i.e., enhanced athlete functionality) emerges when an individual continuously adapts to surrounding constraints, which change over micro- and macro-timescales (Button et al., 2020). These interacting constraints are specifically related to the individual (e.g., genetic composition and quality of learning experiences), task (e.g., relationship between key rule changes, equipment (re)design and performance demands) and the environment (e.g., social, cultural, economic, historical, and political) during competitive performance and in practice. To address organism or environmental biases associated with athlete learning, development and performance research, the thesis includes three studies that describe a programme of study, based on qualitative investigations. Providing a deeper understanding for the contextual and situated nature of the athlete-environment relationship. To contribute to this limited research area this programme of work integrates ideas from a range of scientific sub-disciplines, including skill acquisition theory, ecological psychology, human movement sciences, philosophy, and sociology, to consider why certain behaviours and cultures may exist in talent development and coaching settings, and how the constraints

found in these cultures influence athlete learning, development, and engagement with opportunities for action (i.e., affordances: Gibson, 1979).

In what follows, qualitative data and theory are used to unpack and enrich our understanding of the relationship between socio-cultural-historical constraints and the athlete-environment system. In doing so, I borrow Rietveld and Kiverstein's (2014) use of Wittgenstein's *form of life* (1953) concept to introduce, explain, and describe factors that influence an athlete's responsiveness to opportunities for action. Using recent (re)conceptualisations of Gibson's notion of affordances in ecological dynamics (Araújo et al., 2019), and in line with an ecological conceptualisation of the athlete-environment relationship, the central argument of this thesis is that skilful athlete behaviour (and its development) is always situated within a socially, culturally, and historically-constructed form of life. As van Dijk and Rietveld (2017) argued, to fully understand how individuals respond to affordances, we first must understand the 'practical situations' within which behaviour occurs. Therefore, research is needed to identify and clarify the relationship between socio-cultural-historical constraints and how athletes interact with behavioural opportunities provided in practice and during competition. This multidisciplinary perspective will offer sport pedagogists, performance managers, and administrator's important insights to protect coaches and athletes from traditional cultural responses to attitudes formed by powerful socio-cultural-historical constraints that dominate and organise player development contexts in sport.

1.2 The research setting: why British rugby league football?

As with any social phenomenon, the extent to which history influences sociocultural practices cannot be ignored. In the case of sport coaching in the United Kingdom (UK), for example, industrialization during the nineteenth century influenced social structures and trends, which in turn influenced workplace practice and behaviours from that time forward,

shaping training methods in later years (Day & Carpenter, 2015; Lyle, 2002). Increasing industrialization during the 1800s was successful, in part, due to the 'production line' ethos, which was later strongly influenced by the American mechanical engineer Fredrick Winslow Taylor's systematized approach to industrial efficiency. During a lecture on industrial efficiency in 1907, Taylor (2008, p. 215) provided insights into the workplace practices that contributed to his systematic management methods. His advice was straightforward:

Managers should not allow *employees to think for themselves* but make sure they simply *carry out tasks as instructed*; our scheme *does not ask any initiative in a man*. We do not care for this initiative. All we want of them is to *obey the orders we give them*, do what we say, and do it quick. That scheme of *giving minute instructions to every man*, that is assigning him a task, having that task all planned for everyone [emphasis added].

It is understandable that the reductionist nature of Taylor's methods and the attitudes and behaviours associated with industrial labour were manifested in other parts of society at that time, including the sport domain (Kiely, 2012). A stronger focus on enhanced athlete performance was perhaps due to the increasing professionalization of sport performance through structuring practice and training requirements during the early 1900s (Day & Carpenter, 2015). These traits may have been valued in the sociocultural contexts of the Victorian era in the UK but, in contemporary society, run counter to attributes considered conducive to team sport performance where autonomy within collaborative efforts, creativity, and adaptive decision-making are viewed as important skills for athletes (Araújo & Davids, 2015; Memmert et al., 2010). Of interest is how these ideas, that filtered into the daily practices of education and sport programmes, affected the development of individuals.

British rugby league football is one sport with a relevant socio-cultural-historical backdrop to provide insights into how the sports dominant practices influence player functionality. Historically, rugby football league's roots originated in the north of England, where playing regions had been built on the same industries of the Victorian era (1837 to 1901) that were influenced by Taylorism. The writings of sport historian Tony Collins (2006, p. 149) provide insights into how these strong socio-cultural-historical roots may have influenced the values of rugby league players, suggesting that:

The attitudes of rugby league players were, therefore, shaped and defined by the world of industrial labour, which was intensely physical, often aggressively oppositional to management and, above all, almost absolutely masculine.

The adoption of ideas from Taylorism and the industrial workplace by sporting forms of life resulted in the commodification of athletes and the design of sports performance programs, where strict work regimes and rigid role specification reduced personal autonomy and induced a 'body as machine' philosophy (Smith & Davids, 1992). The transference of these 'production line principles' and Taylor's legacy are still evident in the sport domain today. The application and design of systematic training programmes was aimed at enhancing the athletic performance of rugby league players, which became commonplace (e.g., Jones et al., 2016). This ethos was epitomised by 'reproductive' coaching approaches that favour the decomposition of movement into anatomical units, which could be configured to 'reproduce' skilled actions (Davids et al., 2017). In the sport of rugby league, this is exemplified by traditional methods for learning the '6 o'clock pass,': performers are required to 1. point the ball to 6 o'clock, and 2. pass over the front foot (Rugby Football League, 2014).

Along with features of Taylorism in industrial manufacturing, the deep-rooted masculine nature of rugby league highlighted by Collins (2006) also makes the sport an intriguing space to study, to understand how the common masculine rugby league identity

directly influences the players' relationship with the environment. For instance, Giazitzoglu (2019) used Lefebvre's (1974) concept of *space* (i.e., social, and cultural products), to explore how English rugby union players embodiment was culturally regulated against appropriate masculine identify. Interestingly, the 'body' was used as a tool to demonstrate that players belonged, but in Giazitzoglu's (2019) work, this meant that overtly physical acts during performance were valued over highly skilled behaviour. Coupland (2014) also positioned sport as a vehicle to understand socioculturally-regulated embodiment within a professional British rugby league club. A socioculturally-regulated set of disciplined practices (i.e., weight training routines, heart rate monitoring and disciplined field practices) deemed critical to organise the body to be 'fit for purpose', was instrumental in how the players' bodies became organised and compliant across an entire season (Coupland, 2014, p. 8).

Collins (2006) and Coupland's (2014) work in British rugby league is a good start point for qualitative researchers who are interested in exploring how context and environment constrain how players ought to behave and perform in sport. Gibsonian theorising in ecological psychology can provide a framework to explain how specific customs and codes, specific to British rugby league's rich socio-cultural-historical milieu, are lived and experienced subjectively by its inhabitants and users (i.e., players and coaches). Providing new insights into the 'practical situations' in which behaviour emerges under constraints can break from traditional 'instrumental rationality' thinking and help develop a more symmetrical view of human behaviour. An ecological approach could emphasise how a conceptualisation of athlete behaviour does not need to be imposed by external sources and deterministic means. Rather, behaviour is adaptive and emerges from a tightly knit athlete-environment system described thus far (Araújo & Davids, 2011).

1.3 My experiences in rugby league

The basis of this thesis has evolved out of my experiences in and of rugby league football. Although I was born outside of the M62 corridor in the city of Derby (rugby league is predominately played in the towns and cities along the M62 motorway in the north of England), family ties to the Northwest of England gave me access to the rugby league heartland. During my early teens, family visits to Widnes meant I could spend time on the terraces of the old Naughton Park stadium, watching legends of the game such as Martin Offiah, Ellery Hanley, Jonathan Davies, Billy McGinty, and Alan Tait playing for and against Widnes RLFC. This is where I first learnt about the sport, soaking up the atmosphere, listening to the fans argue and shout at the referee, being absorbed by the social nature of the sport, and valuing the physical and mental toughness of the players. At about a similar time, I started playing rugby league for Derby City RLFC open age team. This playing experience, although a challenge to my fragile teenage body was my real introduction to the sport, where manliness, physicality, and playing hard was the norm.

Fast forward into my adult working life, and I became further institutionalised into the world of rugby league, cutting my teeth in the coaching and talent development domains. As I started to become enculturated into the traditional rugby league way of thinking about athlete development and coaching, I became more curious, and frustrated, by the *why* and *how*. Why was it that the British game replicated, without question, the highly structured Australian choreographed playing style? A way of playing that didn't require players to think and explore opportunities for skilful play, but to simply replicate and reproduce set actions. The traditional autocratic way of coaching applied to developing players to execute this *playing style* wasn't enjoyable or rewarding, and probably did players more harm than good. I was becoming more dissatisfied with the sport I loved. My interest, therefore, lay in the cultural perspective of rugby league because my experiences as a coach had enabled me to

witness the complexities of developing skilful behaviour from inside the sport. Time and again I had participated in failed attempts to provide players with environments that encouraged exploration, creativity, and autonomy. From my perspective, coaches' values, the culture of the club, and the leadership ability of the National Governing Body were the key issues in providing better environments.

At the outset it is important to acknowledge that my previous experiences, briefly outlined above, will play a significant role in the production of this research. And while experiences of being a rugby league spectator, competitive player, coach, and talent development manager provide me with a physical-cultural insider status, providing many advantages in terms of securing access to the field and familiarity with the rugby league lifeworld (McMahon et al., 2017). It also presents considerable challenges in terms of researcher subjectivity. While I have been socialised into a very specific sociocultural way of being, with attached values and biases, it is these biographical experiences that enable me to interpret and make meaning of the phenomena under study.

1.4 The thesis

This thesis comprises three studies, each of which are described in the study map below (Table 1.1). Unlike a traditional thesis, that starts with an independent chapter for the literature review, a theoretical framework is presented to situate the research process in a range of concepts that frame the research problem under study (Merriam, 2001). This approach has been chosen to: 1. build a case for the importance of the study through concepts and theories, 2. demonstrate how the thesis advances knowledge, and 3., interpret the findings through a symbiotic relationship between the research methods, theory, data, and research rationale (Merriam & Simpson, 2000). Later in the thesis, literature is integrated and expanded on throughout each individual chapter to enrich the discussion and make meaning of the data. In this way, a programmatic approach has been taken, meaning that each section

follows on from the other, and inevitably there will be some cross-fertilisation between them. Duplication and unnecessary repeating of content has been minimised. However, in places the motivation to provide a coherent narrative (and the peer review process) has outweighed the necessity to repeat content.

The thesis will also demonstrate originality of the research programme, which arises from two aspects. First, current research efforts in rugby league globally, have been typically dominated by the natural sciences. Very little research in the sport has adopted a social science perspective to advance knowledge about how social, cultural, and historical factors may influence rugby league players' skilful behaviours in performance contexts. Second, throughout the thesis, a relational account of affordances is central to the arguments being made (Chemero, 2003; Rietveld & Kiverstein, 2014). This position also provides a conceptual framework to qualitatively analyse the research findings. Such an approach also offers a novel perspective on affordances in the sport domain, which has traditionally been dominated with research studies that focus on an action-scaled view of affordances (e.g., Heft, 2001; Seifert et al., 2021; Warren, 1984).

Following this introductory Chapter, Chapter Two (Study One) explores rugby league coaches' perceptions of the dominant social, cultural, and historical constraints in the sport. In this study I theoretically elaborate why these dominant constraints might exist and how they might influence the design of practice tasks and the development of British rugby league players. In this Chapter, the form of life concept is unpacked and expanded upon using Bronfenbrenner's (2005) bioecological theory of human development, to provide readers with a deeper understanding of its influence on athlete enhancement.

Chapter Three (Study Two) presents an ethnographic study that provides first-hand experiences of the form of life in a professional British rugby league academy. During this ethnographic study I was embedded within the academy programme as an assistant coach,

providing opportunities to observe and participate in coach development sessions, practice sessions, and the day to day working of the programme. The Chapter describes a socially- and culturally-constructed ecological niche and draws on Gibsonian theorising to explore how the dominant sociocultural practices affect the players' engagement with affordances.

In Chapter Four (Study Three) I present a conceptual framework with combined insights from niche construction theory and ecological dynamics to challenge the sociocultural situated practices that were identified in study one and two. The overarching goal of this Chapter is to provide sport coaches and practitioners, who are interested in moving away from the identified deterministic models of learning and development, with a conceptual framework to design ecological niches that situate the learning process within an ecological dynamics rationale of the athlete-environment system. To substantiate the conceptual framework, I investigate the experiential knowledge of professional sports coaches from a range of sports to establish whether everyday assumptions about teaching, coaching, and learning align to a theoretically informed model of coaching practice. It is anticipated that this novel conceptual framework can inform contemporary learning and development practices that positively influence the evolution of skilled behaviours in different individuals.

To conclude the thesis, Chapter Five presents a summary of the research findings and highlights the contribution the thesis makes to the academic and applied fields of sport coaching and athlete development. In addition, I highlight the limitations of the research carried out within this programme of work and identify future research directions. Finally, in this section, wider challenges are discussed in relation to multidisciplinary teams which can comprise many different forms of life. In this section the Department of Methodology concept is introduced that offers some applied implications for challenging dominant thinking in wider performance preparation teams.

Study one: Exploring Forms of Life in Player Development Pathways: The Case of British Rugby League.	A qualitative study to explore the form of life in British rugby league football player development contexts to clarify how social, cultural, and historical constraints influence the development of rugby league players in the United Kingdom.
Study two: Investigating the athlete-environment relationship in a form of life: An ethnographic study	A qualitative study to identify how the sociocultural practices of a British rugby league football academy might shape an athlete's engagement with affordances.
Study three: Exploring Coaches Experiences of Niche Construction: An Ecological Dynamics Analysis	A qualitative study to explore the situational contexts in which skilful behaviour unfolds and to identify how these contexts influence athlete evolution.

Table 1.1: Thesis Study Map

1.5 Theoretical framework

Before I go any further it is essential to introduce the theoretical framework, and the relationships between the concepts and constructs underpinning this thesis. As argued by Lederman and Lederman (2015), a theoretical framework is critically important to justify the importance and significance of the programme of research. In addition, Anfara and Mertz (2014) suggested that a theoretical framework provides a lens to design and conduct a research study. While these two points are pertinent to any proposed research study, my motivation to position a theoretical framework as the cornerstone of this thesis is based on Strauss' (1995) view that theory clarifies and explains how the world works. Strauss' point is particularly important for this thesis because it not only provides a suitable lens for exploring and examining the socio-cultural-historical constraints on human behaviour, but it also offers a means of interpreting the research findings.

1.5.1 Ecological dynamics

Over 25 years ago, in sport science, Davids, Handford and Williams (1994) challenged the natural sciences' traditional cognitive view of movement control and co-

ordination. They argued that athlete performance models, based on cognitive psychology, neurophysiology, and movement science, is not capable of advancing our understanding of movement performance behaviours in sport. At the same time, Davids, Handford and Williams (1994) proposed an integrated approach to enrich sport scientists' understanding of motor control, based on key concepts in dynamical systems theorising (e.g., Kelso, 2007) and James Gibson's (1979) ecological psychology. Since the 1994 seminal paper, key arguments supporting the alternative interdisciplinary approach have evolved and stimulated research in many other areas such as biomechanics (Bolt et al., 2021), injury prevention (Leventer et al., 2015), sport pedagogy (O'Sullivan et al., 2021), talent development (Lascu et al., 2020) and performance analysis (Giménez-Egido et al., 2020; Travassos et al., 2013). The combination of dynamical systems theory and ecological psychology, now known as *ecological dynamics*, is considered a powerful theoretical framework for understanding how sport practitioners can support athlete development, predicated on complex and dynamic interactions emanating from person-environment relationships (Button et al., 2020).

My intention to situate an ecological dynamics rationale within this thesis is based upon the theoretical framework's following assumptions. First, behaviour is not based on internal centralised computational processes where disembodied approaches encourage the study of the individual-environment system separately (e.g., Lakoff & Johnson, 1999). In ecological dynamics the individual and environment are considered mutual and reciprocal and the influence on one another is complementary (Turvey et al., 1981). From this perspective in sport, behaviour is considered to emerge out of the integrated athlete-environment system when achieving a task goal (Araújo & Davids, 2015). Second, dynamic open systems (i.e., sub-units of teams, individual athletes, and practitioners) are non-linear; therefore, the relationship between time spent in practice and an athlete's development is not deterministic. The emergent nature of a complex system means that small changes in the way

an athlete interacts with the environment, due to carefully designed practice interventions or socio-cultural-historical constraints, could have large effects on the global system. For instance, Uehara et al.'s (2020) qualitative examination of Brazilian sociocultural constraints revealed that *Malandragem* (i.e., cunning, mischief, and deception) emanating from Mulattos' cultural traditions, are common attributes displayed by many elite level Brazilian soccer players. Third, in an ecological dynamics framework the direct perception of environmental information (i.e., playing surfaces, events, objects, and opposition players) can be used by athletes to guide skilled action in practice and competition (Seifert et al., 2017). This key principle of direct perception suggests that athletes who have been trained to select from a rich and diverse range of information available in a competitive performance environment will be better prepared to perceive, adapt their actions, make decisions, and interact skilfully with ecological constraints of competition. This perspective to sport performance contrasts with deterministic models of human behaviour where external features of the environment (e.g., game plans and detailed coach instructions) are deemed necessary to guide performance. Fourth, constraints on action influence the exploration and perception of information sources and self-organisation in practice and competition (Renshaw et al., 2019). Therefore, it is essential that sport scientists and practitioners identify how specific personal (e.g., physical, and emotional attributes), environment (e.g., social, cultural, and historical factors), and task (e.g., rules, equipment, and performance demands) constraints influence behaviour in practice and competition (Correia et al., 2018). When an athlete becomes skilled at satisfying a range of constraints, they harness and exploit inherent self-organising tendencies to form a functional relationship with specific performance environments (Woods et al., 2020b). This is considered the basis of expertise in sport from an ecological dynamics rationale (Araújo & Davids, 2011).

1.5.2 Gibson's theory of affordances

The ecological psychologist James Gibson (1979) introduced the ecological approach to perception, action and cognition to challenge mechanistic and reductionist views of human behaviour that aimed to separate mind and body in traditional psychology. One of the most influential aspects of Gibson's (1979, p.127) theory is the idea that individuals can directly perceive and act on affordances, arguing that 'the affordances of the environment are what it offers the animal, what it provides or furnishes, either for good or ill'. For example, in rugby league a ball offers itself to players for kicking when traveling on the ground or for intercepting with their hands when it is moving through the air; a slow player invites a quicker player to run past them; a hard pitch offers itself to be sidestepped upon.

Gibson's (1979, p. 129) rather simplistic description of affordances, and his contentious point that affordances are 'neither an objective property nor a subjective property' has led academics to fiercely debate the ontology of affordances and how to study them empirically (e.g., Chemero, 2003; Franchak & Adolph, 2014; Reed, 1996; Rietveld & Kiverstein, 2014; Scarantino, 2003; Stoffregen, 2003; Turvey et al., 1981; Withagen et al., 2012). For instance, Turvey (1992) defined affordances as dispositional properties of the environment that are complemented by dispositional properties of animals, which he coined effectivities. Stoffregen (2003) argued that affordances should be regarded as properties of the animal-environment system rather than as dispositional properties. Michaels (2003) defined affordances as the actions permitted to an animal by environmental objects, events, places, surfaces, people etc. Chemero (2003) proposed that affordances are relations between the abilities of animals and features of the environment. These research efforts demonstrate the contrasting interpretations of Gibson's ecological psychology, to explain how the many affordances that are available to an individual at a particular time point, in a particular situation, invite action (Withagen et al., 2012).

What distinguishes between an affordance and an invitation to act is an urgent research question in ecological psychology (Kaufer & Chemero, 2015). This thesis provides a tentative contribution to this question, by adopting Rietveld and Kiverstein's (2014, p. 326) relational position of affordances who argued that "affordances the environment offers are dependent on the abilities in a particular ecological niche". Therefore, the affordances an environment offers is dependent on a particular way of life. To account for the richness and variability within the human way of life, Rietveld and Kiverstein (2014) positioned Wittgenstein's (1953) notion of *form of life* to capture the multiple sociocultural practices available to individuals. A form of life consists of patterns in behaviour, skills, capacities, attitudes, values, beliefs, practices, and customs that shape how we live, our communal practices and daily routines (Wittgenstein, 1953). In Rietveld and Kiverstein's (2014) position, affordances, and subsequent invitations, are directly related to the relations between aspects of our sociocultural practices and abilities available in a form of life (i.e., athlete-environment system).

Other theoretical approaches could have been positioned to situate affordances within sociocultural contexts. For example, Bourdieu's theoretical approach of habitus and practice in his book *Outline of a Theory of Practice* (1977) would have provided a comparable research strategy for looking at this rugby league world. It provides a framework for looking simultaneously at how social class differences are inscribed in the body and how social groups reproduce the structural conditions of their own inequality. However, the findings emerging from my research suggest that Rietveld and Kiverstein's (2014) use of Wittgenstein's form of life concept, provides us with a research lens that offers a way of exploring the "complete entering into the human condition" of one specific life world (Blackshaw, 2013, p. 41). Which enabled me, as somebody already embedded in rugby league, to capture a strong sense of the ways in which the social, cultural, economic and the

political have historically shaped this sport world. Furthermore, under the lens of Rietveld and Kiverstein's form of life concept, a framework is provided that facilitates the exploration of how the multitude of social and cultural factors in specific contexts influence athlete-environment interactions.

1.5.3 Forms of life

Forms of life are predicated on highly specific customary, habitual, highly developed, yet responsive modes of performing, competing, training, and practicing which result in the preference to design specific types of affordance landscapes in athlete development programs. There are current examples of forms of life identifiable in sport (e.g., related to skiing in Northern Europe, soccer in Brazil, cricket in South Asia, and rugby union in New Zealand). In specific sports, these forms of life demonstrate the influence of specific socio-cultural and historical constraints in the development of sporting excellence. They can explain why certain performance styles are developed in certain regions and why they are valued and exploited to establish dominance in elite sport. Athletic sprinting in Jamaica, for example, is ingrained in the sporting culture and has a history and tradition of excellence (reinforced at the Tokyo Olympic Games in 2021) that is strongly influenced by the G. C. Foster College for Physical Education and Sports, where the country's athletic coaches are educated in a Jamaican 'way of sprinting' (Moore, 2015).

In these sporting cultures a form of life can be highly influential in how sport practitioners construct and design the microstructure of practice (i.e., the specific activities designed and periodised into practice tasks hourly, daily, monthly, and annually), which may have positive or negative effects on athlete performance. However, the notion of different countries or regions being associated with a particular style or way of practising and performing in a sport is rather simplistic, lacks theoretical substance, and requires conceptual clarification to help us understand the basis for performance development. For example, to

enhance athlete development, is it feasible for one country to simply imitate a way of practising or performing associated with another (highly successful) nation in a sport (Harris, 2017)? Simply imitating the traditional practices of another nation may present performance challenges without first exploring, understanding, and embracing the form of life that influences the factors that lead to another nation's success in competitive sport. I contend that differences in quality of performance and playing styles are substantively based on a specific form of life, often developed under specific historical and socio-cultural constraints in particular geographical locations in the world.

In specific forms of life, exploitation of the invitational nature of affordances, when designing affordance landscapes in practice task designs (Withagen et al., 2012; Withagen et al., 2017), should aim to support the emergence of effective skilled action. In affordance landscapes, specific practice task designs guide developing athletes in their search to form evermore functional relationships with performance environments founded on skill, expertise, and talent (Davids et al., 2017). Although recent clarifications of Gibson's conceptualization have made valuable contributions to the literature on affordances, little is known in sport domains about how a form of life harnesses local socio-cultural practices to influence affordance utilization and acquisition of sporting expertise. Understanding more about this issue can help sport pedagogists identify and exploit key socio-cultural constraints to enhance the quality of athlete development in specific sports (Araújo et al., 2010; Uehara et al., 2016).

1.5.4 Sporting forms of life, affordances, and athlete performance

A key tenet of Gibson's (1979) theory of affordances is the relational nature between affordances and an ecological niche (e.g., an education setting). Within an athlete performance context, this is especially related to an individual's current available experience, abilities, and capacities captured in their *intrinsic dynamics* (dispositional tendencies shaped by genes, learning, development, and experience) in a constraints-based framework (Schöner,

1994; Vallacher et al., 2015). Gibson (1979) and, more recently, Rietveld and Kiverstein (2014, p. 326) suggested that affordances are not simply action opportunities offered by the environment but are dependent on the ‘abilities available in a particular ecological niche’; important to this point is how an ecological niche can be ‘shaped and sculpted by the rich variety of social practices humans engage in’. Rietveld and Kiverstein's (2014) conceptualization of affordances connotes the mutuality of the athlete-environment relationship which is embedded in forms of life in sport organisations within specific communities and societies.

The theory of affordances embedded in forms of life provides a powerful rationale for the application of this key idea by sport practitioners to consider the (socio-cultural and historical constraints in) environments which shape expectations and beliefs on how athletes should behave, perform in competition, develop, and learn. For example, Taylorism and systematic workplace practices may have influenced the view of performing, developing, and training of an employee in an industrial organisation, who then went on to coach and play team sports. This conceptualization is important for considering how to maximize the design and resourcefulness of practice environments and the sociocultural practices in which athletes engage in around the globe in different societies, and in communities with distinct social, physical, and geographical locations. This theoretical position can provide a lens through which practitioners may understand the potential for transfer of (successful) practices and methods of athlete development and performance preparation from one cultural context to another. This theoretical rationale may explain why an athlete from one society may transfer successfully or not to perform for a sports organisation in another society. Across sports, forms of life are recognizable within coaching values, practice, and behaviours, which are constructed by the relationship between wider social values and key individuals involved in specific sports (Day & Carpenter, 2015). An individual who transitions between social

contexts (i.e., communities, workplaces, and the coaching arena) is influenced by normalized social values which continuously influence the relational nature between affordances and the ecological niche (Bronfenbrenner, 1979).

Consider a form of life in British rugby league, where statistical data on ‘percentages, position and possession have been the prevailing mind set of late’ (Woods, 2017, p. 7), and where the players are considered almost as mere cogs or machinery in the greater strategical planning of the high-performance sports organisation. The consequences of this form of life are exemplified by the experiences and perceptions of ex Great Britain Rugby League International Phil Clarke (2016, p. 11), who warned against the normalization of ‘machine-like’ behaviours in athletes:

I worry that we are stifling the talents of more players by *getting them to play like robots*. The obsession with completion rates discourages players from taking a risk. We need to radically alter that thinking and encourage players not to worry about being wrong and losing the ball, mistakes will happen [emphasis added].

This account of player development is consistent with the occupational ideals of Taylorism, prevailing assumptions of managerialism, and the socio-cultural-historical insights into rugby league provided earlier. This process-oriented approach that adopts a dualist stance (i.e., separating mind and body) can be embedded in the sociocultural practices that are manifested through a sports or teams coaching practices and behaviours (Lombardo, 1999), where coaches design practice tasks based on the decomposition of complex individual or team skills (Chow et al., 2016). Although structure and organization may have benefits during athlete learning, over exposure to practice landscapes that reduce opportunities for action and promote systematic and predictable behaviours can affect an athlete's responsiveness to relevant affordances. This traditional perspective is exemplified again by Phil Clarke (2016, p. 7/10) who describes a common structured playing style:

The “structured” play of who stands where, runs into which hole in their opponents’ defensive line, passes behind which team-mate, it’s a bit like watching a driverless car There is a bigger danger that the shift away *from autonomous thinking in attack will become boring--if it hasn’t already. Worse still, we are in danger of damaging young players by encouraging them to copy this style of play* [emphasis added].

This approach has been labelled the ‘automaticity principle’ (Montero, 2013), aligned with traditional pedagogical methods of rehearsing and orchestrating movements until a performer does need to ‘think’ or ‘reflect’ on what they are doing in performance. Withagen et al. (2017) have argued against this mechanistic conception of human behaviour, instead favouring the role of *agency* (i.e., individuals can make their own way in the world) to better understand how affordances can be designed to invite or solicit functional behaviours. The notion of agency does not mean athletes should be ‘programmed’ to respond to certain affordances but should ‘unreflectively’ interact with the affordances available in a performance environment that invite their actions (Rietveld, 2008). In learning and carrying out everyday tasks (expressing their skilled intentionality), Kiverstein and Rietveld (2015) have suggested that individuals do not need the guidance of ‘conscious thinking’, rather they should act unreflectively to harness a selective openness to perceive and use relevant opportunities for action in the world. When individuals experience the world with a selective openness, they are more responsive to affordances (Rietveld, 2008). Traditionally, conscious thinking has proliferated into the coaching domain where sport pedagogists have relied on verbal commands and feedback to communicate strict practice settings and rigid role specification to support athletes learning and development (Pereira et al., 2009). Overusing these coach-imposed methods, draws parallels with principles of cognitive science and information processing theory (e.g. Schmidt, 1975). They may constrain athletes to experience a narrow field of affordances (field of action opportunities) that limits their

relationship with action in competition. The notion of acting unreflectively or in an ‘automatic’ way has implications for coaches when designing traditional practice environments, where learning tasks do not require athletes to be overburdened with consciously thinking about minute details of anatomical movements or choreographed play. Rather, in ecological dynamics, athletes should be trained to remain in a state of action readiness to be selectively open to the specific demands of the environment, exemplified here by a comment on the Brazilian soccer player Garrincha who was considered one of the best dribblers of a soccer ball (Castro, 1995, p. 38).

Dribbling the ball barefeet, without twisting or damaging your ankle on uneven surfaces is a considerable feat in itself. Dribbling on the border of a slope and not allowing the ball to drop down was another great challenge. Garrincha performed both of these tasks in a very easy way. After losing control of the ball on the uneven surface so often he learned how to dribble on uneven surfaces and against the opponents.

Importantly, advocating that athletes have agency and can, therefore, act autonomously to self-regulate in their performance environment, prioritizes the person-environment relationship as the important scale of analysis regarding developing human movement behaviours (Withagen et al., 2017). This idea implies that sport pedagogists, and the socio-cultural practices they influence, must support, and develop the autonomy needed by athletes during competitive performance. They can develop the autonomy of athletes by facilitating their active exploration of a landscape of available affordances during practice, which helps them to perceive and pick up action opportunities which exist in a performance environment (Araújo et al., 2006). This reconceptualization proposes a significant role for coaches as ‘designers’ of affordance landscapes, as part of a comprehensive form of life in high performance and elite development programs, which simulate critical aspects of

competitive performance environments (Woods & Davids, 2021). Woods and Davids (2021) have termed the idea of dwelling in a place (i.e., exploring a practice landscape) to navigate the complexities of performance challenges as enskilment (Ingold, 2015). Although this idea of expertise acquisition is theoretically coherent, within professional rugby league, experiential knowledge of experts has pointed to the existence of a form of life that is more consistent with mechanistic and reductionist approaches in line with traditional working practices.

1.5.5 Bronfenbrenner's bioecological model of human development

Another field of ecological psychology that can provide important insights into how the diversity of ecological constraints can influence an individual's responsiveness to affordances, is Urie Bronfenbrenner's (2005) bioecological theory of human development. Bronfenbrenner's proposed model provides methodological guidance for identifying relevant socio-cultural-historical constraints that affect the development of athletes (Bronfenbrenner, 1979), and this model looks beyond the athlete's immediate environment (although important) to explore the wider socio-cultural-historical constraints that influence skilled behaviour (Gabbard & Krebs, 2012). Bronfenbrenner's theoretical system has evolved over the years (1973-2006) to incorporate four major concepts, leading to the process-person-context-time (PPCT) model. It is important to note that model does not provide a universal explanatory theory of skilled behaviour (Araújo et al., 2010), However, adopting the model can provide methodological guidance to analyse the relationships that evolve between an athlete's exposures to a multitude of constraints, the influence these constraints have on affordance utilisation, and the sociocultural practices that are embedded in sporting forms of life (Krebs, 2009).

A central assumption of Bronfenbrenner's evolving theoretical system is that human development takes place over the life course, through reciprocal interactions between

individuals and varying environmental contexts (Bronfenbrenner, 1986; Bronfenbrenner & Evans, 2000). These interactions are called proximal processes and are considered the primary engine for human development (Bronfenbrenner & Morris, 1998). Bronfenbrenner and Morris (2006) clarified the distinct properties of proximal processes that influence an individual's development, 1) For development to occur, an individual must engage in an activity (e.g., being part of a talent development programme); 2) For an activity to influence development it must take place on a fairly regular basis, over extended periods of time (e.g., daily, weekly, and monthly engagement in talent development activities); 3) To be developmentally effective activities must take place long enough to become increasingly more complex (e.g., appropriate levels of challenge across yearly development cycles); 4) Developmentally effective proximal processes have a reciprocal dimension, where interactions from individuals involved must influence the exchange (e.g., the coach and athlete can influence practice designs, known as *co-designing* (Woods et al., 2020); 5) Proximal processes involve interpersonal interactions; and also interactions with objects and symbols.

The specific component of Bronfenbrenner's PPCT model that is pertinent to the research aims and objective of this programme of study is the concept of context, because it can serve as a theoretical and methodological framework to fully appreciate the complexity of a form of life (as will be expanded on in Chapter 2). A form of life is embedded in a complex dynamical system that is multi-layered, consisting of the microsystem (e.g., practice settings and contexts), mesosystem (e.g., significant others who influence practice settings such as parents and caregivers), exosystem (e.g., organisational influences), and macrosystem (e.g., socio-cultural-historical influences) (Bronfenbrenner, 1979). Crucially these sub-systems have a reciprocal and bidirectional nature regarding their influence on human development through the proximal processes of regular complex interactions between people,

processes, context, and time (Bronfenbrenner, 2005). Under these complex interactions, attractors (stable states of organization in dynamical systems) emerge and exert their attraction on the gatekeepers of performance programmes and teams, and on the developing individual. To explore these relationships in a sports organisation embedded within a community, a mixed methods research approach can detail a form of life in a specific sport, establish the relationships between a form of life and an athlete's capacity to utilise available affordances, and analyse the task-specific relations between athletes and dynamic practice and competition settings. An ecological dynamics examination of the athlete-environment relationship can allow a functional analysis to identify how perception and action can be harnessed to pick up and utilise affordances by individuals (Warren, 1988).

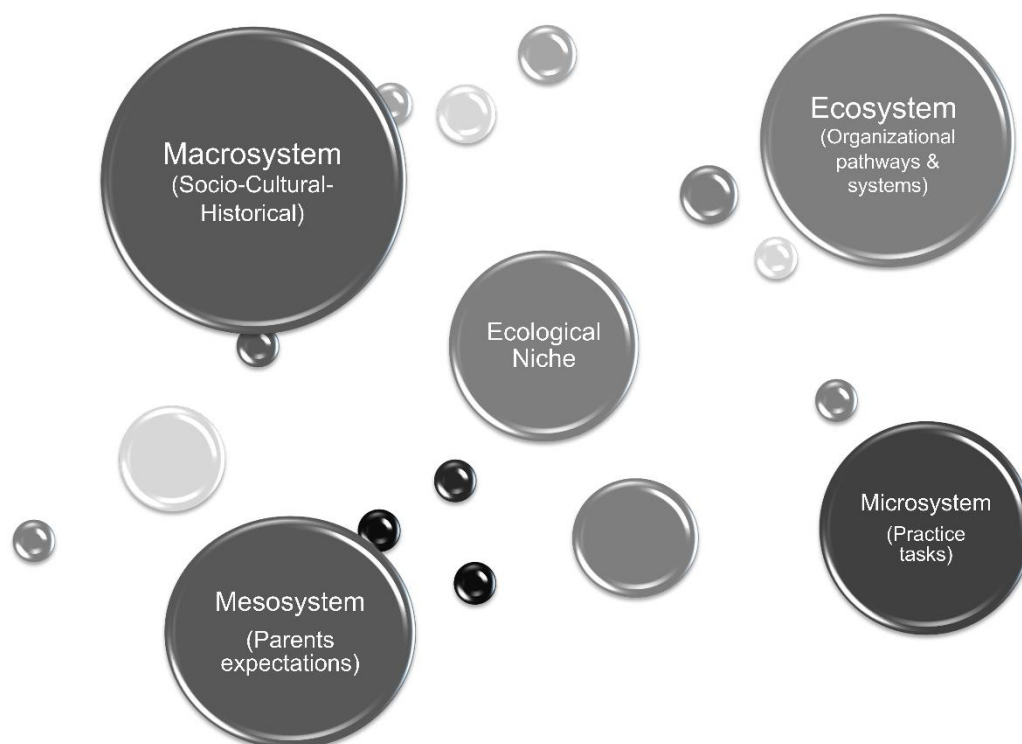


Figure 1.2: A form of life is a complex multi-layered system that has a relational nature regarding how individuals develop a functional relationship with an ecological niche to utilize relevant affordances.

These ideas were exemplified by Flôres et al.'s (2019) exploration of influences on child development, who combined Bronfenbrenner's and Gibson's theoretical models to conceptualise children's motor development because of proximal processes and available affordances experienced in a range of different contexts. Flôres et al.'s (2019) narrative literature review revealed that characteristics of interconnected subsystems such as home (household conditions, family social economic status, neighbourhood, and outdoor play e.g., microsystem), school (physical education classes, and playtime in the schoolyard e.g., mesosystem), and sport settings (organised sport clubs e.g., mesosystem) all influenced opportunities for motor skill development. As I will seek to demonstrate in Chapter 2, Bronfenbrenner and Gibsonian theorising can start to explain why dominant social, cultural, and historical constraints exist in player development systems (by examining the wider macro-exo-meso-micro contexts), and how they may influence opportunities for engagement with affordances for skilled behaviour within the micro context.

1.6 Aims and objectives

The aim of the thesis is:

To investigate British rugby league football performance pathways to establish how prevailing, dominant cultures, attitudes and behaviours influence players' engagement with the environment.

The aim will be achieved through the following objectives:

1. Examine coaches' perceptions of coaching cultures in rugby league, to seek to understand how social, cultural, and historical constraints influence the design of affordance landscapes in practice tasks (Chapter 2 & 3).

3. Interpret how the dominant socio-cultural-historical constraints currently influence the development of rugby league players in the UK (Chapter 2 & 3).
4. Adopt an ethnographic methodology via participant observations to identify and investigate 'forms of life' in UK rugby league performance environments (Chapter 3).
5. Develop a qualitative explanation of how sociocultural practices in rugby league coaching may influence players' engagement with affordances (Chapter 3).
6. Provide sport coaches who are interested in moving away from deterministic models of learning and development, with a conceptual framework to design ecological niches that situate the learning process within an ecological dynamics rationale of the athlete-environment system. (Chapter 4).

1.7 Research project overview

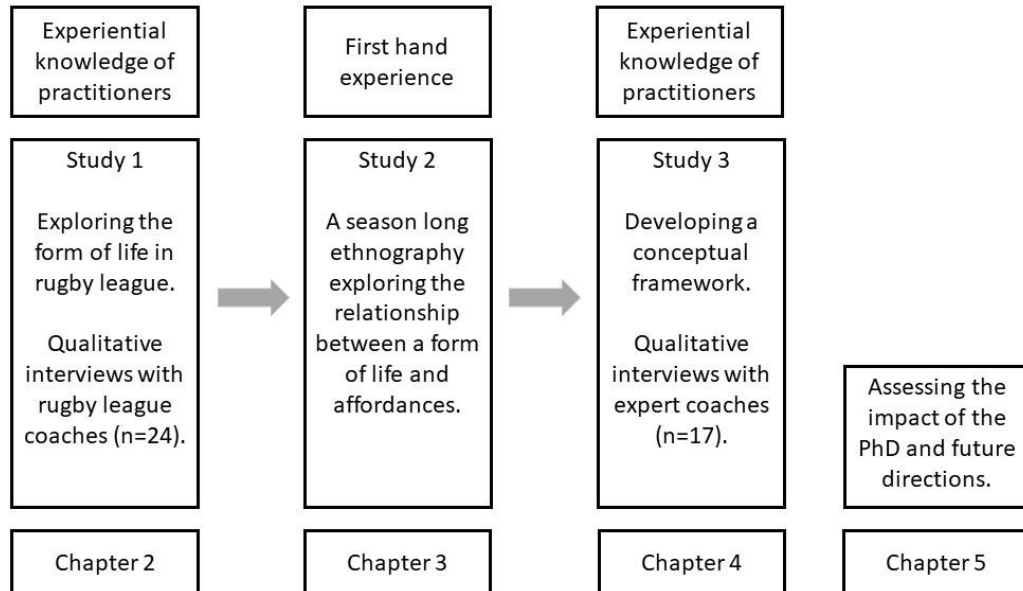


Figure 1.3: Research project overview

1.8 Contextualised skill acquisition research

While ecological dynamics conceptualises skilful behaviour as an emergent property resulting from interacting constraints, the socio-cultural-historical context in which skill develops is still undervalued in empirical investigations. To address this dearth of research and to achieve the aims and objectives of this programme of study, Uehara et al.'s (2014) contextualised skill acquisition research (CSAR) framework provides a relevant philosophical, theoretical and methodological rationale. The foundations of the framework align to the theoretical position provided thus far and are conceptualised on a holistic and contextual model of skill acquisition, that aims to capture the richness of factors that influence the athlete's world.

Following the original insights of Uehara et al. (2014) framework, the contextualised approach has since provided a platform to explore the role of socio-cultural-historical constraints on athlete development (see Uehara et al., 2021). However, these insights mainly focus on the intersection of macro scale constraints i.e., poverty, ethnic diversity, and national culture, and do not focus on how these factors influence the developing athlete at the microscale of analysis from a Gibsonian perspective. To address this challenge, O'Sullivan et al. (2021) have presented the Learning in Development Research Framework (LDRF) to illuminate the influence of a form of life at the microscale of development (i.e., how athletes engage with affordances for skilled behaviour). Drawing on van Dijk and Rietveld's (2017) *skilled intentionality framework*, the LDRF captures the influence of sociocultural forces in shaping athlete development through ethnographic methods. Providing a 'zoomed in' perspective on the everyday customs and routines in the microstructure of practice, to understand how the context of real-life situations influence how athlete's respond to affordances. Throughout the thesis, both the CSAR and LDRF have informed the approach

undertaken to conduct the research studies. Next the philosophical influences, theoretical underpinnings, and methodological tools of these frameworks are discussed.

1.8.1 Philosophical influences

Human behaviour is widely considered to be complex and highly dependent on intentions, context, and history, and is therefore unpredictable in nature. However, the natural sciences still try to explain action through traditional methods dominated by reductionism and deductive reasoning, even though it has been argued that these approaches have failed to provide sufficient descriptions about human behaviour (Riley & Turvey, 2001). In this traditional philosophical approach, context and history are rejected in favour of a cause-and-effect atemporal and acontextual approach, where the study of complex systems is treated in the same manner as isolated and linear systems, where the aim is to enhance predictability and reduce uncertainty through establishing causal relationships. Juarrero (2000) has challenged the scientific community to rethink individual intentionality and agency as static entities formed in a cause-and-effect relationship, but rather as emerging from surrounding constraints.

To understand human behaviour, Juarrero (2000) proposed an interpretive model of explanation, where meaning is derived from the *context* within which agents experience everyday events. Interpretivism is at the cornerstone of the CSAR and LDRF, because as Juarrero (2000) argued, the interpretivist tradition proposes that to understand the social world it is essential to draw upon individuals' subjective experiences and interpret their meanings through shared experience (Hammersley, 2012). Knowledge, therefore, is relative to historical, cultural, and subjective circumstances, and exists based on subjective interpretations by individuals (Levers, 2013). Interpretivists adopt a relativist ontology, meaning that reality is emerging and multiple and cannot be known for real, only how it is experienced from the participants and researcher interpretations (Gibson, 2016). Within an

interpretivist paradigm, the social scientist (i.e., researcher) assumes a subjective epistemology to interact and observe the world, to document the consequences of circumstances, and to understand why people behave in the way that they do, or why particular institutions foster certain characteristics (Hammersley, 2012).

1.8.2 Theoretical underpinnings

The theoretical underpinnings of the CSAR and LDRF are informed by ecological dynamics (Davids et al., 1994; Gibson, 1979; Kelso, 1995) and Bronfenbrenner's (1995) bioecological model of human development, that have been discussed thus far. In addition, Brunswik's (1956) conceptualisation of *representative experimental design* plays a key role in these research approaches and has implications for how sport scientists' study human behaviour. In rejecting psychology's strong tradition of laboratory-based experiments that have failed to understand cognition and behaviour in real world settings (Holleman et al., 2020), Brunswik (1956) proposed that experimental stimuli must represent the behavioural context to which the results are intended to apply. Over 60 years later Brunswik's sentiments are still considered relevant within the psychology community, with Shamay-Tsoory and Mendelsohn (2019, p. 1) arguing that.

.....conventional experimental psychological approaches have mainly focused on investigating behaviour of individuals as isolated agents situated in artificial, sensory, and socially deprived environments, limiting our understanding of naturalistic cognitive, emotional, and social phenomena.

To address the potential limitations of traditional research approaches many researchers have advocated for more *ecological valid* experiments (Osborne-Crowley, 2020). Originally coined by Brunswik (1949), the term ecological validity describes the 'correlation between ecological variables' (i.e., retinal stimulation and perception of objects in the environment) in

psychological experiments to move towards understanding human action in the very contexts that behaviour occurs (Brunswik, 1955, p.199). The usage of the term ecological validity has previously been criticised for becoming detached from Brunswik's original concept (Araújo et al., 2007; Holleman et al., 2020), and while the programme of research within this thesis has not been conducted through contrived laboratory experiments, the focus has been on naturalistic field-based studies to investigate the changing relation between athletes and their environments. In this sense, I have endeavoured to observe environmental structures and processes taking place within them as interdependent and analysed in terms of the athlete-environment system.

1.8.3 Methodological tools

While researchers adopt one paradigmatic stance when working within an interpretivist framework, they may use multiple methods simultaneously. In the context of this programme of study a range of qualitative methods were employed to explore individual's social experiences of their world and interactions with others (Fuchs, 2007). Ethnographic principles and techniques were adopted in the form of participant observations, field notes, and semi-structured interviews (which are expanded on throughout the chapters) (Kraine & Baird, 2005), to establish the social structures, hierarchies, task and environmental constraints, and relationships that influenced developing athlete's responsiveness to available and relevant affordances.

1.8.4 The challenge of trustworthiness in qualitative research

Burke (2016) has argued that the challenge of *quality* in qualitative research is complex and forms a larger debate about the nature of knowledge production. To satisfy the issue of quality, the notion of trustworthiness is considered one way to alleviate this challenge. Alternatively, Sparkes and Smith (2009) tend to *let go* of trustworthiness or applying universal criteria in favour of applying alternative criteria, leaving the responsibility

of judging the quality of research reports on the reader. In this way, the research and subsequent reports presented throughout this thesis have drawn on Smith and Caddick's (2012) alternative criteria to provide 'substantive contribution', 'impact', and 'width'. In this sense, the research aims to 1) contribute to our understanding of a social and cultural form of life in British rugby league (substantive contribution), 2) generate new questions and trigger further research programmes, (impact) and 3) draw on a comprehensive range of interview data and observations to provide a detailed analysis, supporting the readers judgement of quality (width).

In addition to the steps taken to address the challenge of quality, a conscious effort was made to build trust with the participants. For Speziale and Carpenter (2003), building trust with participants can help to solicit information relevant to the phenomenon under study. This was important, because I was concerned that the coaches may have been suspicious about my motives or may have been dismissive of my right to inhabit the form of life that they were deeply embedded within. Therefore, a two-fold qualitative approach was adopted that required me to build trust between myself and the participants across the three studies. This was achieved on the one hand by integrating myself into the different social spaces in which coaching took place, through speaking the same language, dressing in the same uniform, being reliable (i.e., completing planning tasks in a timely manner), acting credibly (i.e., demonstrating my coaching ability), and over time building rapport. On the other hand, I acted honestly and caringly by disclosing the research intent to participants before formal data collection methods commenced. Krueger and Casey (2000) have argued that these steps are essential if investigators want to gain reliable insights into what participants think about the topic under study. I am therefore confident that my findings can be compared with other similar work in qualitative studies of sport (e.g., Mills et al., 2020; Uehara et al., 2021).

Chapter 2: Exploring *forms of life* in player development pathways: The case of British rugby league

Rothwell, M., Davids, K., & Stone, J.A. (2019). Exploring forms of life in player development pathways the case of British rugby league. *Journal of Motor Learning and Development*. 7(2), 242-260.)

2.1 Abstract

Social, cultural, and historical constraints can influence attitudes towards learning, developing, and performing in sport. A recent conceptualisation of these environmental constraints in athlete development pathways is a *form of life*, which describes the values, beliefs, traditions, customs, and behaviours that contribute to an athlete's development. Although a form of life can have a powerful influence on athlete development, research exploring this relationship is limited. In this article I explore the form of life in British rugby league football player development contexts to clarify how social, cultural, and historical constraints influence the development of rugby league players in the UK. Twenty-four coaches were interviewed through individual semi-structured interviews to collect the data. Findings show how forms of life in rugby league player development pathways are established and maintained by the complex interactions between the microsystem, mesosystem, exosystem and macrosystem that shape and guide the development of players. I recommend that player development pathways in sport underpin practice with a theoretical framework of the learning process to protect athletes from social, cultural and historical constraints that are not conducive to their development.

2.2 Introduction

The development of skilled adaptive performers is an imperative goal for elite sports organisations across the globe, where player advancement pathways are systematised in the quest to foster world-class athletes (Coutinho et al., 2016; Güllich & Emrich, 2006). Although commonplace, the effectiveness of these systematised pathways has been questioned (Güllich & Emrich, 2012; Ryan, 2016; Vaeyens et al., 2009), with concerns raised over the impact on athletes' health and well-being (Lloyd et al., 2015), and their ability to produce skilled performance at the highest level due to an over-systematised coaching

approach (Pryce, 2018). This problem is exemplified with insights on the athlete development methodologies of English soccer academies (Calvin, 2017):

The statistics are really sobering. Out of all the boys who enter an academy at the age of 9, less than half of 1% make it. Or make a living from the game either. The most damning statistic of all is only 180 of the 1.5 million players who are playing organised youth football in England at any one time will make it as a Premier League pro. That's a success rate of 0.012%.

These statistics implicate issues which have been associated with player pathways synonymous with rigid, linear optimal performance models in sport (Phillips et al., 2010). Viewing player development pathways through a lens of complexity sciences (i.e., the study of complex adaptive systems) exposes how the interacting network of subsystems is open to continuous dynamical interactions during athlete development (Hristovski et al., 2014). In this model of skill acquisition and talent development, influential constraints at all levels interact to shape the emergence of expertise in athletes (Araújo et al., 2010). This integrated perspective on athlete-environment relations sheds insights on how the interacting network of complex subsystems impacts on athlete development i.e., 1, the microsystem (e.g., practice settings and contexts), 2, mesosystem (e.g., significant others who influence practice settings such as parents and caregivers), 3, exosystem (e.g., organisational influences), and 4, macrosystem (e.g., socio-cultural-historical influences) (Bronfenbrenner, 1979). Bronfenbrenner's (2005) theory of human development suggests that, over time, an individual's development is influenced through proximal processes of regular complex interactions between people, processes, context, and time (PPCT) within these subsystems. In this complexity sciences model, skill and expertise in sport is enhanced over time in the micro-structure of practice (i.e. the daily, weekly and monthly activities in learning environments), by harnessing the spontaneous self-organising tendencies of a learner which

are attracted to stable, functional patterns of behaviour during practice to satisfy task and environmental constraints (Balague et al., 2013).

Task and environmental constraints are boundaries that shape and guide the behaviour of a learner towards a task goal (Newell, 1986). However, little is known about how either category of constraints may influence the views of coaches and athletes during learning, practising, and development (Hassanin et al., 2018). An overlooked aspect of environmental constraints on the design of athlete development programs is socio-cultural-historical influences. This category of constraints is exemplified by the social, cultural, and historical traditions of a nation or region which underpin identifiable performance styles and preferred modes of practice (i.e., backyard cricket in Australia (Cannane, 2010)). These constraints are important in shaping the way athletes engage with learning environments in different sports and physical activities, captured in the structured and unstructured activities which shape learning and development in different societies and nations (for example in the case of Brazilian soccer players; see Uehara et al., 2016). Rothwell, Davids, and Stone (2018) discussed the powerful role that socio-cultural-historical constraints can have in influencing the way coaches' design and deliver the micro-structure of practice. A key point in Rothwell et al.'s (2018) arguments was that highly systematised player development pathways that fail to underpin practice with a theoretical framework of the learning process may be exposed to the dominating influence of socio-cultural-historical constraints that reproduce traditional practice structures, performance habits, and customs of learning and development (Kiely, 2012; Phillips et al., 2010). This reification process may fail to capture the dynamism required in globalised, modern elite sport where a form of 'system capture' may inhibit the adoption of innovative environments for athlete development, informed by advances in empirical and experiential knowledge (Chow et al., in press).

An important influence on conceptualising athlete development under different socio-cultural and historical constraints is a 'form of life', introduced by Wittgenstein (1953) to describe patterns in animal behaviour. In regard to human behavioural contexts, a form of life describes common ways of being that "manifest in the normative behaviours and customs of our communities" (Rietveld & Kiverstein, 2014, p. 328-329). Within the context of an athlete development pathway, a form of life describes the values, beliefs, traditions, customs, and behaviours that influence attitudes towards developing expertise in individuals. A form of life should not aim to constrain coaches into designing rigid and suppressive practice landscapes in the challenging task of athlete development. Rather, a form of life in an elite sports organisation can capture a model of the learner and the learning process to integrate the innovations and ideas of sport practitioners, without inhibiting their work. Thus, providing boundaries so all coaches within a pathway can be integrated in a theoretical framework which underpins learning and developing in sport, evoking innovation and creativity, that exposes athletes to practice landscapes rich in information so that they can interact skilfully with the dynamically evolving ecological constraints of competition (Araújo & Davids, 2011). In this way, a form of life can harness and exploit historical and socio-cultural tendencies which provide a clear identity for modes of expression and performance in sport, underpinned by empirical research advances. A recent example of a form of life positively influencing team performance in sport can be seen by former Queensland Reds and Australian national team rugby union coach Jim McKay. McKay described how he was able to harness a form of life that was influenced by experiential knowledge and the empirical knowledge available in a higher education institution. McKay's work showed how performance analysis data, a theoretical framework of the learner and the learning process, and practice based on experiential and theoretical knowledge, contributed to highly adaptable and effective team play (During this period the Queensland Reds were Super Rugby finalists

on three occasions, Australian conference winners twice, and won the 2011 Super Rugby competition [formed of teams from New Zealand, Australia and South Africa]; for details see McKay & O'Connor, 2018).

The work of McKay and O'Connor (2018) illustrated how a form of life was exploited to design the micro-structure of practice in rugby union, with clear implications for learning designs in other sports and physical activities. The value of athletes spending time engaged in interactions with practice landscapes rich in information can be understood from the phenomenological concept of a *lived space* (Fuchs, 2007). Using this conceptualisation, athlete-environment interactions provide solicitations (opportunities or invitations) to act (Withagen et al., 2012). An important way to understand how athletes should interact with the micro-structure of practice and competitive performance environments, from an ecological dynamics perspective, is to draw on Gibson's theory of affordances. Gibson (1979) introduced the concept of affordances as *possibilities for action* provided by interactions of an individual with the environment. For example, in rugby league football a ball offers itself to players for kicking when traveling on the ground or for intercepting with their hands when it is moving through the air; a slow opponent invites a quicker player to run past him/her; a hard pitch offers itself to be sidestepped upon. Recently, Rietveld and Kiverstein (2014) have emphasised the relational account of affordances and abilities available to performers in the variety of socio-cultural practices that are embedded in an ecological niche (e.g., a talent development system). This relational account suggests affordances are broader and more complex than just action possibilities provided by the environment; they are dependent on a form of life in a particular ecological niche. Crucially, a form of life can be "shaped and sculpted by the rich variety of social practices humans engage in" (Rietveld & Kiverstein, 2014, p. 326), which can be influential in how individuals develop a functional relationship with the surrounding environment to utilise relevant affordances (Reed, 1996). In the context

of sport performance, an individual is considered skilled when s(he) responds to multiple relevant affordances (solicitations) simultaneously, during practice or in competition (Bruineberg & Rietveld, 2014). Increasing the strength of coupling to specific affordances in a landscape is the basis of skilled performance during athlete development (Withagen et al., 2017). It is important therefore, for learning designers, managers, and coaches in player development pathways to understand the influence of socio-cultural-historical constraints on the developmental trajectories of athletes in a particular ecological niche.

Although environmental constraints can have a powerful influence on learning, developing, and performing in sport, research exploring the relationship between socio-cultural-historical constraints and athlete development is limited (see Araújo et al. (2010) for an exception). The team sport of rugby league football provides an interesting research context to study this relationship. The sport's roots emanate from the industrial north of England where playing regions were built on the key industries of the Victorian era (1837 to 1901). Industrial workhouses (i.e., factories) were the backbone of these working-class communities (Collins, 2006), where notions of masculinity, cooperation, knowing your place in the hierarchy, and rigid attention to routine were a strong feature of everyday work life. An emphasis on adopting these collective values in sport can provide a clear boundary around how players, strongly influenced by their socio-cultural-historical environment, achieve an identity in the sport.

Therefore, the aim of this study was to explore the form of life in British rugby league football player development contexts to: 1) understand the dominant social, cultural, and historical constraints within the sport; and 2), interpret how the dominant socio-cultural-historical constraints currently influence the design of practice tasks and the development of rugby league players in the UK.

2.3 Method

2.3.1 Research design

To explore the socio-cultural-historical constraints that are harnessed to create a form of life, Atkinson (2017, p. 51) has suggested that researchers must first "theorise the connection between actions of people in social settings and the social, economic, and political structures within which those actions occur". With Atkinson's challenge in mind, Smith and Sparkes (2016) have recommended the use of individual semi-structured interviews because they present opportunities for participants to share their experiences about the matter in question, namely the form of life in British rugby league football player development pathways. Here, coaches from across the sport were interviewed due to the important role they play in the development of athletes (Burgess & Naughton, 2010; Christensen & Henriksen, 2012), providing an important perspective to help explore the form of life in the sport.

2.3.2 Participants

Purposeful sampling was employed to recruit participants ($n =$ Twenty-four) for the study (Patton, 2002). All participants were current coaches holding United Kingdom Coaching Certificate (UKCC) rugby league coaching qualifications, had extensive experience of coaching rugby league and, in most cases, played rugby league to professional or amateur levels. To explore forms of life that represented all environments that British rugby league players typically develop in, coaches were interviewed from the professional game ($n = 8$), talent development pathways ($n = 9$), and the community game ($n = 7$). Professional coaches had experience of coaching internationally ($n = 3$), coaching in the British Super League ($n = 5$), and the British Championship ($n = 3$). All professional coaches were qualified under the UKCC qualifications, with 4 coaches achieving the Level-4 qualification (highest level) and 4 coaches achieving the UKCC Level-3 qualification. All talent development coaches were

employed full time in their respective positions and had experience of managing and coaching in a Super League Academy, and 4 of the coaches had experience of coaching at international youth level. Eight of the talent development coaches had achieved the Level-4 qualification and 1 coach had achieved the UKCC Level-3 qualification. All the community game coaches held voluntary positions with a community rugby league club and had achieved the UKCC Level-2 qualification. Four of the coaches also had experience of coaching on a talent pathway in a part time voluntary capacity. Institutional ethical approval was granted by a university board with all participants providing informed consent prior to the commencement of the interviews.

2.3.3 Data collection

The semi-structured interview guide was informed by theory (Araújo et al., 2010; Davids & Baker, 2007), and the first author's knowledge of rugby league coaching and professional rugby academy environments. Interviews were conducted face to face on an individual basis with the coaches and lasted an average of forty-one minutes. During data collection, all interviews were audio recorded in their entirety and transcribed verbatim, with permission of the participants. Of specific interest were the conversations about the social, cultural, and historical contexts in which rugby league players develop (e.g., "Can you tell me about the culture of coaching and player development practices in rugby league?"/ Why is it like that?; Where do those methods come from?"), the design of practice tasks (e.g., "Can you tell me about the coaching methods you use?"; "What might a coaching session look like when adopting these methods?"). We were also interested in how these factors influence the development of rugby league players (e.g. "How does this coaching culture influence how players develop in rugby league?"). Probe questions were used to explore these areas further.

2.3.4 Data analysis

Thematic analysis was used to identify themes across the dataset. In carrying out the thematic analysis the research team did not adopt an 'either or approach' (i.e., inductive or deductive), rather, a more pragmatic line was followed that included inductive and deductive approaches (Braun, Clarke, & Weate, 2016; Robertson et al., 2013), where a two-staged thematic analysis was employed to analyse the collected data set. The first coding stage followed deductive analysis by using Bronfenbrenner's (1979) bioecological model to organise the dataset into four dimensions (i.e., microsystem, mesosystem, exosystem, & macrosystem). Once the data set were organised into the four areas and accepting that theory-free knowledge cannot be achieved (Guba & Lincoln, 2005), both inductive and deductive analysis was used. For example, during the analysis some experiences expressed by the participants provided very clear and appropriate meaning without the use of a theoretical framework to interpret the findings (inductive). Conversely, other experiences were interpreted from a theoretical position (deductive), due to the findings representing relevant meaning regarding the performer-environment relationship. During the analysis an independent critical friend was employed to engage in dialogue with the first author, providing opportunities for reflection and feedback on interpretations.

2.4 Results

Results from the interviews with the three coaching cohorts are presented together according to the final themes derived from the analysis, which are: 1, microsystem, 2, mesosystem, 3, exosystem, and 4, macrosystem (Figure 2.1). This mode of presentation was used to reflect the interconnected nature of the coaching environments and the influence on developing rugby league players.

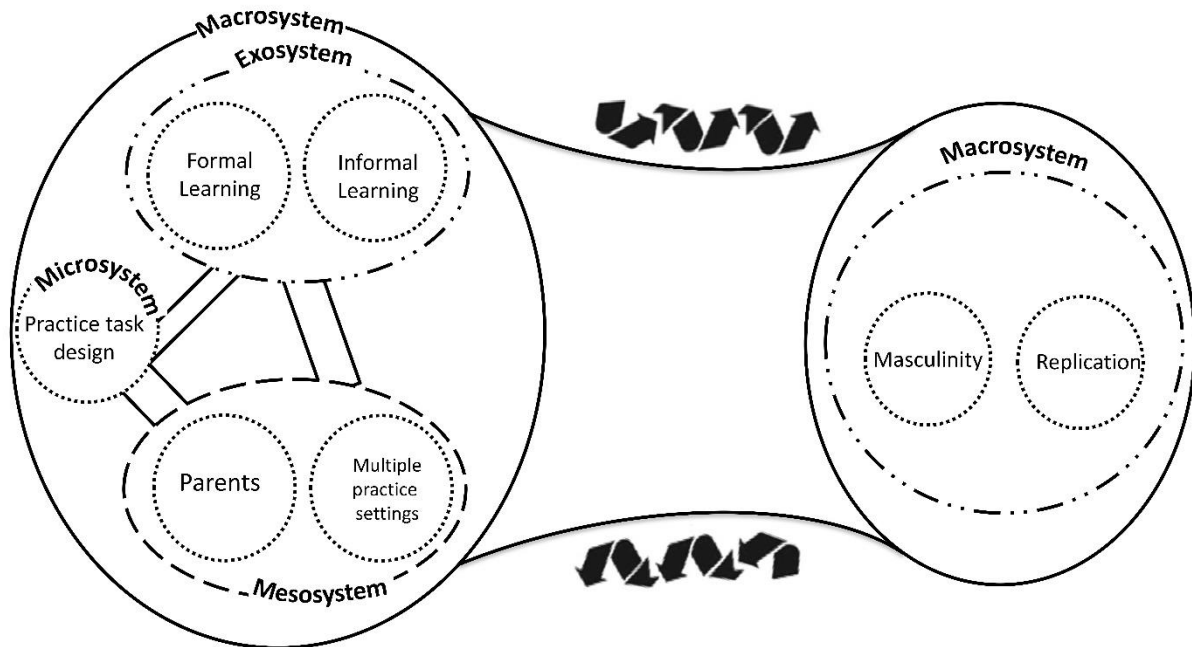


Figure 2.1: Bronfenbrenner's bioecological model of human development reflects the interconnected nature of the coaching environments and the influence on developing rugby league players.

2.4.1 Microsystem

The microsystem is the foundation level of Bronfenbrenner's model, and categorises the micro-structure of practice (patterns of activities and performance opportunities) experienced by the developing individual daily, weekly and monthly in their professional experience. Here, the microsystem categorises common approaches to practice task design in rugby league. This was important because it initiated the description of the variety of practice tasks that players experienced during practice.

Practice task design. The analysis revealed similar views on the type of attributes that players should possess to engage skilfully in the game of rugby league, for example, basic skills of catching, passing, tackling, and decision-making skills. However, the process of developing these skills revealed a range of views, beliefs, and approaches to designing and delivering practice tasks. Participants' responses indicated a continuum of practice task designs with more reported coach-led sessions which were highly dependent on coach

instruction and feedback. Less reported were coach-facilitated sessions that placed the emphasis on the players to solve problems during practice. Here, a coach provides insights into a coach-facilitated practice task aimed at transferring skills from practice to competition, with physical, psychological, and emotional dimensions:

So like you can just go 6 v 6, this is an offloading game we will referee it, you must get two offloads in the set of 6. You work it out. If it is not a good offload you'll hand it over. How do you create the offload? How do you create the space for the offload? How do you get the support there? Leave that with you". And that is a skill game and then they can transfer that. Not going right this is 6 v 6 you have got to play on A, you have got to play on C, you have got to play out the back and that might create an offload. Go and work it out yourself. We haven't got enough of that (coaching approach). (Talent Development Coach 8 (TDC8))

Other accounts discussed coaching approaches that were more coach-led and drill-orientated, focusing on prescriptive and strict technique training. A coach elaborates:

They are very much you need this many repetitions of this way or we need to get our dummy half passing better. So all we do is we will hammer a static dummy half pass, not to a moving target or anything like that, or tackle technique for example. A tackle technique of what it is needed and that's prescribed and it needs to look like this and that's it. (Community Coach (CC6))

Further insights into coach-led and drill orientated approaches suggested that coaches used progressive teaching methods to support skill learning. This approach was categorised

as progressing from high levels of instruction to teach the component parts of a skill, to more game like practice to put the skill under pressure. A coach exemplifies:

We have the very basic technique in terms of actually teaching them the actual skill first. So how do you tackle with your right shoulder, where does your right foot go? Where does your body weight transfer, where does your legs go, where does your hands sit, all that sort of stuff. So doing it at a very basic level is really important. Then doing that skill under pressure. Once they have mastered that we start putting that skill under pressure so I think for me skills under pressure is the biggest one moving forward for a person once he has learnt how to do it in a controlled environment then being able to do it and repeat it under a little bit of pressure so that might be in a drill what speeds up, it might be in a small sided game, it could be actually even in a game, but what I am trying to say is that you develop that skill as you go along but you have got to teach me first. (Professional Coach 7 (PC7))

2.4.2 Mesosystem

Bronfenbrenner (2005) defined the mesosystem as the relations between two or more microsystems that the developing individual spends time in. The value of studying the mesosystem is to help us understand how multiple settings may influence views of learning, practising and developing in sport, of practitioners and athletes. Here, we identified interacting microsystems as multiple practice settings experienced by players and coaches simultaneously, and the social influence exerted by parents.

Parents. Within the mesosystem of rugby league, talent development and community coaches identified parents as playing an influential role in the form of life. Talent development coaches reported parents establishing indirect influence on practice design. There were cases of coaches adapting practice sessions to appease parents' perceptions of

'professionalism' in the practice designs for their children through the replication and rehearsal of professional playing styles, known as "shapes" (highly structured sequential patterns of play). A talent development coach explains that working on skills to play the game as opposed to playing styles, although developmentally appropriate, was problematic due to the expectations set from previous practice experiences at community clubs and parents' perceptions and beliefs of professionalism in coaching behaviours:

I'm going to do a little work on shapes just because that's what they expect. They've had it at community clubs; it's what the parents expect to see. It's really hard to sell this idea at times that you working on catch and pass is really, really important. They think well yeah we can do that anywhere else why aren't you doing that at xxxxxxxxxx (professional club). So that sometimes messes with philosophically where you'd like to get as well you know. (TDC4)

Multiple Practice Settings. The relationship between microsystems in the form of players transitioning between community clubs and talent development environments (mesosystem) presented challenges for talent development coaches. In some instances players would move between coaching environments that valued different pedagogical approaches to providing instructions and feedback, where coaches adopted either facilitative or prescriptive methods to support player learning. For example, players not being able to "interact with the coach" due to the normalised prescriptive approach in their community club presented challenges with autonomy during practice because they "needed to be told what to do" (TDC5). A coach explains challenges with players regularly transitioning between different coaching environments:

You would pull the kids in from clubs and their culture within their coaching environment there has been this questioning challenging (type of) development, these

kids have had it. These other kids where there has been this authority and you will do as I tell you sort of mentality didn't say boo to a goose, would not answer a question and at points I had to go right you three shut up, you shut up, right what could we have done better there? (TDC5)

2.4.4 Exosystem

The exosystem explains the relationship between two or more settings that indirectly influence the experiences of individuals in the microsystem (i.e., settings that do not include the developing individual) (Gabbard & Kreb, 2012). Our analysis highlighted how coaches' experiences of informal learning and formal learning influenced views and attitudes towards learning, practising and developing in rugby league.

Informal learning. The analysis revealed that coaches valued informal learning experiences (i.e., watching other coaches and online social networks) during their early development phases as a coach. The primary mode of informal learning was reported as peer learning; this method of learning was the main source in constructing coaching and talent development knowledge. Interestingly, this method of learning decreased as coaches became more experienced, and they then assumed a mentorship role supporting less experienced coaches in their development. A coach provides insights into informal learning experiences during the formative years of his coaching career:

The first professional coach was xxxxx xxxxx who had come over from Australia. xxxxx xxxxx was like way, way ahead of his time. Ex-school teacher but an unbelievable Rugby League brain as well so he had the way of being able to educate and teach people properly for us to understand what we wanted but obviously he had a vast knowledge above and beyond what was anything in England at that time. So I was really fortunate, my two first real influences were the major ones was my dad

obviously in that field (coach education) and then xxxxx xxxxx so from the very early age that is what I thought coaching was. (PC2)

Formal learning. Formal learning was reported as coach education and higher education. All participants had accessed United Kingdom Coaching Certificate (UKCC) rugby league qualifications during their development as a coach. Although the coaches were supportive of coach education, some were critical about these qualifications in developing appropriate methods to support athlete learning, a coach explains:

The current coach education process that they (coaches) go through doesn't support any other approach (than a traditional linear approach). I don't think the coach education programme what they go through is fit for purpose and reinforces a lot of traditional methods. One hundred per cent of pass a ball you need to do X, Y and Z and if they don't do that it's wrong. There's no real promotion of games based activity. There's no promotion of different coaching styles it is a kind of one box suits everybody badge.

(CC3)

Coaches who had accessed higher education through taking undergraduate and postgraduate degree courses (whilst coaching), considered these learning experiences beneficial in constructing their epistemological beliefs about effective talent development systems and practice designs. Here the combination of coaching experience, peer interaction (interaction with coaches from other sports during higher education), and the intellectual content of the degree courses served as powerful learning experiences, stimulating them to challenge the status quo within the environments the coaches operated in. However, the reality of transferring newly learned pedagogical knowledge into practice proved challenging, described here by a coach:

I'd say typically anyone who has got that kind of philosophy and done the Level 4 would struggle to put that into practice in the typical club environment because it goes against what's the norm and people don't recognise or are not willing to engage or buy in or look into a different approach. So you are kind of between a rock and a hard place, having some knowledge around that and wanting to put that into practice but you are not being able to is where I could see myself. (PC5)

2.4.5 Macrosystem

The macrosystem is the outermost layer of Bronfenbrenner's bio-ecological model (Tudge et al., 2016). Although other systems within the model focus on the proximal processes between people and context, the macrosystem focuses on the wider culture and its influence on everyday beliefs, values, attitudes, actions, and practices (Rosa & Tudge, 2013). The analysis of the macrosystem revealed two dominant ideologies that exist in UK rugby league coaching and player development, which can be understood through the wider socio-cultural-historical backdrop of the sport in that country (Hassanin et al., 2018). These culturally constructed beliefs were identified as *masculinity* and *replication*. Coaches described how these dominant ideologies impacted upon the coaching and player development practices and the individuals who played the sport at all levels.

Masculinity. The analysis suggested that coaches believed masculinity was synonymous with rugby league football. Coaches raised concerns over the interrelated nature of masculinity and physicality, suggesting that a cultural emphasis on players' physical attributes was reflected in the selection of junior and adolescent players onto player development pathways (i.e., the overrepresentation of physically developed players). The reproduction and entrenchment of masculine socio-cultural values could also mean that players who do not fit the system may fail to access further player development opportunities and not fulfil their potential as an athlete. A coach elaborates on this point:

When we had a talent day a few weeks ago 42 players come. 29 of them were back rowers or middles and every single one was massive. So basically our clubs are picking the biggest kids that are ready to play scholarship rugby now, then they are picking the biggest kids that are ready to play Academy. It is all based around gym, being physical, wrestle, tackle and not many have the guts and foresight to say what I am going to take Martyn as a 15-year-old to 19 year old. I want to work on skill development, that's it. (TDC1)

In addition to the influences of a masculine culture on the selection of players, coaches also discussed how masculine ideals are reflected and reinforced through practice environments, where concerns were raised over the type of players a "brutal" environment would produce. A coach explains:

Now I know there are schools of thought out there of make it as brutal as you can. They (players) will end up buying into it by default and then they will have to do it. If they don't do it you will get somebody else in, but I am not sure whether that is going to actually develop the sort of decision making players that are required to kick on and play at a really high level consistently. (CC6)

Replication. Replication characterises the imitative culture within British rugby league and its reproductive playing styles. Coaches believed that one particular reproductive playing style was common across all levels of the game and expressed concerns about the over systematisation of players' behaviours to adopt this movement template, regardless of age or stage of development or individual capacities. A coach discusses the danger in the entrenchment of a one-size-fits-all approach:

There's a lot of different contributing factors to why we don't produce them (highly skilled players) and again you know the way we train them, we don't coach them. We don't allow people to develop expressive skill, we don't allow people to find the solution to situations and decision make enough, we put in structure from an early age. You're a winger, you're halfback, you're a centre, you're a back row, that's what you're doing, this is where you play to, that's a point you get to and this is the line you run. (CC6)

The participants also expressed their concerns about the impact this approach had on developing players' autonomy and independence. A coach offers an explanation in regards to the consequences of a systematised playing style:

We haven't trained them in the ability to solve their own problems, their own challenges, their own issues. There is no self-analysis. Somebody else is going to do your analysis for you, aren't they? I think that no independent thinking, all regimented, all controlled. (PC4)

2.5 Discussion

While an interacting network of complex subsystems in a player development pathway is to be expected. Here, guided by the framework of Bronfenbrenner's (1979) bioecological model, the aims of this study were to explore the form of life in British rugby league football player development contexts to: 1) understand the dominant social, cultural, and historical constraints within the sport; and 2), interpret how the dominant socio-cultural-historical constraints influence the design of practice tasks and the development of rugby league players in the UK.

2.5.1 Socio-cultural-historical constraints and competing forms of life

As with any cultural phenomenon, sport coaching and player development practices are habituated by wider political and cultural contexts (Day et al., 2013). Industrialisation during the nineteenth century was considered to influence social structures and trends, and rugby league culture was considered "resilient" and "self-replicating" (Collins, 2006, p. 143). Therefore, it is perfectly logical that developments in rugby league football were a cultural response to the synergistic relationship and proximal processes between people, context, and attitudes formed by the historically situated connection between the workplace practices of the Victorian industrial industries and rugby league communities. According to Collins (2006, p. 149), these communities were considered to be "shaped and defined by the world of industrial labour, which was intensely physical, often aggressively oppositional to management and, above all, almost absolutely masculine".

In sociology, Kimmel and Messner (1998) defined masculinity as a socially constructed phenomenon ascribed to male activities and dispositions that is normalized as a gender identity in direction opposite to femininity. Sporting environments have long played a central role in the "social production of masculinity" (Whitson, 1990, p. 19), fostering a range of competing discourses that produce a range of masculinities, many of which are considered problematic in a sport context (Stewart et al., 2019). In this study of rugby league coaching environments, the social construction and replication of masculinities came in the form of *toughness* and *physicality*, acting as a means for players and coaches to construct their identity in the sport. The dominant masculinities identified in this study align to Connell's (1987, p. 99) notion of hegemonic masculinity, which "refers to the cultural dynamic by which a group claims and sustains a leading position in social life". The term *group* is pertinent here because hegemonic masculinity is multifaceted and is not to be assumed as normal or existing across multiple *life-worlds*. Synonymous with Blackshaw's (2003) study

of leisure life, rugby league presented a particular life-world where it was acceptable to reproduce a distinct form of hegemonic masculinity. In other words, the participants' masculine identities were not fixed across the different social and cultural settings they reside within, rather, rugby league provides a place for a minority of men to position themselves in relation to a specific hegemonic masculinity. The identified social and cultural beliefs established an ideology that fostered notions of physicality and toughness, and as Macionis (2010) argued, ideologies act as principles that serve to organise social arrangements. Evident by the coaches enacting and valuing development factors such as gym work, being physical, wrestling, and tackling practice. Aspects of the sport that exert institutional power and control over key actors, presenting players and coaches with opportunities to reinforce the taken-for-granted ideology while establishing their place in the masculine pecking order.

In addition to the masculine working conditions, repetitious daily tasks in industrial factories were largely influenced by Frederick Winslow Taylor's 'task system of management' (Taylor, 2008), which aimed to remove manufacturing uncertainty by applying hierarchal systems of control through rigid role specification and task repetition (Taylor, 1911). These ways of working in the industrial factories are synonymous with traditional coaching practices, where "every workman" was given "600 instructions a day" to ensure that all assigned tasks were carried out (Taylor, 2008, p. 215). Although *replication* and *masculinity* appear to act as powerful socio-cultural-historical constraints that dominate and organise player development contexts in rugby league football, the analysis highlighted how the complex and multiple forms of life collide, compete, and often reroute one another. Consistent with research into holistic ecological approaches to developing athletes in sailing (Henriksen et al., 2010), these interpretations highlight how, not one, but all interacting subsystems and the proximal processes that occur within these systems (which include, but are not limited to, environments that the developing athlete are active in) can influence player

development (e.g., parents, coach education, higher education, multiple practice settings, and wider socio-cultural-historical constraints (Krebs, 2009). Therefore, managers and coaches in player development pathways should look beyond the immediate environment that athletes develop in (i.e., the microsystem of practice), and identify constraints across interacting systems that impinge on the potential and characteristic features of human performance in a specific society and community (Phillips et al., 2010).

2.5.2 Influences and challenges to practice task design

Consistent with previous research findings, informal learning was reported as the preferred method of coach learning (Stoszowski & Collins, 2016). Participant reports indicated how this method of learning served as a conduit to indoctrinate and perpetuate the dominant coaching method, where parallels between forms of life in industrial Taylorist practices and traditional coaching methods (i.e. high levels of instruction and direction, rigid practice structure and continuously repetitive practice) (Ford et al., 2010) are apparent. In this informal model of learning, the hierarchy of coaching status and personal characteristics of the 'owners of knowledge' are influential in shaping coaches beliefs and attitudes. The power of these proximal processes between people is influenced by personal resources (i.e., experience, status, and ability) and the demand characteristics that invite or discourage the action of proximal processes (Bronfenbrenner & Morris, 2006).

Although informal learning activities within sport coaching are accepted as a legitimate method of coach development (Jones et al., 2004), this method of learning can be problematic because it is often grounded in a naïve epistemology and is, therefore, open to the influence of anti-intellectual forms of life that have deep rooted values, beliefs, traditions, and customs of coach learning (Grecic & Collins, 2013; Abraham et al., 2010).

Understanding the mechanisms through which these beliefs of learning and the learning

process are acquired is important to identify, challenge, or embrace the forms of life that underpin practice task design for better or for worse (Light & Evans, 2013).

Consistent with research into junior rugby league coaches' perceptions of formal learning, participants criticised the content and suitability of the level 1 and 2 coach education curriculum (Seddon & Stoszkowski, 2017). More specifically, these criticisms were aimed at a *one size fits all* approach to teaching basic skills through isolating techniques and drill based practice. A challenge to the rugby league coach education curriculum was the professional and talent development coaches' experiences of higher education (exosystem). A useful example relates to the experiences of Jim McKay (McKay & O'Connor, 2018), where complex and sophisticated ecological views of the learner and the learning process were developed by critical thinking and reflecting on years of practical experience. Here, the combination of coaching experience and the intellectual content of the degree courses served as powerful learning experiences (Gallimore & Trudel, 2009). Interestingly, coaches' accounts of higher education revealed a sense of relief to *break out* of the closed circle of rugby league coaching and development (Piggot, 2012), where a fixed body of socio-culturally constructed knowledge was maintained, but rarely challenged, by its occupants. This culture of learning through reproduction, which is also evident in other sports (e.g., Cushion & Jones, 2006), left some coaches feeling tentative about challenging the status quo within the environments they operated in. These concerns were attributed to a fear that the socio-culturally constructed form of life that they are embedded within may resist the introduction of a different methodological framework for developing athletes (Jones et al., 2011).

2.5.3 Development of rugby league players

Consistent with the findings of Coupland (2014), coaches believed a culture of masculinity and valuing physical attributes was apparent in rugby league football, taking

performance expectations along a path of over-valuing and over-emphasizing physical size, power, and strength, rather than emphasizing skill, innovation, and dexterity. This emphasis is exemplified by participation and attainment inequalities being influenced by attitudes towards selection and recruitment to scholarships, academies, and professional squads, based on physical and maturational attributes (Till et al., 2010). This bias towards physical attributes demonstrates the reciprocal nature of proximal processes (Bronfenbrenner & Morris, 2006), where influences come not only from the gatekeepers of performance programmes and teams (i.e., coaches, talent scouts and performance managers), but also the developing individuals who value and maintain the strong masculine cultural identity (Pringle, 2008).

Being embedded in a form of life that values physical and maturational characteristics can also impact upon the weekly development practices (micro-structure of practice) that players experience. When aiming to produce masculine bodies, controlling practices consistent with Taylorism, promote de-contextualised coaching methods designed to improve human movement and sport performance (Coupland, 2014). To understand how these methods influence the development of players I draw upon Gibson's theory of affordances.

The hierarchical and suppressive view of the workforce applied to sport performance could be considered problematic because in both contexts the practices emphasise the reproduction of actions rather than the *continuous interactions* of workers/athletes with affordances of their work place. The cross-fertilisation of management methods in industry, and coaching in professional sport, may have historically resulted in athletes being prevented from developing autonomy, independence, and exploring the affordance landscape during practice and performance to solve problems and act on emergent decision making opportunities (Renshaw et al., 2010). The consequences of over-systematising human behaviour have been well documented (Smith & Davids, 1992; E. Gibson, 1994), where a

view is held that it can be analysed and understood in mechanistic terms (Withagen et al., 2017). The problem with this view in a sport performance context is that competition is highly unpredictable and dynamic, and therefore requires athletes to develop adaptable behaviours to negotiate dynamic competitive performance environments (Hristovski, 2017). A form of life that adopts mechanistic frameworks of human behaviour underpins the view that acting in the world is reliant on external agency (i.e., high levels of instruction and feedback (Ford et al., 2010). Withagen et al. (2017) have criticised this view and suggested that the concept of agency ("the self in control" (E. Gibson, 1994, p. 71)) is central to the invitational nature of affordances. The implication is that not all affordances solicit behaviour, rather solicitations are dependent on the intentions, behaviour settings, and action capabilities of the individual to utilise affordances (Kaufer & Chemero, 2015; Withagen et al., 2012).

In contrast, a form of life predicated on player exposure to 'affordances as invitations' supports the use of practice task designs to provide opportunities for learners to strengthen their couplings with available affordances. The lived spaces (coaching environments) that emerge out of, and are maintained by, the collective behaviours of its occupants (Heft, 2001) (i.e., players' expectations of practice and coaches beliefs), can strongly influence the available affordances that players utilise and are responsive to during practice and competition (Kaufer & Chemero, 2015). Utilising affordances is an individual's primary mode of interacting with the environment (Dreyfus & Kelly, 2007), although suppressive and coach-imposed direction may present a narrow field of affordances (i.e., narrowing an athlete's intentions on a field of action opportunities) that limits a player's relationship with performance under competitive constraints. Sometimes this may be needed in a microsystem, but this pedagogical approach is traditionally considered a dominant, 'default' mode of coaching in sports like rugby league (Chow et al., in press).

2.6 Limitations

These results do not mean that I am able to generalise across the rugby league population because interviews alone may lack the "intimate details of human life" (O' Reilly, 2009, p.100). The results can be used, however, as a start point for other research that examines forms of life in sport systems and the socio-cultural-historical constraints that both create and sustain player development practices (Jones et al., 2003). I recommend that future research should employ ethnographic methodologies to develop a broader and deeper understanding of the relationship between a form of life and affordances. Situating future studies in the ecology of a player development pathway, may provide insights into how social, cultural, and historical influences can be challenged to provide appropriate athlete development environments.

2.7 Conclusion

This study highlighted how interacting subsystems in player development pathways collide to create many forms of life in sport, which results in conflicting beliefs and attitudes towards coaching and player development. This situation can favour traditions of practice over a theoretical framework of learning and developing, influencing the relationship between an athlete and available affordances in practice and competition. The relationship between a form of life and affordances is a valuable conceptualisation of human behaviour, providing a powerful theoretical framework to understand the influence of socio-cultural-historical constraints on an athlete's interaction with the ecology of competitive sport. These theoretical insights have major implications for coaches and performance managers when designing programmes that aim to enhance performance and develop high performing athletes, where athlete potential may not be fulfilled. Coaches, players, and performance managers should also consider the form of life when transitioning between programmes or moving between clubs or teams (e.g., national to international levels), where the form of life

might not fit their views on learning, development, or ways of performing in competition. A major issue is the dissonance that may exist at the mesosystem levels where different microsystems (e.g., naïve beliefs or expectations about pedagogical approaches held by parents and sports administrators) may impinge on the capacity of coaches to use evidence- or theory-based pedagogical methods in practice task designs.

Chapter 3: Investigating the athlete-environment relationship in a form of life: An ethnographic study

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3.1 Abstract

From the theoretical perspective of ecological dynamics, skilful behaviour in performance contexts like sport and education is predicted on the establishment of a functional relationship between an individual and the environment. The strength of this functional relationship is shaped over time by everyday behaviours, values, and customs (sociocultural practices) within a specific sport organisation. A growing body of research seeks to identify these influential sociocultural practices that emerge and exist in sport cultures and organisations. However, little is known from an ecological realism perspective how these practices affect an athlete's engagement with opportunities offered by the environment (e.g., affordances). In this study, I draw on ethnographic data and theoretical tenets of James Gibson's ecological psychology to identify how the sociocultural practices of a British rugby league football academy might shape an athlete's engagement with affordances. Findings revealed that masculinity and disciplined behaviours were the dominant sociocultural practices, instrumental in developing beliefs, values, and customs of athlete development practices. An ecological realism analysis of the data suggested that cultural pressures meant that key actors ignored the potential for development and learning of athletes' self-organisation tendencies, and inhibited individuals' capacities to respond to opportunities for action offered in many traditional practice designs. I conclude by discussing implications for sport practitioners that promote 'affordance-regulated' practice designs to enhance athlete-environment interactions.

3.2 Introduction

Uehara et al. (2018) provided evidence illuminating how organizational and societal sociocultural practices shape the development of functional athlete-environment relationships in sport performance and practice. Sociocultural practices are deeply embedded in the inherent values, beliefs, traditions, customs, and behaviors of specific communities, societies,

and sport organisations, and they can shape the learning and development opportunities of athletes seeking to interact with a performance environment (Rothwell et al., 2019). Broader sociocultural factors influencing sport can lead to the normalisation of athlete development practices that have, at their core, an acceptance of disciplinary power, reductionist views of performance, and hegemonic masculine attitudes.

Athlete development practices of this nature can silence or marginalise individuals who demonstrate other resources, such as dexterity, skill, and creativity that may not fit with cultural norms like adhering to rigid team structures and patterns of play, following orders and 'playing tough'. Denison et al. (2017) illustrated these ideas with their Foucauldian analysis of 'disciplinary legacy and the challenge of coaching differently'. They argued that discipline forces, emanating from social and political ideals, align with coaching practices that they considered to render athletes as compliant 'docile bodies' (Denison & Avner, 2011). Similarly, Stewart et al.'s (2019) investigation of a Scottish secondary physical education context identified that male pupils embodied a particular form of masculinity, aligned to an influential rugby culture, through the importance placed on 'trying hard' and 'physical ability' to maintain participants' social standing in the educational institution.

A growing body of research has continued to identify the normative practices apparent in sport cultures and organisations (e.g., Adams, 2020; Blackett et al., 2019; Purdy et al., 2009). To advance these findings for the benefit of athletes and coaches, Anver et al. (2020, p. 14) have argued for a "deeper understanding of the docility-producing effects" that are a consequence of attitudes toward coaching, learning and knowledge, deeply rooted in historical sociocultural factors. Aligned with Anver et al.'s (2020) sentiments, my intention in this paper is to explore an alternative perspective on docility-producing effects, by drawing on theoretical tenets of James Gibson's (1979) ecological psychology. Here, I seek to develop an understanding of how particular sociocultural practices can continually shape an athlete's

intentional engagement with opportunities for behavioural interactions provided by the task constraints of practice and competition (e.g., affordances; see Reed, 1993). Adopting an ecological realism perspective can offer new insights for understanding why and how athletes behave as they do in different sporting contexts and why individuals are intentionally and selectively responsive to one opportunity for action rather than another (Araújo et al., 2019a).

3.2.1 An ecological dynamics conceptualisation of sport performance

Implementing an underlying conceptual framework in athlete development and performance preparation programmes can protect sport organisations, coaches, performance managers, and athletes against effects of ‘path dependency’ (inherent biases) by mitigating against values, beliefs, traditions, customs, and behaviors that are detrimental to supporting the long-term development and functionality of athletes (Ross et al., 2018; Woods et al., in press). Rasmussen et al. (2019) exemplified this point to counter deterministic views of athlete performance by proposing an interdisciplinary, theoretical framework to stimulate creative actions in sport, and to challenge traditional customs within coaching.

Ecological dynamics (the integration of ecological psychology and dynamical systems theory) is one such theoretical framework that can support sport practitioners in recognising social and cultural biases to coaching and talent development practices (Rothwell et al., 2020). Ecological dynamics rejects a traditional assumption that an individual’s interactions with a performance environment are mediated through internally stored mental representations of the world. Instead, ecological dynamics emphasises the development and enrichment of a reciprocal and functional relationship between an individual and environment to form a complex, interconnected system (Araújo & Davids, 2011). This perspective is inspired by the direct realism of ecological psychology (Lobo et al., 2018), where the starting point for understanding human behaviour is the engagement between the active organism (individual), and the constraints of the surrounding environment, predicated on the

continuous use of information to regulate actions (Richardson et al., 2008). From the inherent complexity of the athlete-environment system, functional, goal-directed behaviours emerge as an athlete learns to satisfy multiple interacting constraints, deeply integrated and related to personal (e.g., genetic composition and physical and emotional attributes), task (e.g., the relationship between fundamental rule changes, equipment (re)design and performance demands) and environmental (e.g., social, cultural, economic, historical and political) factors (Phillips et al., 2010; Newell, 1986).

Embedding an athlete's practice experiences in environmental contexts that consist of value (opportunities for action) and meaning (information) can strengthen functionality within a performance environment (Araújo et al., 2019b). Opportunities for action, continuously offered by properties of playing surfaces and markings, positioning of teammates and competitors, equipment, technology and features of competition exemplify *affordances* in ecological dynamics (Davids et al., 2017; Gibson, 1979). In the most simplistic form, affordances are 'possibilities for action' that an environment offers an organism (Gibson, 1979). Rietveld and Kiverstein (2014) have proposed a broader conceptual framework of affordances, suggesting that possibilities for action provided by an environment are dependent on the specific abilities possessed by an individual to integrate mind and body to perceive and act on the rich information sources available in the environment (Woods et al., 2020). To advance conceptual understanding, Rietveld and Kiverstein (2014) highlighted, that, in human behaviour, effectivities (abilities, capacities and tendencies) and affordances can only be understood in the context of an ecological niche and the relationship with a *form of life* (Wittgenstein, 1953). Rietveld and Kiverstein (2014, p. 330) elaborated:

Affordances are possibilities for action the environment offers to a form of life, and an ecological niche is a network of interrelated affordances available in a particular

form of life on the basis of the abilities manifested in its practices—its stable ways of doing things.

In human behavioural contexts, a form of life describes standard sociocultural practices that are "manifest in the normative behaviors and customs of our communities" (Rietveld & Kiverstein, 2014, pp. 328, 329). It is this intertwined relationship between a form of life captured in an ecological niche, which serves as a significant reference point for understanding the functionality of human behaviours in specific performance contexts (Ramstead et al., 2016). An ecological niche reflects how a species or group of individuals, actively construct and modify their own and each other's evolutionary niches (Odling-Smee et al., 2013). Several examples have illustrated how, in a sport performance context, an ecological niche may be formed by a support team of practitioners, sport scientists, performance analysts, and athletes (classed as a performance and development preparation team) within a high-performance programme (McCosker et al., 2019). Exemplified by a Department of Methodology (expanded on later), such integrated teams can modify, reproduce, and implement a shared methodological approach that influences each performer's ability to interact with affordances in the microstructure of practice or competition (Rothwell et al., 2020). Therefore, an athlete's ability to respond to *solicitations* (multiple promoted affordances that have great relevance to an individual in a specific performance context) is highly dependent on how the form of life influences the practices of athlete development teams that exist in a particular ecological niche (Araújo et al., 2019a).

These ideas are exemplified by consecutive NBA champions, the Detroit Pistons, who infamously employed a tough, highly structured, machine-like, defensive style renowned for the 'Jordan Rules' (illegal tactics used when playing the Chicago Bulls to minimise the dominating influence of Michael Jordan's attacking game). Additionally, Detroit's famous Kronk boxing gym has nurtured many World Champions who adopted a similar

confrontational and gritty front foot, power punching, fighting style (Lee, 2019). From an evolutionary perspective it is perfectly logical that these sport performance characteristics were a resonant legacy of the socio-cultural and historical characteristics of Detroit city's mechanized, mass-production, automotive industry. These performance characteristics seem to have formed deeply engrained ideologies shared between coaches, athletes and consumers that fostered tough, reductionist and mechanistic attitudes towards sport performance (Zehntner et al., 2019).

To date, research adopting a perspective of ecological realism to investigate the effect of sociocultural practices on the individual-environment relationship is limited (for some exceptions see Rothwell et al., 2019; Rynne, 2016; Sanderud et al., 2019). An ecological realism perspective may provide unique insights into how the everyday practices of a sport organisation influence an athlete's engagement with affordances. One way to increase understanding and generate knowledge about the relationship between sociocultural practices and underlying structures that influence human behaviour, is to adopt an ethnographic approach (Atkinson, 2017). Through taking an ethnographic approach, and adhering to an ecological realist framework, I sought to consider the following question: What are the sociocultural practices that influence a form of life, and how do they affect the athlete-environment relationship? Additionally, in considering the research question I intended to address the following aims: 1) identify and observe first-hand the sociocultural practices of a sport organisation and characterise the relationship with the existent form of life, and 2), conceptualise, from an ecological realist perspective, how a form of life influences the athlete-environment relationship.

3.3 Methodology

3.3.1 Background and context

A British rugby league football academy provided a research base due to the sport's rich and unique socio-cultural-historical backdrop. Formally organised in 1895, with its origins embedded in the Victorian era (1837–1901) and its industrialisation of manufacturing and labour, rugby league football has developed its influential structures, culture, and traditions (synonymous with the social and political ideals of the time and hegemonic masculinities discussed earlier) that remain today (Collins, 2006). A season-long (September to June) ethnographic study at a professional club's England Talent Pathway (ETP) programme was conducted to gain meaningful insights into these systems and processes. The ETP is a talent development initiative developed by the Rugby Football League (RFL) and aims to increase the number of talented 12 to 14-year-old rugby league players (Rugby Football League 2015). Every British Super League professional club runs the ETP provision and, unlike traditional talent pathways, the ETP removes selection and de-selection through an inclusive approach where any registered school or club player has the autonomy to attend any ETP provision in the country.

Situated within a Super League club in the north of England, the ETP was considered to be an integral part of the club's player development pathway, insofar that all the 2017/18 scholarship players were recruited from the club's ETP. The club ran multiple coaching sessions during the week and on weekends, and all sessions took place at a local school's floodlit artificial pitch. All sessions were field-based and aimed to improve players' understanding of the game, mental attributes, movement, and coachability (Rugby Football League, 2015). The first author gained access to the ETP through personal contact at the Super League club, and throughout the study was immersed as a full participant (Patton, 2002). To achieve this position, the first author volunteered as an ETP coach on the

programme, but fully disclosed his position and aim of the research to fellow coaches during the first coach development meeting. Although disclosure was initially met with some scepticism from some of the coaches who viewed the lead author as an outsider, an insider position was adopted due to the lead author's previous coaching experiences and coaching qualifications.

3.3.2 Research design and procedures

To develop a sophisticated understanding of the culture of groups or organisations from the perspective of the members, ethnographic studies are considered a legitimate means for generating insights into the sociocultural mechanisms that influence human forms of life (e.g., Sparkes et al., 2020). This ethnographic study built on previously collected interview data to adopt a *critical realist* ethnography (Atkinson, 2017), positioning the underlying socio-cultural-historical contexts to generate a deeper understanding of the factors that influence traditions, customs, and practices in the specific ecological niche (see Rothwell et al., 2018). In doing so, I take the position that the talent development setting alone cannot account for the behaviour of its inhabitants. Instead, their behaviour is a product of, not only, the ETP, but the wider sociocultural practices of the communities they live in (Hammersley, 2006).

The ten-month period provided multiple data collection opportunities. Initially, coach meetings and coach development sessions generated observation data, followed by weekly observations of activities before, during, and after practice sessions. An observational funnel approach was adopted (Alder & Alder, 1994), to gain a general understanding of the broader sociocultural context (Tjora, 2006). Field notes were used throughout the observations to capture and describe routines, behaviours, interactions, and specific incidents relevant to the research aim (Walford, 2009). Writing field notes during coaching sessions was not practical, therefore, in line with the advice of Thorpe and Olive (2017), detailed field notes were

written away from the training facility immediately after practice had finished. Interview data were also collected in the form of casual conversations and organised individual unstructured interviews to generate a more sophisticated understanding of the form of life present in the talent programme (Smith, 2013). Discussions between the researcher and participants also provided opportunities to further explore experiences and to attach meaning to specific situations that were explicitly related to the research aims (Smith & Sparkes, 2016).

The host university ethics board granted institutional ethical approval, and all the coaches (pseudonyms for the study are Barrie, head coach; Simon, Terry and Phil assistant coaches) in the study provided informed consent. Additionally, throughout the research process, a relational ethics position was adopted (Lahman et al., 2011). This approach was motivated by the research team's desire to develop "respectful connections" with the participants to fully appreciate how embedded sociocultural practices are in the talent development programme (Palmer, 2016, p. 319).

3.3.3 Data Analysis

A relativist ontology and subjective epistemology guided the study, exposing researchers to their own 'value system', which can lead to the misinterpretation and distortion of data (Baur & Ernst, 2011, p. 120). Evident here, because of the first author's research position and sociocultural biases acquired during previous experiences of managing a rugby league football talent development programme. However, Elias (1956) argued that analysis of social life must move between the researcher's subjective experiences of the world under study and a level of distancing gained through an analytically detached perspective, allowing theory and reflection to provide a more objective view of the social environment under study. The first author engaged in involvement-detachment theory by grounding continuous reflections and the thematic analysis in the theoretical positions informing the research (Braun et al., 2016). The first author did struggle to become entirely detached from the

experiences of the ETP, although a conscious effort was made to remain detached throughout the data analysis process. Indeed, Elias himself maintained that the involvement-detachment dynamic was a balance and that a fully detached position was impossible (Sinclair, 2016). Exemplified in this study by the first author becoming empathetic towards the participants' (coaches') views towards the highly disciplined and coach-led nature of practice. However, this fluid relationship between the involvement and detachment dynamic served to focus future observations, field notes, and topics of conversation with the coaches. To further encourage reflexivity on how the first author's presuppositions may have impacted on the construction of knowledge, the second and third authors acted as 'critical friends'. Specifically, they provided opportunities to engage in the process of critical dialogue to challenge interpretations made and to provide a sounding board for reflection and exploration of multiple and alternative explanations for the data (Smith & McGannon, 2018).

3.4 Results

Data analysis resulted in three main dimensions about the study aims and started to highlight responses to the complex and dynamic relationships between people, context and the sociocultural practices. The three dimensions are categorised as: (a) sociocultural practices (masculinity and disciplined behaviour), (b) a socially - and culturally-constructed ecological niche, and (c), the athlete-environment relationship.

3.4.1 Sociocultural practices

Sociocultural practices refer to the specific details of how the dominant individuals within the talent development setting influenced attitudes towards the development and performance of the young players. Masculinity and disciplined behaviour were socially and culturally constructed and reproduced by the actions, attitudes, and practices of key agents. These attitudes were exemplified by one of the first author's encounters with the coaches during a planning meeting, where a more established cohort of coaches was discussing a

recent Super League game. The discussion focused on the reasons why the losing team had not performed well, where the consensus was that the losing team were not 'tough enough' and 'lacked discipline' (field notes). The weekly practice activities that the academy players participated in reflected these masculine and disciplined attitudes. In one practice session, observations revealed that performance expectations followed a path of over-valuing and over-emphasising physical size and toughness, rather than emphasising skill performance, innovation, and dexterity. Apparent when two coaches were discussing a player who demonstrated skilful play but was considered to lack 'heart':

Simon: I really like him, he plays some nice stuff.

Phil: The problem with him he's a soft cunt, he doesn't like the contact.

Simon: Yea but look at him he's tiny. He'll grow over time.

Phil: I watched him last week at xxxxxxxx (club), he went missing when it got tough.

Simon: Won't he develop (physically) over time? He's only 15.

Phil: He ain't got the heart for it. (Field notes)

This apparent toughness value was explored further through interviews, where masculine identity was attributed to the sociocultural backdrop of the sport and the working class nature of the rugby league community. Terry elaborates:

Your city clubs, i.e., your xxxxx clubs, you know you're gonna get some rougher lads who are open to a good fight and all that and even at an early (age), I mean, I know for a fact.

The sociocultural context also embedded disciplined behaviour in the player development practices, reflected in attitudes towards how the players should behave during practice. These behavioural expectations were set and reinforced by the coaches' instructions and actions, where the norms of the environment restricted players from deviating away from these expectations (i.e., running, passing, jumping and landing in a prescribed way and demonstrating compliance with the 'right' attitude to learn). These expectations were (mostly)

reproduced by the players' willingness to conform to these normative behaviours, to comply with instructions and avoid the critical, watchful eye of the coaches who were ultimately responsible for their destiny. In one instance, during a warm-up task, a group of players were considered to be 'messaging around' by one of the more senior coaches because of their lack of adherence to a task (the players had broken out into an impromptu tag game after completing the warm-up task). The coach became frustrated by this, and his reaction revealed a dissonance regarding players' expectations and the learning culture held by the coaches', discussed here:

Phil: I would have bollocked them if I wasn't here, but at the club.

Lead author: Why not here?

Phil: The problem is kids come here to play games, not to learn.

Lead author: Ok.

Phil: They can't think, they need telling what to do and when to do it. (Field notes)

The conversation demonstrates the reciprocal and influential nature of individual and environment interactions. On the one hand, the coach suppresses his initial instincts to have "bollocked" (castigated) the players for not conforming with instructions, due to the environmental expectations set by the professional club. Whereas the players' expectation to "play" games during practice ultimately influences (some) parts of practice. These conflicting positions demonstrate how specific attitudes towards behaviour and practice are part of a complex social and cultural dimension that can ultimately influence player and coach intentions.

3.4.2 A socially- and culturally- constructed ecological niche

A goal of the talent development programme was to support player development through a *game sense* approach. The rationale behind the professional club moving towards a game sense approach was to support players to become more 'aware' and to improve their 'decision making' behaviour. This aim was evident from the experiences of the coach

development sessions, where coaches designed a range of games to support the development of 'decision making' skills. The ETP coach resource also guided how to structure coaching sessions (e.g., warm-up, game, movement, game, cool down, and summary (Rugby Football League, 2015), where a 'game sense' element features twice during a session. Barrie also reinforced this position during the practice sessions, where he reminded the coaches about the approach to practice.

The coaches are waiting to start practice. Players are starting to arrive, as they do most start kicking a ball to each other. Some play a small-sided game of touch rugby. Coaches are setting up the practices, discussing their session plans, and confirming who is doing which bit of the session. Barrie calls the coaches over to him and reminds them about his expectations. "Let the players enjoy and express themselves and don't be too worried about them making a mistake, let them learn without actually realising it through the game." (Field notes)

Although the professional club and national governing body promoted a game sense approach, deeper probing and observation revealed there was a clear disparity between the recommended method of practice and the coaches' customs and habits. Although a game sense method was used (because the coaches were instructed to), most of the coaches often reverted to traditional coaching methods (i.e., high levels of instruction and critical feedback). Simon explained that the problem was that some of the coaches just didn't 'get' a game sense approach; he elaborated:

Probably because it's ingrained (traditional practice methods) and they've been around it for that long, and that's what they see as normal, that's what the current coaching education programmes have kind of rammed down their throat. Scared to do anything different and they don't quite understand, but at the same time there's probably a

small number of coaches that really do get it and are open and get the concepts so it's probably down to the individual and how open they are or how maybe intelligent they are, but also what a lot of clubs have got going against them is the norms what they've seen for the last ten-twenty years maybe.

The 'norms' that Simon discussed indicated strong historical traditions of practice ingrained over time and aligned to a deterministic view of human behaviour. Simon discussed how previous playing experiences (creating a path dependency) might play a part in supporting these strongly held coaching assumptions and traditions, leading to a status quo bias for a very specific coaching approach. Simon elaborates:

They've played with a successful amateur team, and they've obviously got a vision of how it was done back then, and if it doesn't look like what they were doing back, then they don't understand the way that things have changed.

Thus, the coaches tended to coach the way that they themselves were coached, exemplifying the 'path dependence' that haunts many sports organisations with strong cultural and historical biases towards traditional ways of working. These customs, habits and traditions of practice reinforced the provision of explicit knowledge and mental representations, exemplified by the coaches' disproportionate use of instruction, demonstrations, and feedback based on a putative, internalised, 'technical' model of player behaviour.

The intricacies of a rugby league 'technical' model (e.g., technical components such as pass, catch, tackle, kick) dominated conversations before and after practice sessions. Barrie explained that ensuring players mastered these optimal technical movement patterns, considered essential to play rugby league successfully, was a common goal across the sport. The result was an over-emphasis on repetitive, coach-driven practice designs that focused on all players acquiring basic technical competence, he elaborated:

On a typical training night where there's six squads training, and it all looks very the same and it's people queuing, it's people not listening being shouted at just the old traditional kind of they very much drill, stop listen to me. Just not a general understanding of how players develop and how different people learn and the need to put variety to sessions and players will develop at different rates, they all expect it to be a real linear process.

During the interviews the commonly held reductionist view of learning was explored. Coaches valued an ideology that the complex multi-dimensional actions during competition needed to be 'broken down' for players to learn them and to adequately play the game. This propensity for 'task decomposition' was exemplified by Terry, who explained about the importance of being 'more skilful' to compete, he explains:

The detail we put into players now and they've got more to think about in that detailed way of where to pass, kids nowadays know. Especially into this environment in a Super League club, they know that there's not gonna be weak players in front of them, so they've got to do everything more skilful and more detailed to try and break it down.

Terry's comments demonstrate the commonly held view of determinate human behaviours, where coaches' associated being 'skilful' with acquiring technical skills in highly specific ways that closely replicated the sequentially-listed coaching points highlighted in rugby league coaching manuals. For example, when coaching the sidestep, players must perform these action components in sequence: 1. push off either foot when 1–2 metres away from the defender, 2. drive selected foot hard against the ground and step away from a defender in to space, 3. land on opposite foot with a slight lean forward, 4. accelerate into space to reach top speed (Rugby Football League, 2014). This reductionist and deterministic ideology to

measure players' performance improvement, reinforced the view of the human body as a machine. This belief held by the coaches' resulted in them seeking mechanistic principles to quantify performance improvement by providing explicit knowledge and mental representations to hone technical outputs. This approach was exemplified by Terry, who explained how he supported one player at the club who had a chance of 'making it', by providing him with information about these complex actions:

I'm putting a lot of input into him, I'm putting a lot of information into him because I know he can make it. It tell him don't practice poor, every time you practice make sure that everything is just more quality than quantity, just do it and just practice it really good and it'll come naturally to you then.

The dissonance between (most of) the coaches' socially and culturally constructed beliefs towards coaching practice and the approach promoted through the talent development programme of this professional sport organisation was evident throughout the programme. Interestingly, the cohort of coaches who held these strong beliefs never consciously challenged alternative methods and would agree that players needed better decision-making skills. However, ultimately the strong sociocultural influences ensured the status quo was maintained.

3.4.3 The athlete-environment relationship

Players' experiences of practice tasks and the coaches' behaviour during the field-based sessions were considered influential in shaping players' thoughts and actions during performance. Barrie felt that certain reductionist practice methods were supporting 'robotic' player behaviours, meaning players could only react mechanistically to external features of the environment, a limitation in the dynamic performance context of team sports. He elaborates:

I think it (traditional practice methods) makes them (players) very coach dependent so not necessarily very aware of themselves, what they need to improve on, not great at making decisions, very robotic at times, unable to work things out for themselves so the game's very, very structured now and as a result, people can't make great decisions, yeah very robotic more than anything.

An example of the traditional practice methods that Barrie discussed aimed to enhance predictability and reduce uncertainty through rigid role specification and the reduction of personal autonomy. These traditional practice methods simply required players to 'go through the motions', to rehearse pre-planned actions, with very little emphasis on players to be responsive to the opportunities that may *emerge* in the practice environment. Exemplified here by a coach's session plan:

Mark out an area with 3 cones in a triangle shape with player 1 at the peak and 2 and 3 on the other corners. Player 1 starts with ball. Once he sets off player 2 and 3 time their run so that P1 passes to P2 who in turn passes to P3. Every pass as to be backwards and timed so that the ball stays in the middle area of the triangle. (Session plan)

Reducing players' openness to information emerging within the environment was a consistent feature of practice. Rather than letting the players interact with the practice environment, coaches would use the experience to identify and correct poor 'technique' (i.e., not reproducing a movement as per the coaching manual). This situation was evident on many occasions where coaches would pre-empt technical deficiencies before the session starting, rather than enhancing opportunities to experience decision making actions. This experience was exemplified here by pre-session email correspondence from a coach to the lead researcher:

One coach will lead with it being game-based, and the other can pull players out while the game is running to make sure they are using correct techniques, 2nd game we will switch roles, so both coaches are involved in both aspects of the session if you're ok with that. (email communication)

This approach fostered an environment that valued players' 'reproduction of technique' capacity as opposed to the programme aim of developing better decision-making behaviours, where coach control, rather than player autonomy, was a constant feature of practice. The result was that coaches adopted a 'coach-centred' approach by continually interrupting the flow of practice to provide verbal instructions and corrective feedback if they felt that players were not adhering to 'appropriate' technical competence, regardless of the outcome.

Demonstrated here by an exchange between Terry and the lead author:

Terry: Stop it, you need to stop it (the session), they're getting sloppy (at passing)
Lead author: Right, ok

Terry walks onto the pitch, stops the practice and speaks to the players.

Terry: Remember your passing, I don't want to see this any more (demonstrated an incorrect passing action), right crack on.

Terry returns to the pitchside.

Terry: You've got to keep on at them, or they get sloppy. Don't be afraid to stop it (the practice) and tell them. (Field notes)

The consequence of this technical bias was the influence on players' exploratory behaviours during the chaos of gameplay. Demonstrated during a game designed to improve players' ability to identify and attack space, a playing area was set up with increased width, allowing more space for the attacking team to explore and exploit attacking opportunities.

During the 8 v 8 game players are using approximately 30 meters of the 60 meter wide pitch. Both teams are crowding around the ball. The attacking team are not

making much ground, attacking players are happy to run into multiple defenders and get tackled. Phil is getting frustrated. He starts shouting instructions to the attacking team "space!" "where's space!", players don't respond, the coach gets more frustrated. He stops the game and calls the players over to him and questions them about the practice.

Phil: What's the aim of this game? (10 seconds passes, and the players have not responded)

Phil: Attackers, what are you trying to do?

One of the more confident players responds.

Player: Find space

Phil: So why are you only attacking the middle? (Another period of silence passes)

Phil: This time I want you to use the whole width of the pitch. What will that create?

Player: More space to attack.

Phil: Ok, good, let's go.

The game resumes, and for a short, while the attacking team uses the full width, this results in the performance behaviours the coach is expecting but also increased handling errors and mistakes. Leading to the attacking team reverting to playing down the "middle".
(Field notes)

Although a minority of players were willing to respond to questions and explore the practice landscape when encouraged to do so, the majority of players remained passive, unresponsive, compliant and 'robotic' during practice (i.e., could only act when told to do so). This situation illuminates the risks involved when a dichotomy of coaching approaches (identified previously) contradict one another, creating dissonance and leaving players 'unsure' and 'apprehensive' about how they should interact with the coaches and the opportunities that practice and competition provided for them.

3.5 Discussion

3.5.1 Sociocultural practices and the form of life

The study identified masculinity and disciplined behaviour as the dominant sociocultural practices that influenced the coaches' and players attitudes towards performance and development. Historically, masculinity and disciplined behaviour have been synonymous with rugby league since the sport's birth in 1895, a sport played and watched by members of the industrial working class. The industrial factories shaped men and women through arduous, masculine, and disciplined work conditions. This work organisation pattern was influenced by Frederick Winslow Taylor's 'task system of management' (Taylor, 2008), which aimed to remove manufacturing uncertainty by applying hierarchal systems of control through rigid role specification and task repetition (Taylor, 1911). The workforce was merely a cog in the system and was submissive to institutional regimes. Consequently, on the rugby field, these individuals were governed by the same institutional regimes honed on the shop floor in the factories of the industrial north (Smith & Davids, 1992). These same synergistic interactions between sport and society were demonstrated and reproduced by the coaches (in the current study) perfunctory and inflexible attitudes towards player performance and were ultimately maintained by the complex power relations embedded within the rugby league academy (Bronfenbrenner & Morris, 2007; Gearity & Mills, 2012).

The authoritarian coaching approach embraced by the coaches, synonymous with the traditional daily practices of the industrial factories, was based on normative models of how players should adhere to performance solutions that emphasised aggression, toughness, and the execution of predetermined movement behaviours (e.g., Denison et al., 2017). The coaches rejected the academy's game-based approach and embraced these familiar structural models of human learning based on notions of *linear causality* (Kelso, 2007), with the belief that the enrichment of components can achieve improved athlete performance (e.g., technical

component skills in rugby league), through limiting performance variability, the constant repetition of single tasks, and continuous monitoring for, and detection of, system errors (Schöllhorn et al., 2009). These socially- and culturally constructed beliefs and dispositions, demonstrate how powerful a form of life can be in sustaining customs, habits, attitudes, and practices within a sporting ecological niche (Button et al., 2020).

It is perhaps unsurprising that the coaches rejected a repositioning of their *direct instructor* role (where traditional, technique based, and coach centred pedagogies are considered the norm), considering the sociocultural practices they were embedded within. This situation is synonymous with Harvey et al.'s (2010) exploration into how soccer coaches incorporated Teaching Games for Understanding (TGfU) into their practice, where experiences gained in social and cultural contexts formed a powerful influence on coaching pedagogy, influencing differing degrees of engagement with the TGfU approach. In this study, the coaches practice choice and preferences towards specific approaches can be understood by considering the relationship with the apparent sociocultural dimensions. By way of example, rugby league coach education courses teach coaches to operate in a direct instructor way, and like the factory managers before them, it provides a mechanism to exert the ideological view of discipline and control over the players. For Light and Kirk (2000, p. 165), experiences of this nature influence responses to specific conditions through the “embodied social history of the individual, as the cumulative somatic product of the individual’s corporeal engagement in social and cultural practice”. So, although the academy Managers vision to support players to improve their 'decision making' behaviour through a games-based approach was well intended, it was always going to prove problematic.

Identifying characteristics of dominant forms of life and understanding how they influence coaches’ attitudes towards different approaches, might start to address the problematic nature of socially and culturally constructed attitudes to coaching and

performance that can marginalise players who do not possess the required traits to fit in (Uehara et al., 2018). Exemplified in this study by the expectation of players to follow orders, be tough, demonstrate manliness, and to adopt a disciplined attitude. However, these prevailing traits could be a challenge to developing highly engaged and thinking athletes (e.g., Denison & Mills, 2014), to interact with specific task goals and environmental information to utilise affordances to act under changing performance conditions (Seifert et al., 2013).

3.5.2 The ecological niche and the athlete-environment relationship

To advance our understanding of an individual's experience of soliciting and non-soliciting affordances, based upon sociocultural constraints, it is important to reconsider that affordances are not simply possibilities for action that exist in an environment to offer opportunities to an individual, but affordances can also invite or repel behaviours (Withagen et al., 2017). Therefore, the performance environment should not be viewed as a "collection of causes, but as a manifold of action possibilities" that makes behaviour possible (Withagen et al., 2012, p. 251). From this perspective, how active organisms modify their ecological niche can influence selection pressures on certain action possibilities over others (Matthews et al., 2014), as Levins and Lewontin (1985, p. 106) noted: "The organism influences its own evolution, by being both the object of natural selection and the creator of the conditions of that selection". Player evolution and the notion of niche construction were evident throughout the current study, where the ETP coaches played an instrumental part in controlling, regulating, and modifying the ecological niche through perceptions of performance embedded in reductionist and deterministic attitudes. In the same way, as earthworms or birds shape development opportunities for their offspring, the ETP coaches passed on values, beliefs, traditions, customs, and behaviours to the players, that had a major effect on the

athlete-environment relationship, through a process known as ‘ecological inheritance’ (Odling-Smee et al., 2013).

This conceptualisation of affordances has the potential to provide a different perspective on practice designs (for an excellent example in the sport of Rugby Union, see McKay & O’Connor, 2018), and presents an important research question regarding factors that influence bodily responsiveness to action possibilities, since ‘solicitations are subject-dependent, whereas affordances are not’ (Dings, 2018, p. 4). Although research exploring factors that solicit actions is in its infancy, early work has suggested that key variables such as action capabilities (Warren, 1984), evolutionary history (Withagen & Chemero, 2009), sociocultural factors (Rietveld & Kiverstein, 2014), and cultural pressures (Heras-Escribano & de Pinedo, 2016) can influence an individual’s engagement with the environment. This perspective leads us to the interrelated nature of a form of life, cultural pressures, and the influence of the athlete environment relationship in perceiving affordances that attract or repel solicitations. The practice environments experienced by the players in the current study consisted of affordances and information that could lead to successful engagement in practice and competition. However, the cultural pressures forced athletes to take advantage of certain affordances over others (e.g., Ramstead et al., 2016). As Reed (1996, p. 69) suggested, “[It] is not the animal’s brain that organises its world, but the evolutionary ecology of the animal that organises its brain”. Evolutionary ecology in this sense relates to the evolution of individual players within the England Talent Pathway (ETP), and how cultural pressures (i.e., high levels of direct instruction, masculinity, and disciplined behaviour) shape ‘selective sensitivity’ to relevant affordances (Bruineberg & Rietveld, 2019). From an evolutionary perspective of the ETP, affordances to satisfy sociocultural practices were deemed more important for survival and were more likely to invite behaviour (e.g., playing safe to avoid mistakes, reproducing optimal movement patterns as instructed by a coach, and reacting only

to pre-organised external features of the environment), as opposed to the skilful engagement with the other opportunities provided by the rich practice environment. So, although affordances to support skilled intentionality were available to players to help them thrive in performance (Bruineberg & Rietveld, 2014), the sociocultural practices embedded in the form of life meant that players only responded to certain affordances. This theoretical conceptualisation of affordances offers a means of explaining how the selection of a course of action is based on the engrained, traditional environmental constraints of the athlete-environment system, which determine to what extent an individual is solicited by available affordances (Ramstead et al., 2016).

Another challenge to the players actively engaging with the environment was the determinate, top-down, hierarchical model of human behaviour. Ribeiro et al. (2019) have referred to such external, top-down influences to the regulation of behaviour, as having a 'global-to-local' direction where external agents such as parents, teachers, and coaches oversee rehearsed set plays and pre-planned, coordinated collective actions, considered essential to regulate conscious thinking and action. These global-to-local tendencies were evident within the ecological niche, where wider sociocultural beliefs suggested that the direction of interactions was dominated by a hierarchical, determinate, external influence to globally orchestrate the dynamics of player coordination during practice and performance (Araújo & Davids, 2016). Consequently, coaches designed learning tasks that enhanced predictability and reduced uncertainty through rigid role specification and the reduction of personal autonomy, with players becoming coach-dependent to satisfy global constraints. However, this environmental determinism ignored the potential of players self-organisation tendencies (athletes adapting and organising without external input in a 'local-to-global' direction), to capture the reciprocity between the athlete-environment relationship to form a deeply entwined, complex, adaptive system (Davids & Araújo, 2010).

In contrast, a Gibsonian account of human behaviour suggests that individuals do not need external input or the guidance of conscious thinking to find their way in the world; rather they act unreflectively to harness a selective openness and responsiveness to the relevant opportunities for action (affordances) (Gibson, 1979; Kiverstein & Rietveld, 2015). Interestingly, players demonstrated an openness and responsiveness to multiple affordances during self-led activities (e.g., small-sided touch games before practice started), where players demonstrated unique movements to skilfully engage with affordances, which in the coach-led session, would be actively discouraged. In this sense, highly responsive and skilful athlete behaviour is not the result of a form of life that promotes practice tasks requiring athletes to rehearse, repeat and fluently perform isolated actions devoid of environmental context. Rather, it is the degree to which individuals respond to relevant solicitations that leads to exceptional engagement whilst exploring a landscape of affordances (affordances available in an ecological niche) (Kiverstein, van Dijk, & Rietveld, 2019).

3.5.3 Implications for understanding the practitioner role in sport

Athletes who inhabit an ecological niche that encourages exploratory behaviours to continuously search an affordance landscape (e.g., identifying and exploiting space, engaging in interpersonal coordination to promote collaborative and creative behaviours between teammates, and using variability of actions to de-stabilise attacker-defender dyads) to solicit actions, will more likely be in a state of action readiness to be selectively open to the specific demands of a performance environment (Renshaw et al., 2019). Such ideas offer a means for designing practice tasks that can harness an athlete's responsiveness to relevant affordances. Practitioners can harness these practice designs to appeal to an individual's motivation to seek value (affordances) and meaning (information) in a performance environment (Reed, 1996). Task constraint manipulations can be employed to provide practice settings that allow athletes to unreflectively search (using implicit learning to explore functional coordination

modes), discover (exploring task solutions), and exploit (exploiting inherent self-organisation tendencies in the perceptual-motor system) whilst satisfying goal-directed behaviour (Renshaw et al., 2016).

In team sports performance, this aim can be achieved by implementing tactical principles of play to constrain co-existing ‘local-to-global’ self-organisation tendencies to help athletes utilise relevant affordances through their continuous interactions in practice (Ribeiro et al., 2019). For example, game-based practices designed around tactical principles of play (i.e., go forward, attack space, support the ball, apply pressure, and regain possession), where athletes are constantly striving towards satisfying these specific intentions by searching and exploring the practice landscape (Fajen et al., 2008). Ribeiro et al., (2019) argued that training in team sports needed to be re-designed to be more ‘affordance regulated’ to capture a much more nuanced balance between pre-planned, structured actions (global-to-local direction of control) and the unstructured interactions of players with events and plays as they emerge on the field (local-to-global direction of control by players). It is this striving that can enhance athlete-environment interactions to search for more functional movement solutions and enrich an athlete's relationship with the environment (Kiverstein & Rietveld, 2015).

3.6 Conclusion

In this study, I have considered how a form of life in a sport organisation influences athletic experiences and an athlete's engagement with available affordances of a competitive performance environment. Positioning the athlete-environment relationship as an important unit of analysis for understanding behaviour can advance our understanding of how to strengthen an individual's functional relationship with practice and competition. In this respect, this conceptualisation of affordances in a talent development programme as an ecological niche can support groups of practitioners in designing high-quality learning and

development experiences. The insights provided in this study of a rugby league club, aligned to concepts in ecological dynamics, suggest that, more broadly, the aim of sport practitioners and applied scientists should be to design learning environments embedded in an environmental context that consists of value (affordances) and meaning (information) for the learners. A limitation of this study was not drawing on the athlete's experience of the ecological niche to determine factors that influence soliciting and non-soliciting affordances. To further understand these theoretical insights in preparation for sport performance, it is important to conduct similar field-based studies that combine quantitative athlete development measures (i.e., performance analysis, evaluation and assessments) with phenomenological data to provide a more rich and insightful understanding of factors that continually shape the athlete-environment relationship. Conducting research of a deeply integrated nature will also help applied scientists and practitioners determine how individuals learn to satisfy a range of interacting constraints in the ecological context of sport performance.

Chapter 4: Exploring coaches experiences of niche construction: An ecological dynamics analysis

Rothwell, M., Davids, K., & Stone, J. A. (2021). Exploring niche construction in sport coaching: An ecological dynamics analysis. *Sports Coaching Review*.

4.1 Abstract

In this article I challenge deterministic practices on learning and development, biased towards individual properties of learners (e.g., genetic endowment) and knowledge acquisition (e.g., internal representations). These traditional approaches typically fail to account for environmental influences which may interact in unique ways with relevant personal characteristics of learners. To challenge these deterministic approaches, I present a conceptual framework that combines niche construction theory and ecological dynamics, positioning behaviour at the ecological level of analysis where highly skilled behaviour emerges from the individual-environment system. To substantiate this conceptual framework, I investigate the insights and experiential knowledge of professional sports coaches on their practice designs. Results revealed how athletes and coaches value the capacity to modify athlete-environment interactions influencing opportunities for action in a practice context. This novel conceptual framework can inform the designs of contemporary learning and development practices that positively influence the evolution of skilled behaviours in different individuals.

4.2 Introduction

A goal for coaches and practitioners in performance contexts like education and sport, is to provide meaningful and contemporary learning approaches that support the development of functional and adaptable behaviours (Avner et al., 2020; Rudd et al., 2020). However, traditional education practices typically focus on what has been termed the *knowledge acquisition* metaphor (an influence traceable back to Plato's dialogue *the Meno*), where learning is focused on acquiring facts or skills, the memorisation and reproduction of which can be measured by assessment procedures using standardised performance tests (Barker et al., 2012). In this sense, learning is believed to occur by enriching internalised representations between the brain and the goal to be achieved that support permanent behavioural changes

(e.g., Schmidt & Wrisberg, 2004). Araújo and Davids (2011) have raised concerns over this deterministic explanation of learning in contexts like sport, suggesting that these ideas emanating from the psychological sciences have developed an *organismic asymmetry* (i.e., an organism-centred view of behaviour). This view of human behaviour has promoted a genocentric view of athlete learning and development that has been criticised for objectifying athletes' bodies and over-emphasising the physiological, anthropometric, genetic, and psychological profiling that seeks to dominate debates on the foundations for athletic performance (Barker-Ruchti & Tinning, 2010; Phillips et al., 2010).

This perspective on learning is synonymous with biological determinism and models of human behaviour in the evolutionary sciences, where, as in education and sport, predetermined inherent properties are conceptualised and tested because they have been deemed important for progress or adaptations (Denison et al., 2017). This has led to sport pedagogists holding an assumption that promotes the development of internal representations in disciplined models of learning and development that are technique-focused, coach-centric, with the potential to inhibit individuals' capacities to respond to opportunities for action in practice and competition (Rothwell et al., 2020a). Hassanin and Light (2014) have suggested that deterministic approaches to educational programmes can be attributed to the powerful influence of sociocultural contexts of a specific country or community, demonstrating the significant effect of sociocultural dimensions of learning and development. This is problematic in sport because engrained disciplined and reductionist approaches that focus on an organism-centred view of performance could limit the effectiveness of practice and preparation, lead to overtraining, and cause injury (Mills et al., 2020). Such approaches may reject the idea that individuals have the capacity to develop a reciprocal relationship with the environment to support the emergence of skilful athletic behaviour (Araújo et al., 2019a; Konoval et al., 2019).

An alternative view of athlete learning and development, that positions the learner as an active agent capable of self-regulating to interact with multiple opportunities for action offered by the environment (i.e., affordances), is ecological dynamics (Button et al., 2020). A key tenet of ecological dynamics is Gibson's (1979) theory of affordances. Gibson (1979) argued that humans inhabit ecological niches (i.e., a talent development programme or coaching setting) replete with available *affordances* which continually invite actions from them. Exemplifying Gibsonian ideas on the importance of affordances in person-environment interactions: surfaces offer support, gaps between objects invite transitioning through, and other people provide opportunities for social interactions that are necessary for shared affordances and responding to normative ways of behaving (i.e., sociocultural practices). Within an ecological view of learning and development, individuals become skilled at perceiving surrounding information (e.g., on properties of surfaces, distances between objects and on expressions and demeanours of other people) and develop the agency to utilise some available affordances and reject others (Withagen et al., 2012). When individuals are consistently exposed to ecological niches that are rich in information, they are likely to develop the *effectivities* (skills, knowledge, and capacities; Gibson, 1979) to seek and use available affordances to guide skilled actions (Araújo et al., 2019b).

Rothwell et al. (2020b) have suggested that creating an ecological niche to promote self-regulating, functional, and adaptable athletes, who develop a tightly knit relationship with the environment, should be the cornerstone of learning and development programmes in sport. However, the idea of sport practitioners creating an ecological niche that strengthens the athlete-environment system might be at odds with the norms of a specific sport and can (for an example in athletics see Mills et al., 2020), therefore, be problematic to develop in some social and cultural contexts (Ross et al., 2018). The reasons for this challenge can be twofold. First, sociocultural factors can assert a powerful influence on coaches' professional

practice (Banwell et al., 2020). Second, sport practitioners who are not familiar with the idea of strengthening the athlete-environment system might find the term somewhat abstract. This may inhibit them from being able to support this ecological notion of learning in practice. Therefore, the overarching goal of this article is to provide sport coaches who are interested in moving away from deterministic models of learning and development, with a conceptual framework that supports the notion of niche construction and situates the learning process within an ecological dynamics rationale of the athlete-environment system.

To develop the conceptual framework, we combine niche construction theory (NCT) (Lewontin, 1983; Odling-Smee et al., 1996) with concepts in ecological dynamics. This combination is appropriate because their shared assumptions and reciprocal foundations are aligned to tenets of ecological psychology, particularly the theory of *affordances* referring to the action possibilities that the environment offers an individual for "good or ill" (Gibson, 1979, p.119). The basic premise of NCT is that living organisms, through their "metabolism, activities, and choices" can modify environmental conditions to shape and influence selection pressures (Matthews et al, 2014, p. 245), positioning the reciprocity between an individual and their environment (i.e., athlete-environment system) as the basis for human development, learning, and evolution (Odling Smee et al., 2013). In sport, a selection pressure relates to how coach or athlete modified environments can preference certain performance behaviours over others (e.g., in boxing, coach informed practice can support boxing on the front or back foot). To evaluate the extent to which organism-mediated environmental modifications evolve in natural populations, Matthews et al. (2014) proposed a criterion to test for the presence of niche construction (Criteria 1 & 2) and determine when niche construction affects evolution (Criterion 3) (Table 1). Here, I argue that these criteria are important to provide an operational framework that emphasises the learner-environment relationship for coaches, teachers, trainers, educationalists, and sport practitioners who are challenged with designing

learning environments (i.e., an ecological niche). The combination with concepts of ecological dynamics is important because it provides an explanation of how NCT-informed learning environments support functional, adaptable, and emergent behaviours in response to opportunities for action (i.e., affordances) available in dynamic contexts.

Niche construction theory and ecological dynamics can strengthen the learner-environment relationship		
	Criteria for Niche Construction	Ecological Dynamics concept
Criterion 1	An organism (i.e., a candidate niche constructor) must significantly modify environmental conditions.	Although athletes and coaches can and do modify conditions at the micro (i.e., practice tasks) and macro (system level changes) levels of development. Modifications must be for the benefit of athlete improvement. The concept of <i>representative co-design</i> in ecological dynamics can facilitate the collaborative design of learning environments.
Criterion 2	The organism-mediated environmental modifications must influence selection pressures on a recipient of niche construction.	Coaches and athletes can bring about changes in the practice landscape by influencing selection pressures on the utilisation of specific affordances.
Criterion 3	There must be a detectable evolutionary response in a recipient of niche construction that is caused by the environmental modification of the niche constructor.	Detectable evolutionary responses in athletes may be manifest in the environmental constraints (socio-cultural) that athletes experience on micro and macro timescales.

Table 1.1: Combining Mathews et al. (2014) criteria for niche construction and ecological dynamics can provide sport practitioners with a conceptual framework to design practice environments that strengthen the athlete-environment relationship.

To achieve the overarching goal of developing a conceptual framework that supports the notion of niche construction, I recognise, as Cooper and Allen (2018) did, the value and importance of drawing on the experiential knowledge of experienced coaches to ensure that the development of a conceptual coaching framework is realistic and meaningful. With this in mind, I sought the qualitative insights of experienced sport coaches working across different sports who were informed by an ecological dynamics framework. Crucially, this approach

was adopted to establish if experienced coaches' everyday assumptions about coaching and learning align to the NCT-ecological dynamics coaching framework, to provide a better understanding of its application in future practice (e.g., Williams et al., 2015). Therefore, the specific aims of this paper are to: 1) draw on the experiential knowledge of professional sports coaches' activities and choices when modifying environmental conditions (for example, manipulating task constraints) in the microstructure of practice designs. The microstructure of practice involves designing activities over the hours, days, and weeks of learning programmes for individuals engaged in continuous practice and training, such as encountered in PE and sports programmes (Chow et al., 2020); and 2), collect and analyse coaches' qualitative insights of the microstructure of practice design with respect to tenets of a combined NCT and ecological dynamics framework. In doing so, we also respond to Avner et al.'s (2020) call for more research that aims to understand how new models of coaching can facilitate the development of athletes who are actively engaged in the learning process. In addition, we hope these theoretical insights challenge sport coaches to consider how the ecological niches they modify influence athlete evolution (i.e., developing capacities, abilities, and performance tendencies) over micro, as well as macro timescales (i.e., the entire timescale of talent development).

4.3 Combining niche construction theory and ecological dynamics can enhance our understanding of the athlete-environment system

To complement the criteria proposed by Matthews et al. (2014), and to enrich our understanding of how ecological and evolutionary dynamics interact to develop athlete performance, I first overview key concepts and assumptions of Gibson's theory of affordances in ecological dynamics theory. Ecological dynamics is a contemporary theory of movement coordination, skill acquisition and talent development, aligned with NCT's complementary view, in advocating the mutuality of the athlete-environment system (for

more details see Button et al., 2020). In athletes and sports teams, conceptualised as complex dynamical systems, behaviour is understood to self-organise under constraints, continuously shaped by a range of individual, environmental, and task constraints, impacting on each athlete, seeking to achieve their intended task goals. Sport performance behaviours can be understood at this ecological level of analysis, where the organism-environment system is continuously and reciprocally shaping one another (Richardson et al., 2008). Expanding on Matthews et al.'s (2014) criteria for NCT can help us highlight how the complementary nature of key concepts in ecological dynamics and NCT can provide an interdisciplinary perspective that could enrich understanding of athlete- and coach-modified practice environments on athlete development and learning.

4.3.1 An organism must significantly modify environmental conditions

Aligned with insights of James Gibson (1979) on reciprocity of organism and environment interactions, the biologist Richard Lewontin (1983) suggested that living organisms have the capacity to actively construct and modify environmental conditions (sociocultural practices) for their benefit. This is an important concept for understanding athlete development and performance, because in the same way that many biological species create nests, holes, or webs for ecological and evolutionary importance (Odling-Smee, 2013), sport coaches modify environmental conditions to facilitate (or not) a productive, evolving relationship between an athlete and their environment. This point is supported by data from Roca and Ford's (2020) examination of 53 top-division European professional youth football coaches. They highlighted that Portuguese ($68 \pm 9\%$) and Spanish ($67 \pm 10\%$) youth players spent a significantly greater percentage of session time in active decision-making activities (i.e., uni-directional games, small-sided and conditioned games, possession games, and phase of play). In comparison, they observed that German ($57 \pm 10\%$) and English ($56 \pm 8\%$) youth players experienced more coach-prescribed repetition of passive drills (Roca & Ford, 2020).

The idea of organisms modifying environmental conditions has been instrumental in the theory of ecological dynamics, where the challenge for sport coaches and scientists is to manipulate task constraints in a re-conceptualised role of *learning designers* (Chow et al., 2011; Davids, 2012). However, the careful manipulation of task constraints (e.g., rules, training area dimensions, or equipment) in practice design by coaches are not always based on sampled information sources that are *representative* of a performance environment. As we discuss throughout this paper, how sport practitioners and athletes modify environmental conditions is of great significance for developing adaptable and skilled athletes who need to cope with the demands on modern sport. This point is exemplified by the comments of former Great Britain rugby league player Leon Pryce (2018, p. 4/5), who raised concerns over the influence of ecological niches experienced by young rugby league players.

I worry that coaches are working with these young kids, and in particular the half-backs, stopping them every two minutes during training and scrutinising their every move with them and, in truth, just over-coaching them. We can't keep over-coaching these lads; let them play, let them try things outside of the box. It's the only way we can compete at the highest level against the best in the world – by taking risks.

NCT can support sport practitioners working within an ecological dynamics framework to move away from disciplined practices described by Pryce (2018) and consider how the ecological niches they modify influence an athlete's engagement with the environment. Adopting concepts of NCT can challenge coaches (i.e., learning designers) to manipulate task constraints that guide athlete's perception of surrounding information sources to continuously specify the (re-) organisation of actions during performance (Araújo et al., 2019a). Through this process, coaches can also draw upon athlete's deep knowledge of performance contexts to collaboratively design representative practice opportunities (Woods

et al., 2021), that require the exploration of action-relevant properties to provide important information about perceptual and action possibilities (Araújo & Davids, 2016).

4.3.2 Individual-mediated environmental modifications must influence selection pressures on a recipient of niche construction

The idea that individuals can perceive their environments primarily in terms of opportunities for action (i.e., affordances), with the agency to accept or reject, is highly pertinent from an evolutionary perspective. This is because conceptualising behaviour through an ecological realism perspective means that intended behaviours may emerge through the development of perceptual and action systems, while others do not (Withagen et al., 2012). Although the idea that affordances can enrich our understanding of evolutionary biology has been previously considered (see Reed, 1996), these conceptualisations have tended to adopt a selectionist view aligned to traditional positions in evolutionary sciences, seeking to describe why some affordances may be selected for utilisation by an individual and others ignored. This view has been criticised for viewing the animal and environment system as separate entities under adaptationist theorising (Heft, 2007).

Withagen and Van Wermeskerken (2010, p. 499) re-examined the role of affordances in the evolutionary process from a NCT perspective to counter the selectionist view of the changing animal-environment system, arguing that not only do "affordances constitute the context of selection, but also that animals' destruction and construction of affordances change this context". Withagen and Van Wermeskerken's (2010) more '*interactionist*' conceptualisation of affordances is relevant for understanding the evolutionary consequences of NCT on athletes' performance behaviours. In the same way that animals create and destroy affordances through modifying environmental conditions, coaches and athletes can bring about changes in the practice landscape by influencing selection pressures on the utilisation of specific affordances. In this way, pedagogical practice can potentiate athlete readiness for

action through the co-design of specific, relevant ‘fields’ of affordances during practice (for examples in team sports see Otte et al., 2020; Rothwell et al., 2020a; Woods et al., 2021).

This conceptualisation of practice design is synonymous with assumptions in ecological dynamics because it counters the scientific dualism that positions the organism and environment as two distinct and functionally separate systems (Turvey & Shaw, 1995). An ecological dynamics rationale of the design of learning activities in sport positions the *athlete-environment system* as the relevant scale of analysis for understanding how behaviour emerges from continuous interactions, encompassed by brain, body and environment integration (Walsh, 2014; Woods et al., 2020a).

An ecological conceptualisation of direct perception is integral to this interactionist perspective in sport because it emphasises the importance of exploratory behaviours to develop what Gibson (1979, p. 242) termed *knowledge of the environment*. He elaborates:

Knowledge of the environment, surely, develops as perception develops, extends as the observers travel, gets finer as they learn to scrutinize, gets longer as they apprehend more events, gets fuller as they see more objects, and gets richer as they notice more affordances. Knowledge of this sort does not “come from” anywhere; it is got by looking, along with listening, feeling, smelling, and tasting.

This analysis of knowledge as emerging from *active perception* and *engagement* with the environment to achieve intentions and tasks goals is relevant to the current discussion of practice design in sport. Practice experiences, designed from an ecological dynamics perspective, should aim to solicit opportunities for athletes to continually explore, directly perceive, and select from a range of available information to regulate behaviours immediately and prospectively (Rudd et al., 2020). Through the continuous exploration of practice landscapes, athletes can develop deep *knowledge of the environment* and learn to use perception of information to continuously reorganise actions, to utilise affordances during

sport performance (Araújo & Davids, 2018). This type of knowledge contrasts with *knowledge about* the environment (Gibson, 1979), used by individuals to *represent* features and information in verbal, pictorial, and abstract descriptions of the world (e.g., as used in traditional coaching methods).

4.3.3 There must be a detectable evolutionary response in a recipient of niche construction that is caused by the environmental modification of the niche constructor

Matthews et al.'s (2014) final criterion for niche construction suggests that there must be a detectable evolutionary response in a recipient of niche construction in the form of genetic or ecological inheritance (i.e., sociocultural practices). We recognise that genetic changes can and do occur in respect of NCT and gene-culture co-evolutionary theory (Feldman & Laland, 1996). However, in sport, this perspective may be problematic because: 1) the practice of gene profiling presents ethical and practical issues, regarding athlete consent and power relations in a sports organisation, which can lead to prioritising the role 'nature' is believed to play in athletic performance (Baker & Young, 2020), 2) it neglects aspects of niche construction that are influenced by acquired knowledge and shared practices resulting from sociocultural influences, and 3), testing for genetic changes linked to environmental modification is highly problematic, having little supportive evidence for its validity (Davids & Baker, 2007). Rather, detectable evolutionary responses in athletes may be manifest in the culturally inherited practice settings that athletes experience on micro and macro timescales (Rothwell et al., 2020b).

Unlike genetic inheritance that occurs through reproduction and selection, cultural inheritance concerns the knowledge and skills that are transmitted between multiple organisms across generations, in shared eco-systems. Odling-Smee and Laland (2011, p. 226) were keen to clarify culture, typically an ambiguous term, as information shared in a reciprocal manner between organisms and environments, which influences human

evolutionary responses when acquired through “learned knowledge, beliefs, values, and attitudes, which are expressed in behaviour, artifacts, and technology”. This conceptualisation positions cultural inheritance as a central component by which human evolutionary responses occur in niche construction. By way of example, Steven Hansen (2018), the ex All Blacks rugby union coach has suggested that traditions historically embedded deep in New Zealand’s cultural processes support a philosophy of a *typical All Black being a faster learner* due to the historical need to adapt to the demands of a challenging environment in an emerging nation. The idea of athletes needing to be faster learners aligns to the notion in ecological dynamics of *skill adaptation* as individuals exploit inherent self-organisation tendencies to adjust to emerging task and environmental constraints, forming the basis of autonomous, self-regulating, and skilful behaviours in sport (Araújo & Davids, 2011).

In ecological dynamics, athletes are considered complex adaptive systems, resonant of neurobiological systems *open* to the rich information sources that constrain the self-organisation tendencies of individual component parts (i.e., muscles, joints and limbs) and the co-adaptation between teammates (Davids, 2014). Cultural inheritance, and associated social and historical constraints, continually influence practice designs that shape athletes’ self-organising tendencies in either global (i.e., sociocultural constraints) or local (i.e., performers cooperating to achieve a common performance goal) directions (Ribeiro et al., 2019; Woods et al., 2020b). This idea is exemplified by Uehara et al.’s (2020) exploration of how sociocultural constraints operating at a *global to local* direction influence emergent coordination tendencies in Brazilian football players (for a theoretical explanation see Ribeiro et al., 2019). The findings of Uehara and colleagues (2020) suggested that global macro influences emanating from the late 1800s, such as slavery, socioeconomic inequalities, corruption, and unemployment supported novel and creative behaviours for survival, known as *Malandro*. In football, this direction of influence, operating as a macrosystem to guide and

shape in-competition behavioural characteristics are still evident today, where deception, creativity, body sway, and feints form the fabric of the highly skilled Brazilian football style (known as *Ginga*). However, macro influences may not always necessarily have a positive influence on sport performance. Traditionally, research has suggested that *global to local* directions in shaping coordination tendencies are most typically emphasised in practice designs of sport development programmes, espoused in coach-led methods to direct learning (e.g., Eather et al., 2020). Over-reliance on this directional tendency in traditional practice designs can suppress an individual athlete's capacity for self-regulation and their openness to seeking, discovering and using the rich range of information available in a competitive performance environment (Button et al., 2020).

4.4 Method

In line with previous research designs that have aimed to construct or develop knowledge about individuals and the social world in which they reside (i.e., coaching settings), qualitative inquiry in the form of semi-structured interviews, was adopted to elicit information from participants (Smith & Sparkes, 2016). Specifically, our research study was conducted through an interpretivist research paradigm because this is appropriate for achieving the aim of constructing knowledge through a subjective and shared (i.e., researcher and participant) process (Markula & Silk, 2011).

4.4.1 Participants

Participants were purposefully sampled, based on their extensive experience as professional sport coaches and their alignment to an ecological approach to coaching. The authors were aware of the participants' philosophy for creating practice environments, based on prior interactions at academic conferences, coach education events, and sharing of knowledge on applied practice. To ensure their anonymity, participant specific roles are not outlined. However, they were all experienced individuals working within national level sports

teams, coaching Olympic level athletes, and being employed within professional sports organisations. The sample level of coaching experience, defined temporally, at the time of the interviews, ranged from 9 to 28 years. Seventeen, experienced professional sports coaches (14 males; 3 females), from a range of countries worldwide (Australia, Netherlands, Portugal, Sweden, UK, USA), working in individual and team sports (n = 1 Athletics, 1 Australian Rules Football, 1 Field Hockey, 1 Figure Skating, 1 Golf, 2 Rugby League, 3 Rugby Union, 3 Soccer, 2 Swimming, 1 Tennis and 1 Volleyball), volunteered to be interviewed. This study was approved by the host Institutional Research Ethics Committee and all interviewees provided informed consent prior to participation.

4.4.2 Data collection

Individual semi-structured interviews with each participant were conducted face-to-face by the first author who had previous experience of qualitative interviewing. Interview lengths ranged between 35 and 99 minutes (mean 52 min) in length and were recorded on a digital voice recorder and transcribed verbatim. The content of the interview guide was generated based on the authors' inductive logic of coaching, ecological dynamics, and Matthews et al.'s (2014) criteria for niche construction. In this way, the interview guide was developed to explore relevant research aims, with open-ended questions, including: 1) how the coaches and athletes modified environmental conditions through their practice designs (e.g., "Can you tell me about the type of activities you use in practice sessions?"), 2) the influence of practice designs on athletes responsiveness to opportunities that emerge in practice (e.g., "How do the athletes respond physically and cognitively to the practice sessions you deliver?"), and 3), the evolution of athletes through exposure to the practice setting (e.g., "what sort of attributes do you feel the athletes develop after continuous engagement with practice?").

4.4.3 Data analysis

Thematic analysis was used to identify themes across the dataset and the research team did not adopt an ‘either or approach’ (i.e., inductive or deductive). Rather, a more pragmatic line was followed that included inductive and deductive approaches (Braun et al., 2016; Robertson et al., 2013), where a two-staged thematic analysis was employed to analyse the collected data set. The first coding stage followed deductive analysis to organise the data into one of Matthews et al.’s (2014) three criteria for niche construction. Once the data set was organised into the three areas and accepting that theory-free knowledge cannot be achieved (Guba & Lincoln, 2005), both inductive and deductive analysis were used. For example, during the analysis, some points expressed by the participants provided very clear and appropriate meaning without the use of a theoretical framework to interpret the findings (inductive) (i.e., athlete ownership). Conversely, other experiences were interpreted from a theoretical position (deductive), due to the findings representing relevant meaning regarding NCT.

The approach to data analysis went some way to addressing the challenge of the first author’s (who is a practising coach himself) past experiences and biases, which may have led to the misinterpretation and distortion of data (Baur & Ernst, 2011). In addition to the pragmatic approach to data analysis, the first author adopted a reflective and analytically detached perspective during analysis, allowing theory and reflection to provide a more objective view of the social environment under study (Elias, 1956). In addition to this, all three authors engaged in an evaluative process of critical dialogue to challenge the interpretations made and to provide a sounding board for reflection and exploration of multiple and alternative explanations of the data (Smith & McGannon, 2018).

4.5 Results and discussion

The results and discussion have been organised and presented according to Matthews et al.'s (2014) three criteria for niche construction and evolution but have been renamed to reflect the coach and athlete interactions in a performance sport context (Figure 3.1).

Themes	Sub themes
Coach and athlete modified environmental conditions	Representative co-design Exploratory behaviour Athlete ownership
Coach and athlete mediated environmental modifications must influence selection pressures on athletes	Constraints on behaviour Affordances for action
There must be an evolutionary response in at least one athlete caused by the environmental modification	Self-organisation External focus of attention

Figure 3.1: Thematic map demonstrating the analysis of the qualitative data

4.5.1 Criterion 1 – Coach and athlete modified environmental conditions

Congruent with the notion of NCT, each participant's description of practice design demonstrates how the symbiotic relationship between coaches and athletes served to modify environmental conditions. These may not be modifications in the physical sense, but rather, the shared sociocultural practices that are situated in the everyday practices, varying affordances perceived by individuals in their ecological niche (van Dijk & Rietveld, 2017). Therefore, analogous to the way a colony of beavers can affect the surrounding ecosystem

through constructing a dam in a river to modify water flow, participants described how their role was to co-design the ecological niche, with athletes, to evolve opportunities for action within the athlete-environment system (Araújo & Davids, 2016). This Australian Football League (AFL) coach emphasised the importance of co-designing practice tasks and described how players' game knowledge is instrumental in identifying important information sources to shape task constraints:

We would constantly design in that information not just through our own perceptions but through discussions with the players themselves so we actually were able to understand what they perceive, what information they perceived was important to educate their decision making and subsequently the resultant behaviour. AFL coach

Through co-designing learning environments to enhance athlete development, coaches also emphasised the importance of engagement and athletes taking ownership of their own learning and performance enhancement. The value of coaches modifying the environment in this way was demonstrated by Hodge et al.'s (2014) case study that examined the motivational climate created by the New Zealand All Blacks rugby union coaches Graham Henry and Wayne Smith. Henry and Smith suggested that supporting athlete ownership and empowerment can enhance player problem-solving and self-reliance. However, it should be noted that adopting athlete-centred approaches is a complex challenge embedded in “operations of power” that have sociocultural dimensions (Denison et al., 2017, p. 773). This type of athlete ownership is described in the current study by a swimming coach who aims to support athletes to “take ownership”:

What I try to do, is help athletes learn how to coach themselves so you give them these concepts of what needs to happen when swimming. And, basically you need to create a bodyline that creates no resistance and you need to create a propelling, use your arm or your leg to propel yourself and you want as much surface area and you

need to hold that surface area as long as possible. You know those are the only real rules. And you can start to shape their behaviours a little bit by asking questions and it's less instructional and it forces them to take ownership. Swimming Coach 1

Another feature of the coach- and athlete-modified environmental conditions were the opportunities presented to performers to explore a range of task solutions through the careful manipulation of learning tasks. Hacques et al. (2020) have suggested that sport practitioners who are tasked with developing skilful performers should facilitate exploratory movements and perceptual behaviours, not reducing these activities at the expense of more rigid training practices and methods that focus on adherence to rehearsing 'optimal' performance techniques. An ecological niche in athlete programmes, that supports the exploration of practice landscapes, can help learners to become perceptually attuned to information in the environment. In ecological dynamics, attunement involves the process of learning which sources of information need to be perceived to regulate actions and when (Renshaw et al., 2015). Modifying the learning environment to highlight regulatory sources of information can facilitate a tighter coupling between perception and action for performers in practice. This pedagogical approach can support the search for a tighter coupling of perception and action in practice, even leading to innovative connections between these sub-systems (Davids, 2012). The idea of performers exploring a range of task constraints is demonstrated by this athletics coach, who manipulated hurdle spacing, to provide a performer with opportunities to attune to relevant specifying information sources. The coach explains:

XXX (young performance athlete) is progressing to a longer race as his age group has moved up, so he will be eventually running 10 hurdles in his race. We are around seven hurdles at the minute, so I had seven hurdles set up last night and they started at five and a half metres, six, six and a half, seven and then I fixed the rest of the run at seven metres. The idea there is I am trying to encourage XXX (young performance

athlete) to think about how he comes off the hurdle, sets up how he goes into the next hurdle, which is a fundamental part that I believe he needs to learn.

Manipulating hurdle spacing also required the athlete to satisfy a range of task solutions, facilitating experience and exposure to 'any scenario that may emerge in a race'. Experiences of this nature can support athletes to differentiate between *specifying* (relevant and useful) and *non-specifying* (less relevant and useful) information sources available to facilitate their effective regulatory engagement with the environment (McCosker et al., 2020). The coach continues:

.....because if he learns that, if he works out how to land off the hurdle and how that will set up his next hurdle I can then present him almost with any scenario in a race, getting it wrong, clipping a hurdle, being fast, being slow, head winds, etc. So I set that landscape and get him to explore it. Athletics Coach

Along with providing opportunities for athletes to refine their perceptual attunement to surrounding information, participants also felt that facilitating exploration of practice environments supported athletes to develop creative and new movement solutions. Orth et al. (2017) conceptualised how the emergence of creative and adaptive motor solutions can emerge from athletes exploring varied practice conditions, while satisfying a mix of ecological constraints. This soccer coach explains how applying a task constraint to a simple 4 v 4 game exposes players to variability in movement organisation redundancy (using multiple ways to coordinate a movement to achieve the same task goal), while exploring different (potentially useful) movement patterns within a dynamic practice environment. The coach elaborates:

How can I teach you how to balance and how to fall without saying now we are going to roll and now stay with your feet? No, I start bringing in the element when it is safe

for everybody to take off your shoes or keep on your shoes or we double extra socks around your soles and then I give you another ball, then we play four against four, with goalkeepers and we mix in the goalkeeper. So the skills of the goalkeeper is also your skill.

The coach then continues to describe the creative movements that this type of activity can develop:

.....and then I start training balance, stability, learning to fall, because I believe that if you learn to fall you make different choices in your balance activities, so it is a creativity boost. In that way you are not afraid for the floor anymore and for contact.

Soccer Coach 2

Ranganathan and Newell (2013) have argued that practice of this nature can enhance motor learning, provide alternative ways to achieve the same outcome, address current movement organisation, and lead to performance advancements. To exemplify, during the 1974 soccer World Cup finals, the Dutch player Johan Cruyff displayed a novel approach to beating a defender by dragging the ball behind his standing leg, turning 180 degrees, and accelerating away. This innovative move became known as his signature ‘Cruyff turn’.

4.5.2 Criterion 2 – Coach and athlete mediated environmental modifications must influence selection pressures on athletes

Opportunities offered to individuals by the environment are dependent on the relationship between the normative practices that are influenced by key agents in a particular ecological niche (i.e., a sports organisation) (van Dijk & Rietveld, 2017). This ecological view of human behaviour is congruent with the notion of selection pressures in niche construction theory, where living organisms can alter their environments and, in turn, influence selection pressures on their species (Odling-Smee et al. 1996). This perspective was

implicit within the coaches' description of practice designs, where the interview data demonstrated how direct coach influence on environmental conditions (practice design) influenced an athlete's responsiveness to certain affordances (selection pressures). A soccer coach explains how they manipulated a “phase of play” to provide goalkeepers with opportunities to detect and act on affordances to achieve a functional defensive outcome (sustaining the continuous interactions between the athlete and coach modified environment):

So when I'm doing a crossing session I try to make it look like a phase of play with all the goalies. The goalies in, they'll have four players on the outside, the goalie will clip the ball into them and then they'll start passing it. Any one of them can cross at any time. *He's constantly now having to readjust his position, communicate to the back three in front of him all at once, having to make sure he's checking his shoulders to see runners coming in, balls on its way in. He's having to think about first of all can I come and get it so that depends on are your defenders close enough to deal with it or is this my ball. If he decides it is my ball he's got to assess the flight of it, he's got to communicate nice and early to let everybody know he is coming for it and then is it a catch? Is it a punch? How do I know if it's a catch or a punch because the pressures on me [emphasis added]. Soccer Coach 1*

This practical coaching example elucidates a Gibsonian (1979) perspective of human behaviour, where it is considered that the performance environment is substantive in *meaning* to support individual interactions. Meaning consists of rich, available information sources that athletes can directly perceive to utilise affordances to support intended interactions with the environment. Drawing on this perspective, and in line with the work of Otte et al. (2020), the coaches discussed how their specific role was to manipulate variations in the task (constraints) goal to strengthen an athlete's relationship with the environment and facilitate engagement with affordances for skilled action. The importance placed on the athlete-

environment relationship, by the coaches, aligns with an ecological dynamics rationale of sport expertise, outlined by Araújo and Davids (2011, p. 7) who argued that sport expertise is the emergence of an ever more “adaptive, functional relationship between an organism and its environment”. This is an important conceptualisation for sport practitioners as designers, advocating that they should constantly (re)consider their modifications of environmental niches designed and implemented in programmes over days, months, and years.

Many examples from sport illustrate how highly functional athlete-environment relationships, developed over years of engagement in high quality athletic experiences, can lead to greater receptiveness to relevant affordances that guide skilful behaviour in performance contexts (see Button et al., 2020; Renshaw et al., 2019). By way of example, Seifert et al. (2020) demonstrated how novice and expert ice climbers used different affordances while climbing an icefall (frozen waterfall). Data revealed that experts used a broader range of multi-limb coordination patterns to execute fewer exploratory movements with ice tools and crampons, suggesting that *existing* holes in the icefall structure were exploited since they provided affordances to regulate climbing behaviours. In contrast, novice climbers displayed lower levels of multi-limb coordination while repetitively swinging ice tools and kicking in crampons to achieve and maintain a deep anchorage. These repetitive actions suggested a lack of perceptual attunement and calibration to available affordances (ice properties) to support climbing performance. Differences between expert and novice ice climbers, in affordance utilisation, was predicated on action effectiveness and energy efficiency. The sentiments of Araújo and Davids (2011) and Seifert et al. (2020), were evident within the coaches' description of practice, where there was a clear motivation to support athletes to develop *knowledge of* (Gibson, 1979) the environment to strengthen the quality of their interactions with the performance context. A swimming coach explains how he eschewed an instructional, coach-led approach, in favour of designing task modifications

to promote a functional relationship between a swimmer and the water, he elaborates (note the emphasis on body awareness to reduce water drag):

It's like all these micro-adjustments that you've got to make to do it and like you know am I going to tell a kid to posteriorly tilt his pelvis by 5 degrees? Like they have no idea what that means and so you know how can I *create more awareness of the shape that their body's in so that they can move through the water better*. So I guess a couple of my solutions are make the feedback bigger and louder to them and so the idea is they swim with a t-shirt and they go fast with a t-shirt because now they've got all this extra drag and also their skin on their torso is not exposed to the water so it's probably they can't feel as much and then you *take the t-shirt off and hopefully now they have a whole lot more sensory information* and they can feel things better and that's one way that maybe they can hopefully *learn to adjust their body position to keep it skinnier so it feels like the waters flowing over their body better* [emphasis added]. Swimming Coach 1

In this sense, learning to be skilful is not the result of an athlete acquiring new *knowledge about* the environment (i.e., through verbose descriptions, visual representations of tactical play or coach-imposed technical models). Rather, a skilful athlete is one who develops deep *knowledge of* the environment to support active interactions, therefore, inhabiting a richer landscape of affordances (Rietveld & Kiverstein, 2014). An important consideration for sport practitioners, however, is to consider that affordances are not simply possibilities for action that exist in an ecological niche, but affordances are invitations which can invite or repel behaviours from individuals (Withagen et al., 2017). Therefore, the performance environment should not be viewed as a “collection of causes, but as a manifold of action possibilities” that makes behaviour possible (Withagen et al., 2012, p. 251). Accepting this position demonstrates how important it is for sport practitioners to consider

how environmental modifications may influence selection pressures and can encourage coaches to evaluate athlete performance from an ecological perspective. This viewpoint is exemplified by a participant who constantly reviews practice designs to establish which affordances are rejected and which are accepted:

I guess the important part was that we explicitly designed information within the environment or opportunities, affordances for the players to, I guess, attune to. In a way that we really wanted to do so without being too explicit with our instructions towards them so again we really lived that concept of we're designing an environment and if we want a certain behaviour to emerge we have to invite those behaviours, and if they're accepted fantastic if they're not we need to assess perhaps why they're not which is like what I said before we constantly review our activities to determine which affordances our players are accepting, which they're rejecting and perhaps why. AFL coach

Along with demonstrating how coach-mediated environmental modifications influence selection pressures on athletes, these examples also illustrate how individuals have the capacity to continuously modulate couplings with the environment's many solicitations (Withagen et al., 2017), positioning the athlete-environment relationship as the starting point for understanding how skilful athletic behaviour emerges.

4.5.3 Criterion 3 - There must be an evolutionary response in at least one athlete caused by the environmental modification

The well-established sociocultural perspective of sport is synonymous with the evolutionary nature of NCT, where cultural inheritance is viewed as a key driver in the evolutionary responses of athletes (Uehara et al., 2020). In the current study, cultural inheritance influenced coach and athlete evolution, and was exemplified by the participants' motivations to reject a dualist, Cartesian philosophical worldview (i.e., the separation of mind

and body). This command-style pedagogical approach is typically manifest in top down, coach-centred approaches in sport (i.e., an over emphasis on athlete control through direct instruction and feedback). Rather, participants' responses highlighted a desire to implement an ecological worldview (discussed in the previous sub-section) grounded in principles of self-organisation (Barab et al., 1999). Specifically, participants discussed the importance of contextualised learning experiences where performance problems were discussed with the athletes to facilitate functional levels of self-organisation. The intention of the participants to create learning opportunities that exploit self-organisation tendencies and promote athlete self-regulation was exemplified here in the aim:

.....to develop self-regulating athletes that are able to regulate actions and behaviours relative to emerging problems in the game, so we really shifted our perspective from providing solutions to players to providing an environment in which the players could interact with and then regulate actions and behaviours based upon what they perceive within their environments. AFL coach

In ecological niches, learning customs and practices can generate innovations that propagate through populations and serve to trigger evolutionary responses (Odling-Smee et al., 2013). Athlete attempts to 'evolve' their performance, described by the participants, appeared when striving to satisfy intentional or task goals to promote naturally emerging order, in the individual and/or collective, through athlete-environment integration (Araújo & Davids, 2018). A practical example of this intention is described here by this tennis coach:

.....at the moment we're trying to get them to recover back to the middle after each shot. So they always run, they hit a shot and they just stand there watching the ball instead of preparing for the next shot. And getting back towards the middle of the court but instead of having a recovery box in the middle of the court, in the middle of the

baseline, I've moved it slightly to the forehand side so they're more likely, the ball is more likely to go to their backhand on the next shot to encourage them to hit more backhands compared to forehands.

From a complex systems perspective, the concept of emergence under constraints described by the coach provides a platform for individual and team behaviours to emerge (Araújo & Davids, 2016; Shaw & Turvey, 1999). A consequence of this athlete-environment reciprocity is that functional athlete performance can be understood as self-organising while exploiting task (i.e., playing area, equipment) and informational constraints (i.e., surfaces to negotiate, opposition movement or formations) to stabilise intended behaviours (Seifert et al., 2014). The concept of self-organisation in ecological dynamics rejects the idea that skilful behaviour is best shaped by internal (i.e., the mind) or external (i.e., over-arching coach instructions) memorised representations or structures (Araújo & Davids, 2011). Instead, skilful behaviour emerges from the continuous re-organisation of body and brain with events in performance contexts (i.e., dynamic competition) while satisfying a range of constraints (Otte et al., 2020). Consider this explanation of developing the vertical jump in figure skating, where movement competency is not inferred by internal or external structures, rather, the coach encourages attention to the *effects of the environment* on the emergent movement through an external focus, an approach shown to be more beneficial in skill learning (Wulf, 2007). The coach explains:

And so let's say I'm working for something technical, I'll use an example of a vertical jump. So traditionally we would work on all of the body parts. They're working on a vertical jump, you want to make sure you're pressing off with your ankles and you're pointing your toes and you're extending this and you're pressing with your hips and all that stuff. I don't talk about body parts anymore. I'm a big fan of external focuses, keeping the mind, keeping your thoughts off the body. So I'll use a concept say for a

vertical jump or a jump take off on the ice of trying to look up over a fence. So tell a seven year old kid alright I want you to stand there, imagine that there's a big high fence in front of you and I want you to jump up and try to look over it and you'll see that their bodies extend and they push off with their toes. Figure Skating Coach

When athletes are exposed to specific practice settings, the experience can facilitate an enculturation process that supports certain evolutionary responses over others (Blackett et al., 2020). In the previous example, prolonged exposure to enrichment through exploration can evolve athletes' intentions to actively search for information for self-organisation (individual or collective), resulting in the development of functional movement solutions to skilfully engage with the constraints of performance (Uehara et al., 2016).

4.6 Conclusion and future directions

The overarching goal of this article was to provide sport coaches, who are interested in moving away from deterministic models of learning and development, with a conceptual framework to design ecological niches to guide practice design, and to stimulate reflection on how the practice environments they modify may influence the evolution of performance behaviours in learners. The paper has proposed a shift away from a *genocentric* view of athlete evolution as genetic adaptation and re-positioned a complementary view of how skilful performance within a Gibsonian framework is contingent upon an ever-evolving, tightly knit relationship between an active and autonomous athlete and their sociocultural context. I examined evidence from a sample of elite sport practitioners which may encourage researchers and sport practitioners to consider our reconceptualization as a framework for future practice designs and research. The reconceptualization can inform the design of future studies to understand the influence of specific sport contexts on athlete evolution at micro and macro timescales. Although the challenge of investigating which properties of practice design contribute to athlete evolution is significant, a good start point could be to adopt an

ecologically situated perspective to observe how responsive athletes are to the unfolding situations embedded within their ecological niche. One way to achieve this task and to address the limitations of the current study, is to integrate ecological realism theorising and ethnographic observations in real world athlete development settings to enhance our understanding of learning and development of skilled behaviour. In addition, phenomenological data can provide insights into athletes lived experiences of practice, to elicit rich information about key constraints placed on their development leading to the design of more meaningful and empowering learning environments to enhance athletic performance.

Chapter 5: Assessing the impact of this PhD and future directions

5.1 Summary and contribution of the research findings

Throughout this thesis an ecological scale of behavioural analysis has been adopted to understand how prevailing socio-cultural-historical constraints influence athletes' engagement with the environment, within which they operate. As Davids et al. (2017) highlighted, the environmental constraints that impinge on an athlete's learning and development are multiple and intertwined, the qualitative data and theory presented in this thesis goes some way to enriching our understanding of these constraints. I identified how environmental constraints can promote a form of life in athlete development programmes, fundamentally shaping an athlete's relationship with a performance context. The form of life identified in this study influenced the way sports organisations and national governing bodies implement athlete development and performance preparation programmes, and how athletes interact with the environment. These findings contribute to our understanding, and addressing a gap in current literature, about the relationship between socio-cultural-historical constraints and the athlete-environment system.

The aim of this thesis was to investigate British rugby league football performance pathways to establish how prevailing, dominant cultures, attitudes and behaviours influence players engagement with the environment. To fulfil this aim, the objectives of this thesis were to:

1. Examine coaches' perceptions of coaching cultures in rugby league, to seek to understand how social, cultural, and historical constraints influence the design of affordance landscapes in practice tasks (Chapter 2 & 3).
2. Interpret how the dominant socio-cultural-historical constraints currently influence the development of rugby league players in the UK (Chapter 2 & 3).
3. Adopt an ethnographic methodology via participant observations to identify and investigate 'forms of life' in UK rugby league performance environments (Chapter 3).

4. Develop a qualitative explanation of how sociocultural practices in rugby league coaching influences players' engagement with affordances (Chapter 3).
5. Provide sport coaches who are interested in moving away from deterministic models of learning and development, with a conceptual framework to design ecological niches that situate the learning process within an ecological dynamics rationale of the athlete-environment system. (Chapter 4).

The aim and objectives were examined across three studies. In study one (Chapter two) the form of life concept was positioned as a framework to explore rugby league coaches' perceptions of the dominant socio-cultural-historical constraints on players learning, development, and performance in the sport. The specific aims of this study were to address objectives one and two by exploring the form of life in British rugby league football player development contexts to 1) understand the dominant social, cultural, and historical constraints within the sport; and 2), interpret how the dominant socio-cultural-historical constraints currently influence the design of practice tasks.

The data were analysed through Bronfenbrenner's bioecological model of human development, and categorised under the micro, meso, exo, and macro, systems. At the macro level, masculinity, and replication, traced back to the sport's industrial factories roots, were the dominant ideologies influencing attitudes towards learning and development. These attitudes proliferated into coach learning preferences (exosystem) and parents' beliefs (mesosystem) about how their child should be learning to play the sport. Finally, at the micro level, the participants insights suggested that the practice activities players experienced on a weekly basis were embedded in masculine and reproductive customs and cultures. Where, the emphasis was placed on physicality, power, and strength, rather than skill and innovation. By examining the rugby league coaches' perceptions of coaching cultures, the study provided a better understanding of the social and cultural structures that influence rugby league players

engagement with the environment. The findings of this study were utilised as a frame of reference when designing the ethnographic investigation for study two, offering a start point to guide observations in terms of *what to look for*.

In study two (Chapter three), a season-long ethnographic study was conducted within a professional rugby league club's academy programme. The aim of the study was to address objectives three and four by identifying and observing first-hand the sociocultural practices of the academy and characterise the relationship with the existent form of life, and 2), conceptualise, from an ecological realist perspective, how the form of life influences the athlete-environment relationship.

Data analysis resulted in three main dimensions which highlighted the complex and dynamic relationships between people, context, and the sociocultural practices. The three dimensions were categorised as: (a) sociocultural practices (masculinity and disciplined behaviour), (b) a socially – and culturally-constructed ecological niche, and (c), the athlete-environment relationship. The study demonstrated how powerful a form of life can be in sustaining structural, deterministic, and linear, models of human learning within formal organised player development programmes. These programmes limit athlete's performance variability and skilful engagement with the environment, rendering them docile and unresponsive to relevant affordances for skilful behaviour.

The ecological realist analysis applied in study two provides a novel approach to analysing contextually situated athlete behaviour, relevant to inform applied coaching practice and future research studies. A recommendation of this study was to challenge sport practitioners and applied scientists to design learning environments embedded in an environmental context that consists of value (affordances) and meaning (information), conceptualised as an ecological niche.

To address the challenges associated with deterministic models of learning and development identified in studies one and two, study three (Chapter four) aimed to provide sport coaches with a conceptual framework to reject the socially and culturally dominant approaches to coaching and athlete development. To achieve the aim, and to address objective five, the notion of niche construction in evolutionary ecology was combined with an ecological dynamics rationale to situate the learning process within the athlete-environment system. The study was conducted in two phases. First, a conceptual framework was presented by combining niche construction theory with concepts in ecological dynamics. Second, seventeen, experienced professional sports coaches (14 males; 3 females), from a range of countries worldwide were interviewed to ensure that the development of the conceptual coaching framework was realistic and meaningful. The coaches' insights may encourage researchers and sport practitioners to consider the reconceptualisation as a framework to inform the design for future practice designs and research studies that aim to understand the influence of specific sport contexts on athlete evolution at micro and macro timescales.

The methods and results presented within this thesis can contribute to the ongoing methodological challenge of identifying the multitude of dynamically interacting constraints that influence athlete behaviour. While previous studies have established the influence of interacting performer and task constraints (e.g., playing space and distance between players in soccer (Silva et al., 2015), and skill opportunities and frequencies in field hockey (Timmerman et al., 2019), these studies have not considered the wider sociocultural (environmental constraints) context within which skilful performance occurs. Considering how sociocultural constraints influence skilled engagement may provide practitioners with a better understanding of how they can design practice environments to facilitate athlete learning.

5.2 Limitations

While this programme of study has provided new knowledge on a traditionally understudied area in the sport science field, it is not without its limitations. At the centre of any coaching or performance preparation programme is the athlete, who is typically considered the subject under study or the subject to be developed, and rarely, within these programmes will the coach give athletes a voice to offer insights into their lived experiences of development and performance practices (Smrdu, 2015). For example, how often does the performance analyst, strength and conditioner, physiotherapist, or sport scientist turn to the athlete's experiential knowledge to understand the effectiveness of prescribed interventions? Doing so could provide important, and often overlooked insights, that could be critical in shaping and improving future performance preparation methodologies (e.g., Woods et al., 2021). This challenge to sport practitioners and coaches is no different to the challenge presented within this thesis, inasmuch that, rugby league players have not been part of the research process to understand their lived experiences of skilled behaviour. What this thesis has attempted to understand, is the socio-cultural-historical context within which skilled human behaviour occurs. This is important because as Atkinson (2017) has argued, without first undertaking this endeavour, observable events are not capable of providing a sufficient explanation of the underlying mechanisms that shape human behaviour.

To advance the current area of study beyond the context and observable events presented within this thesis, and to develop a deeper understanding of the athlete-environment relationship, a consideration of context while exploring athletes lived experiences of perception and action is required. Phenomenology, an ontology of human existence, provides a methodological and philosophical approach to unlock lived experiences, and to develop a greater understanding of embodied athletic performance (e.g., Aggerholm & Larsen, 2017). Käufer and Chemero (2015) and Larsen (2016), have argued that any study of

human behaviour should, at the very least, include some exposure to phenomenology, otherwise, our understanding of skill acquisition and bodily expertise will remain underdeveloped. This point is exemplified in Purser's (2018) phenomenological account of dancers' learning new movements, where the traditional information processing paradigm was rejected in favour of Merleau-Ponty's (1945/2002) embodied perspective of practical experience. Purser's (2018) non-dualist phenomenological analysis challenged traditional assumptions that viewed learning as a step-by-step process of moving from no skill to skilled, instead, highlighting that dancers' and bodies in general, act unreflectively and evolve and develop through interactions with the world around us.

To provide a more contextual understanding of skilled behaviour, Bruineberg and Rietveld's (2014) *skilled intentionality framework* can support researchers and coaches to develop an understanding of what it means for athletes to develop a functional relationship with the performance environment. The phenomenological notion of skilled intentionality indicates the behaviour an individual displays in an ecological niche to improve their grip on a situation. When individuals improve their *grip* on a situation they unreflectively and simultaneously respond to multiple relevant affordances (solicitations of the environment) (Bruineberg & Rietveld, 2014; Rietveld & Kiverstein, 2014), which is the basis of autonomous behaviours in sport performance contexts. In doing so, athletes can become open to a field of affordances, that is, affordances that solicit and stand out as relevant during a situation because of an individual's specific needs and concerns at that time (Kiverstein & Rietveld, 2015).

Exploring the concepts of skilled intentionality and optimal grip on a field of affordances through phenomenological means can help researchers and sport coaches identify when athletes are in a constant state of instability in their interactions with the environment (Davids et al. 2013). During this instability athletes never have an optimal grip on the

environment; rather, they are constantly striving towards satisfying their intentions by searching and exploring practice landscapes (Fajen et al., 2009). It is this striving that can solicit an individual's intentions towards a field of affordances, thus, constantly moving towards an optimal grip on the environment and developing skilled intentionality (Kiverstein & Rietveld, 2015). Being embedded in a form of life of this nature means that players become sensitive to and utilise (rapidly appearing and dissolving) affordances in dynamic performance contexts that are not effectively simulated under the narrow task constraints of traditional socio-cultural practices (i.e., styles of play). These ideas imply how transitioning of teams between performance states of stability and relative instability can emerge to underpin successful performance in sports such as rugby league.

From a research perspective, these rich phenomenological concepts can provide a framework to investigate athletes lived experiences through empirical means, to develop a better understanding of skilled intentionality within a sport context. Generating these insights could support sport practitioners to design more effective interventions to develop athlete's capacities and skilled intentionality, the basis of a functional relationship between an individual and the environment in sport (Araújo & Davids, 2011).

5.3 Future directions for research and practice

The insights provided within this thesis can provide an individual coach or a team of coaches with a start point to consider how wider sociocultural constraints might influence their practice and athletes skilled engagement with the world. However, in modern sport multidisciplinary sport science teams are now common and play an integral part in the preparation of athlete performance. Olympic support teams for example will comprise of specialists from several sub-disciplines including strength and conditioning, nutrition, performance analysis, psychology, technical and tactical, physiotherapy, and lifestyle support. The merits of multidisciplinary working has stimulated academic interest in recent

times, with advice on the facilitation of effective and collaborative performance teams (Sporer & Windt, 2018), recovery from underperformance (Gustafsson et al., 2008), and a multidisciplinary approach to support the design of practice tasks to enhance performance (McKay & O'Connor, 2018).

Despite growing academic interest in multidisciplinary sport science support, a crucial and often overlooked factor is how powerful forms of life operating at subdiscipline levels, serve to influence integrated support. Hristovski et al. (2017) has suggested the problem of integration is embedded in the traditional reductionist method of applied sport science, leading to the eagerness of individual specialists to quantify progress in isolated components. Without careful integration guided by a theoretical framework, competing forms of life within multidisciplinary support teams can result in silo working (Springham et al., 2018) and specialisation and fragmentation of support services (Hristovski et al., 2017), leading to poor athlete development practices and performance outcomes.

The importance of effective integrated working is highlighted by Portus (2019), one of Australia's most respected and experienced sport scientists, suggesting that the Australian Institute of Sport was at its most effective when an integrated hub of sport scientists and practitioners co-habited a "vibrant ecosystem" to "co-deliver ground-breaking innovations". In addition, Portus (2019) questioned the effects of the de-centralisation of sport science at the AIS on the potential for practitioners from different sub-disciplines to use a 'case approach' in an integrated manner to focus on the needs of individual athletes (i.e., a 'case approach' originates from the health care industry where a coordinated approach is used to meet the demands of patients).

To fully support an integrated 'case approach', a move away from a multidisciplinary approach (that has traditionally seen a non-integrative nature of disciplines) to a transdisciplinary view of sport science support is needed. Transdisciplinarity calls for the

integration of principles to provide a "space of knowledge beyond the disciplines" to promote collaborative problem solving (Nicolescu, 2002, p.2). In this space of knowledge, the integration of principles can inform a shared context dependent vocabulary (Hristovski et al., 2014) within sport science support teams to encourage innovation, collaboration, and highly effective integration. From a practical perspective, adopting a transdisciplinary approach requires some obvious behavioural characteristics (e.g., willingness to work together and share ideas), and ways of working that can be shaped by the wider form of life.

5.3.1 Ecological dynamics and support integration

The introduction of a theoretical framework to guide the integrated efforts of sport scientists is essential to provide substantial scientific rigour required for the effective implementation and integration of concepts and tools from different sport science sub-disciplines in athlete support systems (Hristovski et al., 2017). The theory of ecological dynamics is an appropriate theoretical framework to coordinate common principles and language of a team of sport scientists using a transdisciplinary approach to develop athletes and enhance performance.

The rationale to promote an ecological dynamics framework to enhance the effectiveness of a transdisciplinary approach is based upon the following characteristics (for a detailed overview see (Davids et al., 1994), (1) a complex systems theory perspective considers athlete performance preparation and support programmes (including sport scientists, coaches, and athletes) as a whole system and not separate entities. The multiple dynamically interacting parts of such a system (e.g., sub-units of teams and individual athletes and practitioners) can cooperate to provide order in the overall system (Clarke & Crossland, 1985). Therefore, training individual component parts in isolation or devoid of environmental context is inappropriate; rather, carefully co-designed programmes can develop multiple factors simultaneously in real world settings. (2) Complex systems are non-

linear; therefore, the relationship between time spent in practice and an athlete's development is not deterministic. The emergent nature of a complex system means that small changes in the way an athlete interacts with the environment, due to carefully designed integrated practice interventions, could have a large effect on the global system (i.e., an artistic gymnast dramatically increasing the overall score across all events due to psychological and physical interventions). (3) In an ecological dynamics framework the person environment relationship is the important unit of analysis when considering how to strengthen perception action couplings to afford highly skilled performance. The direct perception of environmental information (i.e., playing surfaces, objects, and opposition players) can be used by athletes to guide skilled action in practice and competition (Seifert et al., 2017). This contrasts with deterministic models of human behaviour where external features of the environment (e.g., games plans and detailed coach instructions) are deemed necessary to guide performance. (4) The extent to which an athlete perceives the rich information sources in practice and competition is related to constraints on action (Renshaw et al., 2019). Therefore, it is essential that sport scientists and practitioners identify how specific personal (e.g., physical, and emotional attributes), environment (e.g., social, cultural, and historical factors), and task (e.g., rules, equipment, and performance demands) constraints influence behaviour in practice and competition.

This conceptualisation of ecological dynamics positions practitioners and applied scientists as 'designers' of learning environments (Stone et al., 2020), for beginners as well as advanced learners amongst experienced high-performance athletes. It has clear implications for the design of athlete development, support, and advancement programs, predicated on each individual's continuous interactions with personal, task, and environmental constraints of practice (Coutinho et al., 2016). This conceptualisation signifies the need for designers of the micro (e.g., practice tasks) and macro structure (e.g., talent systems) of athlete

development, support, and advancement programs to recognise the non-linearity and complexity of interacting subsystems that influence human development (Bronfenbrenner & Morris, 2006; Davids et al., 2017).

5.3.2 A challenge to multidisciplinary teams

A challenge, however, to adopting an ecological dynamics framework to support athlete preparation and development programmes is the wider social, cultural, and historical influences on system structures and organisation in high performance sport identified throughout this thesis. These constraints co-create and reinforce a status quo bias that can stabilise athlete preparation and development programmes on a trajectory which is often difficult to change (Ross et al., 2018). This status quo bias is evident in the daily and weekly activities at sports organisations that are deeply entrenched in traditional practices, shaped by socio-cultural-historical constraints.

Entrenched practices are exemplified by multidisciplinary support teams who adopt operational frameworks as the start point to guide the preparation of athletes (e.g., coaching teams planning long term development based on players acquiring certain technical abilities at set time points). The problem with using operational frameworks as the start point of athlete development is that they can foster approaches such as deliberate practice (Ericsson et al., 1993), and associated early specialisation systems (for criticisms see (Baker et al., 2017), contributing towards overuse of drill-based coaching methods (Ford et al., 2010), despite evidence countering these approaches (e.g., Araújo & Davids, 2018; Baker et al., 2018; Davids et al., 2017).

A challenge for multidisciplinary teams is to identify how socio-cultural and historical constraints influence athlete preparation and performance environments (Ross et al., 2018), and to understand how evidence-based methodologies can underpin a model of transdisciplinary working to support athlete learning and development. Future directions for

research and practice within multidiscipline teams is to promote the idea that a conceptualised framework can integrate the collaborative work of scientists and practitioners, charged with development of skill, expertise, talent, and preparation for performance in athletes. A conceptualisation of skill performance and self-regulation (e.g., the extent to which athletes take the responsibility to address immediate, daily, weekly, and yearly performance problems) in competitive performance is needed to provide foundational principles to coordinate the work of all practitioners (e.g., strength and conditioning specialists, trainers, coaches, sport psychologists, performance analysts, and skill acquisition specialists) in a '*Department of Methodology*'.

5.3.3 Integrating experiential and empirical knowledge in a Department of Methodology

A challenge in sports organisations is to understand how evidence-based methodologies can overcome issues presented by multidisciplinary teams (MDTs) to support practitioners in developing innovative models for athlete learning, development, and performance preparation. Current models of athlete development and support in preparation for performance, tend to be dominated by the MDTs approach where isolated specialists work 'in silos' (e.g., Springham et al., 2018); see also earlier comments of Marc Portus). MDTs tend to be guided by a reproductive philosophy for athlete development and performance preparation, which may be superficially coordinated and therefore presents an illusion of integration, but lacks the deep integration offered by a Department of Methodology.

A Department of Methodology can overcome the issues presented by MDTs, because it provides a unified conceptual framework to guide practitioners and subdiscipline specialists to: (i) coordinate activity through shared principles and language, (ii) communicate coherent ideas, and (iii), collaboratively design practice landscapes rich in information (i.e. visual, acoustic, proprioceptive and haptic) and guide emergence of multi-dimensional behaviours in athlete performance (Chow et al., 2011). By way of example in high performance sport,

McKay and O'Connor (2018) and McKay et al. (2021) illustrated how a team of practitioners and sport scientists *integrated* knowledge, experience, and ideas to enhance performance preparation for the Queensland Red's rugby union team. This collaborative effort revealed that traditional practice designs tended to favour structured attacking possessions (team's own scrum, own line out, and 50 m and 22 m receipt restarts) over unstructured attacking possessions (i.e., transitions from kick receipt, unexpected turnovers from errors, and quickly taken tap penalties). In this integrated and collaborative approach, the Department of Methodology identified that unstructured possessions (56%) were in fact the most common form of possession sources. Informed by dynamical systems theory and constraints led pedagogy the team of defence and attack coaches, physical performance staff, and performance analysts collaborated to identify principles of unstructured practice (self-organisation, adaption, communication and competitiveness), to support the re-design of practice tasks to better simulate rugby union attacking play conditions (during this period the Queensland Reds were Super Rugby finalists on three occasions, Australian conference winners twice, and won the 2011 Super Rugby competition [formed of teams from New Zealand, Australia and South Africa]; for details see (McKay & O'Connor, 2018).

McKay and O'Connor's (2018) example demonstrates how integrated work in a Department of Methodology can lead to a shared, theoretically-informed understanding of when, how, why and, by whom, particular fields of a practice landscape can be searched during practice. Rietveld and Kiverstein, (2014) concept of embedding affordances in a form of life has important implications for a Department of Methodology. Although a form of life at the macro level (i.e. wider socio-cultural contexts and historical influences on sports) may be more challenging for individual sport scientists, pedagogists and practitioners to work with, they may be better positioned to shape a form of life at the micro level (i.e. at the level of practice task designs in daily, weekly and monthly machinations of sport science support)

(Davids et al., 2017). In this micro-structure of practice, the behaviours, skills, capacities, attitudes, values, beliefs, practices, and customs of a Department of Methodology can lead to learning designs that offer rich affordance landscapes that selectively invite performance behaviours conducive to successful outcomes for athletes in a sports organisation.

A Department of Methodology should be composed of a group of practitioners and applied scientists who share integrative tendencies, based on a rich mix of empirical and experiential knowledge. Traditionally, applied science support for athletes and coaches has been dominated by empirical knowledge derived from separate sub-disciplines of science, often imposing a hierarchical relationship between theory and practice in athlete support. It is important that a Department of Methodology attends to the fundamental relationship between theory and practice, emphasising that it is not a trivial issue for philosophical reflection only. Indeed, James Gibson (one of the founders of ecological psychology), drawing inspiration from the words of the Gestaltist, Kurt Lewin highlighted that: “There is nothing so practical as a good theory” (Gibson, 1979, p135). Moreover, recent models for application of sport science support for athlete learning and preparation for performance have indicated the importance of evidence from the *experiential knowledge* of experienced practitioners and athletes involved with elite and developmental athlete performance programmes (Burnie et al., 2018; Greenwood et al., 2014; McCosker et al., 2019; Phillips et al., 2010). Experiential knowledge is gained from the experiences of professional coaches and practitioners in the micro-structure of practice over minutes, hours, days, weeks and months of developing and preparing athletes for competitive performance (Araújo & Davids, 2016; Renshaw et al., 2019).

A deep integration of experiential and empirical knowledge can lead to new models of coaching and sports science support predicated on theory, science, and knowledge from high-quality, applied practice in sport (see Figure 4.1). The outcome could be a deeply symbiotic

process where academics, researchers and practitioners can co-create new knowledge and innovative designs of practice and training programmes. However, as previously discussed, the value and role of experiential knowledge of practitioners has often been neglected largely because of the 1) inability to ‘collect’ data through classical experimental designs because of the inherent complexity of studying athlete expertise and knowledge, and 2) not all experiential knowledge may have a positive contribution due to the sociocultural dimensions discussed throughout the thesis. In this way, the rationale for 'evidence-based' approaches in applied sports science and coaching has been skewed towards a limited categorisation of knowledge used in shaping practice.

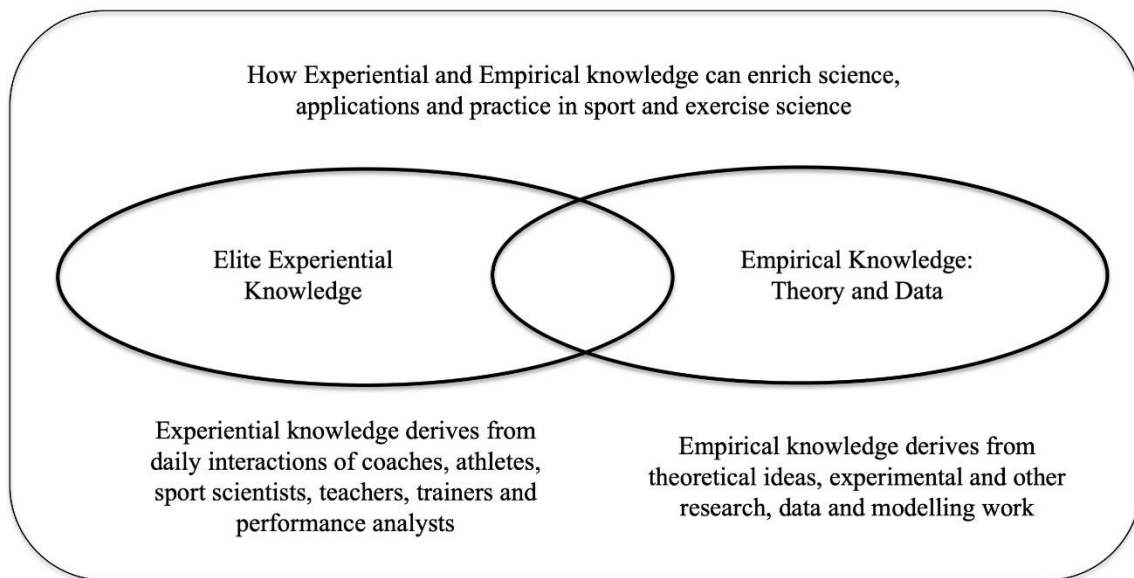


Figure 4.1: Different types of knowledge needed to support athlete development and preparation for performance in sport. Integration of Experiential knowledge of elite practitioners in sport can enrich (and in turn be enhanced by) Empirical knowledge of science and theory. The space where the two bodies of knowledge intersect can be inhabited by elite sports practitioners, applied scientists and coaches working in a Department of Methodology in a high-performance sports organisation or club.

Future research designs aimed at understanding athlete development in elite sports organisations would need to consider different types of knowledge and data to integrate in innovative practices. Relevant tasks include the need to track athlete development and preparation, not only over days, weeks or months, but also to include research questions that

capture competitive cycles over seasons and years (Renshaw & Gorman, 2015). There is a need to make more use of individual or multiple baseline methodologies, rather than using traditional group-based experimental designs with control groups, as they may not be most appropriate when implementing theoretical concepts or considering the ethics of impacting athletes' performance needs and careers. This is especially the case when it comes to assessing impact of interventions on elite and developing high level athletes. It is simply not feasible to undertake experimental manipulations with such groups. Appropriately 'representative' interventions should be developed that utilise the knowledge of practitioners and scientists to gain critical insights on implementation of methodologies to evaluate athlete learning and development. Research designs that disentangle the need for laboratory-based research, such as field-based studies and observations, can evaluate the effectiveness of interventions on athlete learning and development in the messy, noisy world of competitive high-performance sports organisations. Future quantitative reviews need to also consider a range of different data sources, rather than simply sample experimental studies in the scientific literature. These databases could emerge from performance analysts working closely with coaches, practitioners and sport scientists in practice programmes as well as from scrutiny of competitive performance (e.g., Robertson et al., 2016).

A key challenge for practitioners is understanding how to put complex theoretical ideas into practice. For example, we have argued that, within a practice design context, practitioners should see themselves as *learning designers* (Davids, 2015). However, integrating complex theoretical ideas into learning designs can be highly challenging. It is this gap, between the theoretical underpinning and the practical application which is often cited as the most significant barrier practitioners face as they negotiate the pragmatics of practice design (Greenwood et al., 2014). This challenge is a significant factor that precludes migration from the historical status quo bias and associated path dependency. Therefore, one

role of the Department of Methodology is to support the practitioner's journey, providing a clear route between what typically are two disconnected and distant locations (i.e., theory and practice).

In summary, the conceptual tenets of a Department of Methodology offer a framework to address the issues associated with MDTs where there is propensity for subdiscipline specialists to work in silos. This challenge can lead to fragmented practices raising concerns over integration. The deep integration of support services in high performance sports organisations can support practitioners in continually seeking to develop more innovative and robust practice environments that are likely to facilitate a greater level of transferable and targeted learning and development.

5.3.4 A new model of athlete development and sports science support is needed

Problems and challenges with traditional models of athlete development and performance preparation were outlined by Ross et al., (2018) who discussed the barriers to changing practice in sports organisation, drawing attention to the inertia for meaningful change that is inherent in such systems. Ross et al.'s (2018) ideas dovetail with views expressed on the pitfalls of adhering to traditional forms of life in elite sports organisations, discussed elsewhere (Chow et al., 2016; Rothwell et al., 2018). It is important to note that some forms of life can result in *system capture*, termed acculturation: the tendency to coach and support athletes 'in the way that it has always been done'. While traditional ways of coaching and supporting athletes in elite sports organisations may yield some success, adhering to traditional methods because of system capture may risk misconceiving athletes, sports teams, and even sports themselves, as stable, linear systems, rather than as complex, adaptive, nonlinear systems (Davids, 2015). The latter provides a paradigm of elite and developmental sports as constantly changing and subject to the continuous influence of changing environmental constraints, dominated by technological, scientific, social, cultural,

economic and political perturbations (Rothwell et al., 2018). Sports organisations need to adapt to these important environmental constraints in a dynamic landscape by embracing innovations, whether they emanate from technological, empirical, or practical routes. To achieve this fundamental aim, and avoid system capture, it is important to adopt an evidence-based, theoretical rationale to provide a sound principled framework for applied sport science support and pedagogical practice (Renshaw et al., 2019). For example, the recent upsurge of technologies that promote ‘brain training’ and ‘perceptual-cognitive training’ have been criticised for dualist methods of athlete preparation due to the lack of a theoretical framework to guide the development and implementation of such technologies (Renshaw et al., 2019 p. 2).

Analysing athlete performance in simulated (representative practice designs) and competitive performance environments, from an ecological dynamics perspective, supports an evidence-based rationalisation of significant constraints which shape successful performance behaviours, providing the basis for designing representative training, preparation and learning contexts. This approach has been illustrated in relation to athlete preparation and practice design in several sports (Greenwood et al., 2014). For example, (McCosker et al., 2019) investigated competitive performance of elite level long jumpers (n = 244; male and female) seeking to ascertain the main individual, environmental and task constraints that shaped performance outcomes. McCosker et al.'s (2019) data suggested that the key performance-shaping constraints in long jumping included: individual constraints (especially specific intentions and performance goals of athletes and their impact on immediate jump performance); environmental constraints (strength and direction of wind) and task constraints (requirement that front foot must be behind foul line at take-off board to avoid making a foul jump). Based on these findings the interconnectedness of jump performance highlighted that each jump should not be viewed as a performance trial

occurring in isolation, but rather as part of a complex system of interconnected events which contribute to competitive outcomes.

These findings emphasised the nature of the contribution of performance analysis in competitive performance contexts. Evidence from performance analytics can support athlete preparation for competition by enabling practitioners to design more innovative training tasks, based on dynamic ecological constraints in competition. The targeting of specific constraints on physical, psychological, cognitive, and perceptual demands of competitive performance environments on individual athletes can be met by a group of practitioners working within a Department of Methodology in a sports organisation. The framework of ecological dynamics can be integrated with experiential knowledge of skilled and experienced practitioners to provide a comprehensive theoretical rationale to coordinate their work in supporting the self-regulation of each performer. This new model of athlete development and preparation for performance can support coaches, sport practitioners, and athletes to collaboratively explore and exploit functional intentions, specific performance goals and movement solutions aligned with context-specific demands of competition.

Burnie et al. (2018) reported, in another example, how strength and conditioning training could vary in its transfer to elite sport performance from training designs. Many typical strength and conditioning training programmes had problems with over-use of non-specific exercises and training, with limited effects on enhancement of adaptive intramuscular coordination tendencies needed for elite sports performance in sports such as cycling, running, kayaking and rowing. Newell's (1986) model of interacting constraints has been used to propose how changes in physical capacities (such as strength or flexibility) need to be accompanied by adaptations in other effectivities such as coordination (Burnie et al., 2018) and cognition (Araújo et al., 2019). An effective Department of Methodology could be headed by an experienced individual with a broad understanding of athlete performance and

learning and would support organisational function with many deeply integrated components (e.g., strength and conditioning specialists, trainers, coaches, performance analysts, skill acquisition specialists) that are continuously interacting and evolving under the demands of the current and future performance constraints of the athletes, team, and sport. Such a re-organisation of high-performance sport systems might alleviate some problems and weaknesses of traditional models of athlete support and coaching which include:

- Coaches overemphasising action reproduction and rehearsal of tactical and strategic patterns of behaviour, leading to imitation of styles of play from other performers and teams or adoption of the latest trends in performance development. A Department of Methodology would provide the much-needed conceptualisation and system structure to allow sports organizations to develop uniquely relevant performance styles underpinned by a set of principles, consolidated in environmental constraints (currently captured in cliché descriptors like 'our organisation's DNA').
- The role of a performance analyst being limited to data analyst or computer scientist, with little involvement in practice task designs informed by performance data. A Department of Methodology would provide the system structure for an integration of expertise in data analytics and the design of practice and conditioning tasks, to enhance athlete self-regulation in performance (see also next point).
- An over-specialised role for S&C staff and sport psychologists who are called upon *reactively* when problems are perceived to arise, or as a 'treatment' for a performance issue, with a single athlete. A Department of Methodology would provide the system structure for continuous and prospective interactions between skilled specialist practitioners in elite athlete development and preparation for performance.
- Enhancement in isolation of specific athlete attributes such as strength, coordination, resilience, performance anxiety reduction. Rather than the innovation of collaborative

practice designs during training, which require athletes to satisfy a range of personal, task, and environmental constraints without the constant direction of a coach, can lead athletes to *self-regulate* more effectively in practice tasks which integrate key elements of physical conditioning, psychological and emotional regulation and movement (re)organisation under pressure. A Department of Methodology would provide a framework for new models of learning design and athlete preparation for coaches and other sport practitioners.

5.3.5 Conclusion

Here, I have argued that effective preparation and development of athletes for performance in elite sports requires a unique integration of theoretical principles and experiential knowledge of expert practitioners to guide the designs of learning and practice environments. The application of research findings and concepts could be best facilitated with new models of coaching and sport science support for athlete learning and development, perhaps best undertaken by a group of sport practitioners working together in a Department of Methodology to facilitate collaborative integration of theory and practice. The essential point is that research in ecological dynamics, on experiential knowledge of elite athletes and coaches, is beginning to reveal how some elite performers in sport have not developed in traditional ways, but rather in highly adaptive ways (for examples see (Burnie et al., 2018; Greenwood et al., 2014; McCosker et al., 2019). These athletes have posed unique challenges to coaches and sport science practitioners, who have perceived the need to adapt the learning and development of these players by facilitating their emergent behaviours (Ross et al., 2018). This body of evidence implies the need for new models of coaching and of sport science support for athlete development and preparation for performance. These new models of coaching and support will require research on the generation of new variables and measure and better analyses of performance to understand how these athletes satisfy interacting

constraints and how practice task constraints may be (re)designed to elicit learning and development during practice and training.

5.4 Reflections from the field and closing summary

I would like to close this thesis by offering some critical thought on what I have learned from my experiences of conducting this thesis. Throughout, I have maintained that the athlete-environment system is the appropriate unit of analysis to understand a range of issues in relation to human performance. From listening to, and reflecting on the participant coaches' views, and through the continuous process of observing, making field notes, and reading theory, during my time conducting the ethnographic study, my belief in this unit of analysis has been strengthened further. And while traditionally, much of the research in this area has been conducted through the natural sciences paradigm, I believe that qualitative means can provide a richer picture of how coaches and sport scientists can enhance the athlete-environment relationship. However, much of the literature on athlete development and sport psychology, is based on a bioscientific rationality, that values research conducted through conventional laboratory methods embedded in an organismic asymmetry (Holleman et al., 2020). Indeed, the prevailing culture of this bioscientific rationality is evidenced in a House of Lords report following the London Olympics and Paralympic games (House of Lords, 2012, p. 12, as cited in Ross et al., 2018), which stated.

.....much of the research presented was observational and anecdotal, so the results of such research must be viewed as no more than provisional. Observational research needs to be followed up with rigorous testing of hypotheses in controlled experiments with sufficient sample sizes for statistical analysis.

The position presented in this report highlights a contradiction in sport that assumes bio-scientifically research informed, and coach centric athlete development practices, can

lead to greater athlete performance. Despite coaches and sport scientists' best intentions, these approaches can reject the importance of strengthening the athlete-environment system, and lead to more disengaged, unsuccessful, and injured athletes (Mills et al., 2020). Mills et al., (2020, p. 247) make a very astute observation when they suggest that although modern societies 'sociocultural-historical processes extoll freedom, they also legitimise and normalise the control of different groups of people'. Evident in the growth of sport science disciplines (e.g., exercise physiology, biomechanics, and performance analysis) working in traditional methodologies, leading to the precise measurement of athletes that normalises the control of human performance across sports (Mills & Denison, 2015).

While some of the informal and formal experiences gained throughout conducting this thesis have aligned to my subjective values and biases, critical reflections from the field have challenged my thinking about the theoretical and conceptual choices. For example, my naïve attempt to position Elias' (1956) involvement-detachment theory to address the subjective nature of my researcher position was perhaps flawed. Rather, an approach which would have proved more fruitful and achievable is reflexive practice, therefore acknowledging that I cannot be detached from the research process. Standing back from the analytical process from time to time and being reflexive and self-critical, would have challenged my theoretical assumptions and conclusions. Adopting a reflexive approach would have also given me the confidence to contest the peer review process with a little more conviction, and not be subservient to the reviewers sometimes erroneous assumptions about data analysis and the arguments I was attempting to present. For example, a reviewer recommended a rejection because in their opinion the narrative was "laced with a priori assumptions" raising "concerns regarding integrity". Being familiar, and confident, with reflexive practice would have given me the tools to tackle these types of reviewers' comments more coherently and competently.

The points made about reflexive practice lead me onto a final reflection that acknowledges the tension between interpretivism and adopting the theoretical framework of ecological dynamics. While this framework provides a lens to study coaching and athlete development and conveys my *world view* and epistemological dispositions, I was reluctant to engage with theory whilst at the same time working within an interpretivist framework. During the peer review process, I became confused about combining an interpretivist paradigm with a theoretical framework to position the central argument for the thesis. For the same reason Saldana and Omasta (2018) argued, I had concerns that theory would distort the research and data, reducing it to abstract statements about social life and offer explanations of linear causation. Additional challenges were related to the over reliance of theory in the data analysis process, and therefore limiting my capacity to see emergent findings in the data. However, as Anfara and Mertz (2015) contended, the use of a theoretical framework can be integral to the qualitative process, guiding a study and providing an explanation about the way things work. I reconciled with this position, and as Henstrad (2006) discovered, the use of a theoretical framework contributed to the design, data gathering, and analysis of the studies.

A newfound confidence has been developed that has changed the way I now see and embrace the world. In a Gibsonian sense, although the world around me is no different, the skills, abilities, and capacities developed over the course of this PhD programme have enabled me to interact with it more skilfully. Coaching and academic environments now afford me more opportunities for positive action, solicited by a certain field of affordances that wasn't open to me before starting out on this academic endeavour. In the same way it has influenced me, I hope this thesis goes some way to challenging traditional methodologies and promotes sport experiences described by Phil Gould at the beginning of this thesis.

Experiences that lead to individuals across the physical activity and sport spectrum with the

safe exploration of affordance landscapes that promote highly skilled behaviour to strengthen their engagement with the world.

Chapter 6: References

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