# Examining the Relationships Between Coaching Practice and Athlete 'Outcomes': A Systematic Review and Critical Realist Critique

Adam J. Nichol[a]*, Edward T. Hall[a], Will Vickery[b] & Philip R. Hayes[a]

[a] *The Department of Sport, Exercise and Rehabilitation, Northumbria University, Newcastle, UK. NE1 8ST.*

[b] *Department of Rehabilitation, Nutrition and Sport, La Trobe University, Victoria, Australia. VIC 3086.*

*Corresponding author.
Adam James Nichol
Department of Sport, Exercise and Rehabilitation
NB431, Northumberland Building
Northumbria University
Newcastle upon Tyne
NE1 8ST
E-mail: adam.nichol@northumbria.ac.uk
Telephone: +44 (0)191 227 7018

Author biographies…
Adam Nichol is a PhD Researcher and Associate Lecturer in the Department of Sport, Exercise and Rehabilitation at Northumbria University, UK. His research interests focus on how coaching practice is received, interpreted by, and influences others through a critical realist lens. Adam is also an experienced practitioner, coaching with representative level squads in cricket and with soccer referees.

Edward Hall is a Senior Lecturer in the Department of Sport, Exercise and Rehabilitation at Northumbria University, UK. His research interests focus on the complexity of the coaching process, particularly how social interactions influence how sense is made of experiences, relationships and the self. Edward is also an experienced rugby coach and coach mentor, currently working with professional rugby coaches at Premiership and International level to support their continuing development.

Will Vickery is an experienced cricket coach and sport scientist working with a number of high-performance cricket teams across a variety of countries. He is an early career sport coaching researcher with a strong focus on the practice design and the impact this has on the outcomes of athletes.

Philip Hayes is a Senior Lecturer in the Department of Sport, Exercise and Rehabilitation at Northumbria University, UK. His research interests focus on endurance running, quantifying training and factors affecting coaching and athlete performance. The underlying theme of Phil's work is enhancing athlete performance. Phil is a level 4 athletics coach, with over 25 years coaching experience, working with runners ranging from national to club level.

As accepted for publication in *International Sport Coaching Journal*, ©Human Kinetics.
DOI: 10.1123/iscj.2017-0105

# Examining the Relationships Between Coaching Practice and Athlete 'Outcomes': A Systematic Review and Critical Realist Critique

A widely accepted role of the sport coach is to elicit positive athlete 'outcomes' (e.g., enhanced performance, wellbeing, confidence etc.). However, evidence concerning the relationships between coaching practice and athlete outcomes is fragmented leaving researchers and practitioners little clarity to inform their work. Through a systematic search protocol and critique conducted through the lens of critical realism, this paper provides an overview of 208 English language peer-reviewed studies investigating relationships between coaching practice and athlete outcomes, and how current approaches may facilitate or hinder our understanding. Findings indicate research has predominantly utilised quantitative, cross-sectional or correlational approaches, with limited explicit consideration of paradigmatic influences. Discourse is dominated by psychological theorising (e.g., motivation), with studies generally employing single-method research designs and engaging a singular perspective (e.g., the athlete). Thus, we have a broad understanding of some coaching practice variables that may influence athlete outcomes (i.e., the *what*), but lack more interpretive and causal explanations of *how* and *why* practice is influential, accounting for the inherently complex and multi-faceted nature of the coaching process. Future research directions are proposed, which it is hoped will extend our understanding of the often intricate, heterogeneous influence of coaching practice, supporting coach educators and coaches.

**Keywords:** sport coach, methodology, critical realism, emergence, critique.

## Introduction

Sports participation is associated with an extensive range of positive athlete outcomes (Holt & Neely, 2011). These include sport-specific skill proficiency and knowledge (Hastie, Calderón, Rolim, & Guarino, 2013), life skills and motivation (Gould & Carson, 2008), health and well-being, self-esteem and confidence (Beckman, Rossi, Hanrahan, Rynne, & Dorovolomo, 2017), and physiological development (Vickery, Dascombe, Duffield, Kellett, & Portus, 2013). Negative outcomes such as burnout (Myer et al., 2015), body dissatisfaction (McMahon & Penney, 2013) and dropout (Fraser-Thomas, Côté, & Deakin, 2008) have also been connected to sport participation, among many others. However, such outcomes are the result of more than mere participation in sport; they are shaped by a range of social and contextual factors (Holt & Neely, 2011). Of these, the sports coach has been strongly implicated in directing or contributing to various athlete 'outcomes' (Horn, 2008).

Jones, Edwards, and Viotto Filho (2016) suggest the coach's primary purpose is to support athlete learning and performance enhancement. Yet, coaches have been found to frame their roles in nuanced ways (Gilbert & Trudel, 2004b), and to focus only on learning and performance would ignore a wider range of physical and psychosocial implications of coaching (Mallett & Rynne, 2010). Indeed, one of the most prominent conceptualisations in this regard suggests that coaches should purposefully pursue a broader range of athlete outcomes, which can be considered 'variations in athletes' attitudes, behaviors, or performance' (Côté & Gilbert, 2009, p. 309). Specifically, Côté and Gilbert (2009) advocated maximising athletes' competence, confidence, connection and character. This lack of clarity concerning the scope and variety of implications claimed of coaching underlines the often ill-defined roles of the sport coach in society (Gilbert, Gilbert, & Trudel, 2001; Morgan & Bush, 2016) and the need for research that deals directly with the impact coaches have on their participants.

The volume and scope of research on coaching and particularly coaching practice is now substantial and growing, but the extent to which it has impacted coaching practice and coach education has been questioned (Lyle & Cushion, 2010). One challenge associated with a rapidly evolving knowledge base is the ability of academics and practitioners to keep pace with the change, which:

> limits the ability of (a) researchers to set research agendas and situate their work in the larger context of coaching science, (b) coaches to access and realize the potential of coaching research, and (c) coach educators to integrate the full scope of coaching research into coach education programs. (Gilbert & Trudel, 2004a, p. 388).

Various reviews of the literature have attempted to redress these issues, providing some useful insights into existing findings and prevalent research approaches (e.g., Kahan, 1999; Gilbert & Trudel, 2004a; Vella, Oades, & Crowe, 2010; Denison & Avner, 2011; Cope, Partington, & Harvey, 2016). However, most reviews focus on specific elements of coach behaviour or research methods in isolation, leaving our understanding of the relationship between coaching practice and athlete outcomes fragmented and unclear. Indeed, in their overview of the conceptual development of sports coaching, Lyle and Cushion (2010, p. 7) found ‘few if any links between coaching practice and performance outcomes’.

A lack of connection between coaching practice and athlete outcomes remains a prevalent issue within contemporary coaching literature (Lyle, 2018). Although North’s (2017) critical realist critique of coaching science literature presented a potentially valuable framework for interdisciplinary thinking and research with scope to advance the field, it reviewed broad coaching literature (i.e., not solely dedicated to relationships between coaching practice and athlete outcomes), was largely focused on coaching practice, and was presented at a certain level of abstraction. Conceptualisation of the connections between coaching practice and athlete outcomes, and consideration of how this domain can be advanced, is important because the dearth of such work places a significant restraint on our

ability to more fully understand the coaching process and hence for research to inform practice.

The purpose of this study is, therefore, to systematically and critically review the extant literature which has investigated the impact of coaching practice on athlete outcomes. More specifically, the aim is to provide a clearer picture of how empirical research designs have shaped our existing knowledge by reporting the following characteristics from relevant papers and how they have been employed: (a) paradigms, (b) research designs/methodology, (c) methods, (d) sports, (e) stakeholders included as participants (e.g., athletes, coaches, parents) and (f) which coaching practice and athlete outcome variables have been investigated. Such an overview of the literature may help to identify existing limitations, clarify future research directions, and subsequently influence research, coaching practice and coach education. Indeed, it is hoped that taking stock of existing ways of knowing might stimulate further critical thought about the 'ways that the research we conduct can actually make a difference in the lives of those participating in sport settings and the practitioners working with them' (Gould, 2016, p. 199). In particular, a clearer conceptualisation of relationships between coaching practice and athlete outcomes could better support coaches in achieving their primary functions to: (1) set the vision and strategy, (2) shape the environment, (3) build relationships, (4) conduct practices and prepare for and manage competitions, (5) read and react to the field, and (6) learn and reflect (International Council for Coaching Excellence, Association of Summer Olympic International Federations, & Leeds Beckett University, 2013).

## Method

### Purpose and Function

Bennie et al. (2017) suggested that as coaching science research continues to expand rigorous reviews are required to comprehend and bring meaning to the ever increasing database of material. In order to access and refine the breadth of relevant literature now presented in sport coaching a systematic search protocol was adopted in line with Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA; Moher, Liberati, Tetzlaff, & Altman, 2009). However, in order to understand the state of current literature and its consequent implications for knowledge, rather than exclude research based upon pre-determined positivist notions of methodological quality (i.e., to synthesise the statistical evidence-base and provide recommendations for direct intervention - e.g., Brown & Fletcher, 2017), studies employing a wide range of approaches (e.g., quantitative, qualitative and mixed-method) were included. Thus, conventions were followed for the integration of a diverse body of work into systematic review methodology (e.g., Mays, Pope, & Popay, 2005), which is introduced in greater detail within the succeeding sections.

**Sources and Search Strategy**

Three levels of searching were utilised to obtain articles pertaining to relationships between coaching practice and athlete outcomes. First, searches of four electronic databases, which have previously been identified as relevant to coaching science literature (Rangeon, Gilbert & Bruner, 2012), were conducted: (a) PsycARTICLES; (b) Science Direct; (c) Sport Discus and (d) Web of Science. Second, 20 relevant journals were selected and electronically searched (see Table 1). Finally, citation pearl growing (De Brún & Pearce-Smith, 2009) was utilised to search within reference lists of relevant review articles identified through the sifting process. Articles published up to the search date of January 13th, 2017 were considered for inclusion. The same keyword search strategy was used within all databases and journals: "(sports coaching practice) OR (coaching behavio?r) AND (athlete outcomes)". No start date

was set for the inclusion of studies, aiming to incorporate as wide a range of coaching literature as possible.

[Insert Table 1 about here]

**Inclusion and Exclusion Criteria**

Studies were considered for inclusion if they were published in English language, and contained original empirical data published in a peer-reviewed journal. In pursuit of a more comprehensive review, following Mays et al. (2005) and Dixon-Woods et al. (2006a), articles containing either qualitative, quantitative, or mixed-method data were considered for inclusion.

Although Smith et al. (2016) reported that relationships between independently observed and athlete- or coach-perceived dimensions of practice were weak, arguably all of these perspectives (coach, athlete and independent perceptions) are required if the empirical assessment of practice is to become more sophisticated and authentic to coaching's holistic complexities (Potrac, Brewer, Jones, Armour, & Hoff, 2000). Perceptions of coaching practice and independent observations of coaching practice were therefore included in the present research.

Studies that did not examine directly relationships between coaching practice (e.g., coach behaviour or management of the learning environment) and athlete outcomes (e.g., physiological outcomes, psychological outcomes, or performance outcomes) were excluded. Studies were also excluded if they occurred in lab-based or non-field-based settings (i.e., non-naturalistic coaching contexts), or where the coaching practice was designed by a researcher (i.e., non-naturalistic coaching practice). Research of this nature likely does not account for the highly complex, multifaceted nature of the coaching process (Turnnidge & Côté, 2016),

limiting the value of findings for practitioners. Further, studies completed in the physical education, injury, executive coaching or clinical domain were excluded.

Contrasting with orthodox systematic review protocols (e.g., Allegranzi et al., 2011; Free et al., 2013), and as alluded to earlier given the aims of the study, research was not excluded on grounds of positivist notions of methodological rigour or methods used. Instead, the main focus was on identifying research most pertinent to the central questions of the review (Biddle, Wang, Kavussanu, & Spray, 2003). Borrowing directly from the work of Pawson (2006), careful consideration was given to the relevance of research included; the key question posed was is this study good enough to provide *some evidence* that will contribute to the review? Consequently, the worth of each study was examined throughout the review process, not determined beforehand. A key advantage of this approach, in contrast to the strict methodological doctrine guiding some reviews (e.g., Free et al., 2013), was that it permitted the inclusion of 'trustworthy nuggets of information' which responded to the aim of the review, even if the studies were 'technically deficient in some overall sense' (Pawson, 2006, p. 90). For example, studies were included even if they had poorly interpreted results or made unwarranted inferences, but nonetheless presented data which were relevant to addressing the research questions.

**Sifting Process**

2609 articles from databases and 4772 articles from empirical journals were returned (total $n$ = 7381). After removing duplicate papers, 7107 articles remained and were taken forward to stage 1 of the sifting process. Figure 1 depicts an overview of the full sifting process, conducted in line with PRISMA guidelines (Moher et al., 2009), by stage. Studies were assessed for relevance to the review in three stages, as recommended by Rumbold, Fletcher, and Daniels (2012) and Weiler, Mechelen, Fuller, and Verhagen (2016). In

accordance with the inclusion criteria, articles were initially sifted for relevance by title (stage 1), then by reading abstracts (stage 2), and finally by reviewing the full-text (stage 3).

Beyond the work of Siddiqi, House, and Holmes (2006) and Tew, Brabyn, Cook, and Peckham (2016), where 10% of studies were independently screened, the first and second author independently sifted through and then discussed 20% of the overall number of papers (*n* = 1424). Following Langan, Blake, and Lonsdale (2013) any disagreements between reviewers about inclusion suitability were discussed until agreement was reached. If the consensus building process did not lead to agreement, the article was automatically advanced to the next stage of the sifting process, or it was passed on to the third or fourth author to determine inclusion at the final stage.

After stage 1, 4810 studies were excluded (see Figure 1). Subsequently, abstracts of remaining articles were read and a further 1564 studies were removed (stage 2). Relevant review paper reference lists were then searched to include any additional papers which met the inclusion criteria at this stage (*n = 44).* Stage 3 involved reading through the full-texts of articles to assess suitability for the review; 575 articles were removed at this stage. 202[1] articles remained after the full sifting process was completed. These were included in the data extraction process.

[Insert Figure 1 about here]

**Data Extraction and Analysis**

[1] Two-hundred and eight individual studies were included within the final data extraction process, as some papers included more than one relevant study.

Procedures for data extraction were adapted from similar reviews conducted within the field of sport and physical activity (e.g., Park, Lavallee, & Tod, 2013; Sallis, Prochaska, & Taylor, 2000). Detailed coding systems were designed to extract data related to: (a) the paradigmatic, theoretical and methodological approaches utilised; (b) sample characteristics; and (c) athlete outcomes impacted in some way by coaching practice[2]. Wherever possible, a form of coding was adopted where data were extracted and recorded in the same manner in which it was originally reported.

The first, second, and third authors met to critically interrogate the data extraction using a sample of 20% of the final number of included studies. These studies were selected at random, whilst ensuring a range of quantitative, qualitative and mixed-method papers were considered. Following Clegg (2005) and Pawson (2002), the aim of this process was to understand how we had coded the data from papers and why discrepancies may have occurred. Given one can never fully free themselves of their theoretical preconceptions (Belfrage & Hauf, 2016), the authors' different paradigmatic allegiances, (i.e., the critical realist, constructivist, and positivist standpoints of the first, second, and third authors, respectively) were considered an asset to strengthen both the rigour of the extraction process and to guard against bias originating from a single paradigmatic perspective. Different ontological and epistemological viewpoints aided the interpretation of the way in which data had been coded, stimulating interdisciplinary thought within the review process; something, it has been argued, critical realism is well positioned to facilitate, and, in some respects, to reconcile (North, 2017).

Data analysis was carried out by the first author drawing on concepts of thematic and content analysis as well as conceptual comparison from critical interpretive synthesis (CIS;

[2] A full list of reviewed articles can be viewed in the online version of this paper.

Surr et al., 2017), which are compatible with systematic search protocols (Thomas & Harden, 2008) and provide knowledge support (Mays et al., 2005). Specifically, this involved a critical analysis of papers, both as individual entities, and in light of other included papers, through thematic and conceptual comparison (Kangasniemi, Kallio, & Pietilä, 2014), generating clear trends to be critically appraised through critical realist critique. Importantly, these concepts from CIS permitted the incorporation of literature conducted from different disciplinary positions and with varied research methods (Dixon-Woods et al., 2006b). The product of the synthesis was not simply a neutral, objective accumulation of data. Instead, the first author developed a critical realist reading of the findings, which is presented in the *Results and Discussion*. This involved carefully considering predominant themes evident in papers retrieved (e.g., the methodological approaches selected), in order to propose a potential framework for advances to knowledge (Dixon-Woods et al., 2006b), again, aligning with the vision of the present paper to inform future research, coaching practice and coach education.

## An Introduction to Critical Realism

Critical realism has only recently been applied in the field of sport coaching (e.g., North, 2013a, 2013b, 2017), but offers a set of meta-theoretical assumptions (e.g., emergence, ontological depth and causal theory, introduced in greater detail below) which are capable of providing a novel contribution to understanding the influence of practitioners (Elder-Vass, 2010). While it is impractical to attempt to present a single, unifying explanation of critical realism (CR) here, due to the complex assemblage of ideas and debates related to it, the purpose of the remainder of this section is to introduce a general reading of CR, principally according to the work of Bhaskar (1975, 2011, 2015, 2016), before deploying these concepts in the critique of the literature.

Archer et al. (2016) suggested that critical realists have a broad dissatisfaction with the regularities, law-like and regression-based models frequently sought in positivism. Critical realists are also dissatisfied with the postmodern interpretivist focus, which negates causal explanation, but instead emphasises rich description, processes of meaning making and hermeneutics (*ibid*). In response, at the heart of CR is the conception of a material, causal, emergent and stratified ontology, and, more specifically, of ontological realism. In other words, the world and its objects or entities are viewed as being real, characterised by depth, and *can* exist independently from our epistemological capacity to know about or identify them (Bhaskar, 1975). There are four key modes of reality in CR: objects and structures can be materially real (e.g., oceans, planets), ideally real (e.g., discourse, beliefs, language, theory), socially real (e.g., organisations, norms, rules, or conventions) or artefactually real (e.g., buildings, computers; Fleetwood, 2004). However, such reality is only able to be known through our discourses about it, which we are unable to step outside of (North, 2017). Experiences are very much interpreted and made sense of by human agents, although these experiences are often 'out of phase' with actual events which can occur independently of perception (Bhaskar, 1975). Archer (1998) suggested that we should not confine social causes to the mental or to meanings. Instead, critical realists seek explanatory understanding of the causal powers of real entities, rejecting the view that all beliefs are always of equal value (in terms of truth; Clark, MacIntyre & Cruickshank, 2007). In recognition of this and of discourse being real itself, CR assumes that scientific activity remains fallible and open to constant revision (Collier, 1994). This double hermeneutic, whereby social science is both affected by society, but is also an effective agent which can shape society (Bhaskar, 1978), opens up the potential for the agency of practitioners to be transformed through shaping the ways in which they conceive of and practice the real world (discursively real entities affect emergence).

Making such assertions regarding the world and our knowledge of it requires deeper exploration of how we view its makeup. For Bhaskar (1975), the world is made up of three layers, which represent *ontological depth*. These layers comprise the *empirical* (i.e., events that are observed and experienced), the *actual* and the *real* (i.e., which consist of events, and objects or structures causally interacting to produce these events, respectively). This stratified view of ontology implies that everyday observable or experienced events (e.g., coaching actions or responses) are caused by an underlying reality which is not directly understandable to us through the events themselves or our observations or experiences of them (Bhaskar, 2011). Real objects and structures are seen to have causal powers or liabilities, and the activation of these (through what is known as mechanisms) occurs at the level of the actual to constitute events, but our experiences and observation of events exists only at the empirical level (Archer, 2007). Causal forces (powers and liabilities) can only be understood through their effects and in the social world many causal forces interact simultaneously, meaning they are unable to be simply reduced to objects or structures at a lower level. These forces instead interact in an *emergent* and relational fashion making the task of understanding events and their underpinning causal properties incredibly complex (Elder-Vass, 2010). In more clearly defining the notion of emergence, events cannot be understood as being simply the sum of their parts. Instead, 'it is the way that a set of parts is related to each other at a given point in time that determines the joint effect they have on the world at that moment' (Elder-Vass, p. 23). This process of interaction between the parts is also commonly referred to as the 'mechanism'.

In light of such emergent relationships, there is a need to distinguish between what critical realists conceive of as open and closed systems. Closed systems include (more stable) mechanisms operating to produce a regular pattern of events (Sayer, 1992), for example planetary movement in the solar system. Open systems (i.e., sport coaching) are comprised of

myriad mechanisms (with emergently related and contingently acting entities, causal powers and properties; Bhaskar, 2015). Consequently, an understanding and grounding of analysis *in context* is imperative to begin to unearth the nuances of these mechanisms (North, 2013a). It is this very nature of emergence which also provides the bedrock for interdisciplinarity; we require theory from multiple scientific fields to comprehend how causal mechanisms emergently combine to produce events (Bhaskar, 2010). For instance, biological, psychological and sociological concepts can be combined in order to understand the complex interaction of real entities and how they emergently produce action (North, 2017). These points are important in conceptualising the way in which interactions between coaching practice and athlete outcomes operate according to a critical realist perspective.

CR, then, offered a means to critique the contributions and limitations of different disciplinary and paradigmatic positions (applied to specific questions) during the review, and to theorise a possible path for advancement. Further, it also provided a relevant platform to consider the integration of theory from these different positions and if it may be possible to conceptualise issues in an interdisciplinary manner (North, 2017; Wiltshire, 2018). To be clear, although CR may offer a useful framework to do so in future research, the aim of this paper was not to identify how and why specific coaching practice was related to particular athlete outcomes (Brannan, Fleetwood, O'Mahoney, & Vincent, 2017). Instead, the principal aim was to investigate how relationships between coaching practice and athlete outcomes have been researched to date.

## Results and Discussion

Two hundred and eight studies examined relationships between naturalistic coaching practice and athlete outcomes. Findings are presented and discussed in order of: (a)

publication timeline, (b) paradigms, (c) research design, (d) methods, (e) sports and perspectives, and (f) coaching practice-athlete outcome relationships.

## Publication Timeline

The current review retrieved papers published from 1982 to 2017. Year of publication was categorised into five-year periods (see Table 2). The rate of publication of research investigating the relationship between naturalistic coaching practice and athlete outcomes started relatively slowly, with the earliest recorded paper retrieved within this review published in late 1982. 90.4% of papers identified within the parameters of the present study were published from the year 2001 onwards.

[Insert Table 2 about here]

Compared to telemedicine, one small strand of healthcare literature, which had 5,911 publications between 1964 and 2003 (Moser et al., 2004), the fact that only 208 total articles were retrieved pertaining to naturalistic coaching practice and athlete outcomes in the present study shows that this domain of inquiry is still in its infancy. Despite this, a marked increase in papers published around the turn of the millennium may be explained by wider calls to develop the sophistication of coaching research (e.g., Jones, Armour, & Potrac, 2002; Potrac et al., 2000; Strean, 1998) in pursuit of a more holistic understanding of coaching practice (Côté & Gilbert, 2009; Kidman, 2001; Mouchet, Harvey, & Light, 2014). Furthermore, data presented in Table 2 would imply that research output in this field is currently continuing to rise, year on year. Such a discernible increase underlines the importance of the present study in providing a critical overview of literature and its meta-theoretical underpinning, to give clearer direction to future research, to practitioners, and to coach educators.

## Paradigms

The majority of research did not state which paradigm had guided the investigation of the interplay between coaching practice and athlete outcomes ($n$ = 194 studies). In spite of this, many of these papers were clearly influenced by positivism (e.g., Fransen, Decroos, Broek, & Boen, 2016; Vazou, Ntoumanis, & Duda, 2006). Only a small number ($n$ = 14) of papers were explicitly constructivist or interpretivist in nature (e.g., Light & Robert, 2010). This mirrors findings previously documented elsewhere (Brustad, 1997; Cushion, Armour, & Jones, 2006; Gilbert & Trudel, 2004a; Lyle, 1999), pertaining to a heavy emphasis on positivism in coaching literature. North (2013b) suggests this is likely due to the strong early influence of psychology's dominant meta-theoretical assumptions, on the domain. Positivism has valuably contributed to our knowledge of relationships between coaching practice and athlete outcomes. Specifically, work in this paradigm has highlighted features of coaching practice shown to be related (sometimes mediated through other variables) to some athlete outcome variables, and in some cases the strength of this relationship has also been indicated (e.g., Vazou, Ntoumanis, & Duda, 2006).

Due to its lack of consideration for contextual influence (Miles, 2009) and assumptions of the domain being linear and uncomplicated (North, 2017), positivism has however frequently been cited as being poorly equipped to research within social domains such as sport coaching (Benton & Craib, 2001; Cushion, 2007; Danermark, Ekström, Jakobsen, & Karlsson, 1997). Martin, Sugarman, and Thompson (2003) critically remarked that the reductive ontology of positivism cannot alone account for the reflexive and emergent nature of human behaviour and cognition, especially within circumstances often characterised by high levels of ambiguity and pathos (Jones & Wallace, 2005). According to CR, research with its roots in scientism cannot explore how entities of open systems interact to produce outcomes. By seeking law-like regularities, patterns, or constant conjunctions, positivist studies reduce the world to our observation and experiences of it (Bhaskar, 1975). This is

problematic, as although we may be able to understand that a certain aspect of coaching practice (e.g., instruction) has preceded, or is related to an athlete outcome (e.g., performance), we cannot comprehend the continuous process by (and mechanisms through) which the coaching practice has actually influenced the athlete (or not) (Sayer, 1992). Yet, this is not to say that positivist science cannot play a role in advancing our knowledge of sport coaching; positivist-informed investigations, in fact, often provide us with the impetus to investigate more complex dimensions of the coaching process.

A small number of papers in the present review explicitly claimed to fall within an interpretivist paradigm, viewing the world as socially constructed (e.g., Gearity & Murray, 2011; Light & Robert, 2010; McCalpin, Evans, & Côté, 2017). In response to the limitations of positivism, interpretivist-informed researchers have argued that their paradigm is better positioned to investigate the nuanced and complex nature of coaching due to its subjectivist epistemology (Potrac, Jones, & Nelson, 2014). Valuably, interpretivism has progressed our understanding of the lived experiences of both coaches and athletes in relation to how they take meaning from coaching practice (e.g., Gearity & Murray, 2011). Rather than seeking law-like regularities, this paradigm has strengthened our grasp of how athletes perceive and may be *influenced* by coaching practice, through ongoing sense making. As such, interpretivism has illuminated some of the ironies, complexities and tensions which must be navigated as an inherent feature of coaching (Jones & Wallace, 2005). However, some cognitivist informed researchers have suggested that these (predominantly sociological) approaches place too heavy an emphasis on complexity, advocating instead the simplicity and structure of models to encapsulate the core process of coaching (Abraham & Collins, 2011; Lyle, 2007).

While interpretivist approaches provide us with a greater exploration of emotional, political and power-ridden factors as inherent features of the coaching process (Potrac et al.,

2014), because they do not consider ontology and individual epistemological beliefs to be able to exist separately, they reject the idea that it is possible to move beyond observation or experience of events (O'Mahoney & Vincent, 2014). As a result, tensions between relations of structure and agency are present within constructivism (Klotz, 2001) and the extent to which one or the other of these factors play a role in determining action remains a topic of prominent debate (Purdy & Jones, 2011). This often polarised debate, has led to a lack of research that connects the micro, meso and macro in the coaching process. Indeed, there remains a need to pay attention to 'the detail of coaching practice, the forces that shape coaching practice and the interconnections that run between them' (Cushion, 2007, p. 399). Here, as is further argued, CR offers one potential avenue to explore how coaching practice is embedded within, shapes, and is shaped by its broader context. For instance, Elder-Vass (2007) suggested that we should account for both structural influences (i.e., through habitus), and conscious agency or agential reflexivity when understanding the determination of human action. In other words, human action should be viewed as the outcome of 'a continuous interaction between dispositions and reflexivity' (Elder-Vass, 2007, p. 325). It is important to acknowledge that this is only one conception of structure-agency relations and that other accounts of such interaction are available (e.g., Archer, 2003; Bourdieu & Wacquant, 1992; Crossley, 2001).

Perhaps one of the reasons why there is a dearth of research able to connect coaching practice to athlete outcomes is because prevailing paradigmatic approaches commit to the *epistemic fallacy.* In other words, they operate on a flat ontology (ontology and epistemology are collapsed into one another) unable to extend beyond the level of the empirical (i.e., what we can observe and experience). Positivism principally provides us with accounts of nomothetic, law-like findings, or constant conjunctions, while interpretivism typically provides us with knowledge for understanding. However, neither of these perspectives alone

are able to distinguish reality from our knowledge of it, meaning explanatory or complex causal accounts are severely restricted. CR, on the other hand, is able to distinguish ontological realism from epistemic relativism and as such provides us with a basis to understand the causal and explanatory mechanisms which underpin the how, when, why, and under which circumstances coaching practice is related to athlete outcomes through retroduction[3]. Importantly, what should be remembered here, is that prevailing paradigms in this area (i.e., positivism and interpretivism) provide useful, albeit limited contributions to such stratified causal explanation from a CR standpoint (Pawson, 2006).

Frustratingly, many studies in this review (e.g., Claringbould, Knoppers, & Jacobs, 2015), failed to acknowledge explicitly their underpinning paradigm, leaving ontological and epistemological uncertainty. It is recommended that authors explicitly acknowledge and consider the philosophical and paradigmatic assumptions underpinning their research. This would aid interpretation by other researchers, as well as promote interdisciplinarity and permeations across traditional boundaries (North, 2013b). Specifically, it would allow more rigorous assessment of the quality of research according to its underlying ontological and epistemological assumptions. Moreover, when considered alongside research design, it would enable enhanced understanding of the scope and ability of the research to, for example, be generalised, or to problematise through rich description.

**Research Design**

In line with other reviews of coaching literature (e.g., Gilbert & Trudel, 2004a), the largest proportion of research ($n$ = 173, 83.2%) was conducted using a quantitative approach (see Table 3). Proportionately, a small number of studies were either qualitative, or multi-

[3] Retroduction – a mode of analysis which constantly seeks to answer the question: what are the emergent causal (theoretical) factors (including eliminating alternative causes) at play, and how do they interact to produce events? (Bhaskar, 1975).

method (i.e., employing multiple forms of either quantitative or qualitative research methods), while a smaller proportion of studies again were mixed-method (i.e., using both qualitative and quantitative research methods).

[Insert Table 3 about here]

Among the quantitative research, a large number of papers were further defined as cross-sectional or correlational in nature (with many of these studies also employing regression or multiple regression analyses). Due to the coding process in the present study, if quantitative papers did not specifically state that they were cross-sectional or correlational, they were coded as 'quantitative'; clearly, the majority of the quantitative papers would have been either cross-sectional or correlational (but could not be coded in this manner). Consequently, much of the research in this area cannot assume directionality or causality between practice and outcomes (Sedgwick, 2014). Instead, it can only be inferred that a relationship is present, the strength of this relationship, the influence of one variable in predicting a dependent variable (e.g., when including regression analyses), or the influence of multiple variables in predicting one dependent variable (e.g., when including multiple regression analyses).

Although quantitative research designs have provided researchers and practitioners with a basic understanding that certain elements of coaching practice may be linked to certain athlete outcomes (i.e., the *what*), critical understanding of *how*, *when*, *why*, and *under which circumstances* these relations occur and may be most effective remain lacking (Jones, Potrac, Cushion, & Rongland, 2011). Athletes have widely been treated as a homogenous agential entity, limiting the ability of research to resonate with 'on the ground' coaching interactions, through neglecting the notion that athletes can, and do, respond to the same coaching practice in a heterogeneous fashion. The limited number of qualitative and mixed-method approaches have allowed us to begin to redress some of these issues through generating understanding at

the level of the individual athlete. However, in order to further assess the potential and limitations of all research designs there is need to pay close attention to the specific methods deployed.

**Methods**

The most frequently used research method was questionnaires, followed by interviews and observation, with 17 different research methods being utilised in total (see Table 4). A substantial proportion of papers used a single method design ($n$ = 174, 83.7%). Studies employing this approach have tended to use questionnaires to assess perceptions of coaching practice as well as perceptions of athlete outcomes, before investigating the relationship between these variables (e.g., Goudas, 1998; Price & Weiss, 2013). In implementing questionnaires at one static time point (e.g., the end of the session) research of this nature has often negated the *temporal* dimension (and by extension the influence of other variables) surrounding the development of athlete outcomes. For instance, athletes' interpretations of variables were likely to have changed throughout different time points in a session, rendering the static time point measurement of somewhat restricted value. Only 34 (16.3%) papers approached their research questions using more than one research method. The most frequent combinations of methods were questionnaire and competition performance data ($n$ = 8, 3.8%), questionnaire and observation ($n$ = 7, 3.4%), questionnaire and physiological measures ($n$ = 3, 1.4%), and observation and interview ($n$ = 3, 1.4%). These findings are again consistent with broader coaching science reviews (e.g., Gilbert and Trudel, 2004a), which reported that the largest percentage of coaching research had utilised a single-method approach, mainly questionnaires.

CR does not *a priori* determine suitable methodology or methods. It instead subscribes to methodological pluralism; recognising the limits of any methodology and the

need to approach phenomena through different methods (Bhaskar, 1975). This does not, however, mean that any method can be applied uncritically to any question, or object of study. 'There should be congruence between the object of study, the assumptions about society and the conceptions of how knowledge is possible, and one's choice of design and method' (Danermark et al., 1997, p. 150). As the social world necessitates understanding of open systems, ontological depth, facts as being theory-laden, and emergent powers (according to CR), this clearly has implications for methodological choices (Danermark et al., 1997). As such, the use of more intensive research designs (studying mechanisms in depth, as opposed to patterns), using ethnographic research, including interviews with multiple stakeholders and participant observation, has been argued to be best positioned to generate causal theory within the sport coaching environment (North, 2017). Furthermore, given actions can have an immediate impact on outcomes, but generally coaching will influence athletes in a *sedimentary* way (i.e., in the longer-term; Sayer, 2000), the use of more longitudinal data collection is needed to account for this. Making use of more sophisticated methodologies would provide an added layer of understanding to research, which until now has widely considered relationships between coaching practice and outcomes to be simple, unidirectional and homogeneous.

[Insert Table 4 about here]

Addressing some of the issues identified, Mouchet et al. (2014) utilised a complex interwoven methodology of pre-match interviews, observation (through video and audio recording), analysis of behaviour and communication, and further psycho-phenomenological post-match interviews. This more sophisticated bricolage of methods allowed interpretations to be developed about what the coach intended to do, what they actually did in their practice and how athletes performed after observed practice. In addition, the coach provided retrospective reflections about their actions. While this paper is a good example of how

multiple methods can permit us a deeper exploration of the impact of coaching practice, many findings were presented tentatively. This may be because athletes were not also consulted, to understand their perceptions of the impact of the practice. Without this insight, it was assumed that the outcomes of athletes were related to coaching practice in a constant conjunctive manner (i.e., because the coach had delivered a message and athletes were observed changing their behaviour, the practice was deemed to have influenced the change).

In order to address general limitations associated with previous research, two approaches are proposed below which build upon the small proportion of literature considering relationships between coaching practice and athlete outcomes to be idiosyncratic and individualistic. Aligning with a more critical research philosophy, empirical studies should look to understand *how*, *when*, *why,* and *under which circumstances* coaching practice is related to athlete outcomes in order to make better informed recommendations for situated coach education. In line with North's (2017) suggestion this could be achieved using participant observation, as well as other rich intensive methods (e.g., interviews, focus groups, stimulated recall, field notes). CR would be well positioned to use these methods in order to generate causal explanatory understanding, advancing knowledge further than simple inference that coaching practice is related to athlete outcomes. Specifically, critical realist logic to unearth the interdependent mechanisms which underpin coaching practice and its influence on athletes would help to extend beyond the level of the empirical (e.g., what can be observed and experienced; Bhaskar, 2015). Given these mechanisms include entities from multiple disciplines (e.g., biological, psychological and social; North, 2017), interdisciplinary research capable of explaining their emergent relations is essential to the development of the field (North, 2017; Wiltshire, 2018).

Researchers who continue to conduct work according to positivist or interpretivist assumptions may also consider implications for their research based upon these findings.

Scholars who continue to identify with the positivist paradigm could look to utilise experimental or randomised control trial studies (with sophisticated methods to capture outcomes) in order to explore the effectiveness of coaching interventions and understand which direction causally inferred relationships are operating, recognising their often limited external validity or generalisability (Black, 1996). Those researching from an interpretivist standpoint should aim to generate deeper and more comprehensive *in situ* meaning (e.g., ethnographies of practice incorporating multiple methods). Arguably, such work would help in contributing toward our (causal explanatory) understanding of sport coaching and its influence on athletes, when included and drawn upon in further interdisciplinary work (North, 2017).

**Sports and Perspectives**

Representative of wider coaching literature (Cope et al., 2016; Cushion & Jones, 2006; Partington & Cushion, 2013; Potrac, Jones, & Cushion, 2007) the most prevalent sport identified within articles pertaining to coaching practice and athlete outcomes was association football (soccer) ($n$ = 91 studies). Other more popular sports within studies were basketball ($n$ = 61 studies), swimming ($n$ = 40 studies), volleyball ($n$ = 38 studies), track and field ($n$ = 31 studies), and tennis ($n$ = 24 studies). In total, studies investigating the relationships between naturalistic coaching practice and athlete outcomes encompassed 72 different sports. It was not possible to synthesise the competitive level observed within studies, as there were too many derivatives and too wide a lexicon of terms to be able to interpret cross-continental equivalents. It is important that research is conducted in different contexts given, for example, that preferences for coach behaviour have been found to differ between individual and team sport athletes (Baker, Yardley, & Côté, 2003). Indeed, there is still clearly a need to situate research in a more diverse range of sporting contexts to aid the dissemination and implementation of findings (Williams & Kendall, 2007), and given that grounding in context

553 is considered to be crucial in the understanding of causal theory according to CR (Sayer,
554 1992).

555 The participant perspectives reported in each study are shown in Table 5. Most studies
556 considered the impact of coaching practice from a singular perspective (82.7%, *n* = 172)
557 dominated by the athlete viewpoint. This finding is in contrast to the review conducted by
558 Gilbert and Trudel (2004a) who found that coaches were the most prevalent participant
559 group. Possible explanations for discrepancies between the present study and the work of
560 Gilbert and Trudel (2004a) may be that the earlier review did not narrow the focus as much
561 as the present study (to only include papers focused on coaching practice and athlete
562 outcomes), but instead looked at any coaching science literature. Such a strong focus on
563 athletes as participants within the present study may also be explanatory of the assumption
564 that without the athlete viewpoint, it is not possible to assume coaching practice has had an
565 impact. For example, how do we know that athletes have not simply come up with an
566 independent strategy, regardless of the coaching practice received? And, how do we know
567 that the coaching practice has actually been received and interpreted by the athletes in the
568 first place, unless we consult them?

569 [Insert Table 5 about here]

570 The perspectives of other key stakeholders in the coaching process received
571 comparatively less attention (e.g., national governing bodies and coaches themselves). Only
572 17.3% (*n* = 36) of studies considered more than one perspective. Of these papers, the most
573 popular combinations of perspectives were those of the coach and athlete (*n* = 15, 7.2%), and
574 of independent observers and athletes (*n* = 5, 2.4%). Future studies should aim to consult
575 multiple perspectives in order to understand the influence of the coach in a more
576 sophisticated manner (i.e., including the perception of the athlete, coach, researcher, and

other relevant stakeholders). Aligned more closely to 360-degree feedback processes, this has been argued to be a superior approach to managing and evaluating coaching practice and relations to outcomes (O'Boyle, 2014). As Bhaskar (2015) posited, however, a central feature of CR is that claims to truth are resolved and compared through discussion and debate that seeks, on a rational basis, to identify those findings or beliefs that appear to be truthful. While acknowledging that human knowledge is socially produced, CR attempts to find the truth, avoiding the view that all beliefs are always of equal truth value (Clark et al., 2007). Therefore, depending upon the mode of reality being investigated, an inclusion of multiple perspectives when generating causal theory must be grounded in terms of *judgmental rationality* (i.e., evaluating whether theory can be justified on the basis of evidence available to us, and if it is capable of explaining phenomena better than competing theories; North, 2017). It is also important to consider the practical adequacy and application to contexts studied, as well as how endurable the theory is.

## Coaching Practice-Athlete Outcome Relationships

Hundreds of individual relationships between different elements of coaching practice and athlete outcomes were reported in the literature (see supporting material). It is beyond the scope, and not the intention of this review, to synthesise the intricate relationships between every element of coaching practice and athlete outcome investigated to date, or to generate a generalisable list of 'effective' coaching practice. Instead, in the following section, we provide an overview of some of the more saturated areas of research (in chronological order

from more to less popular themes), with examples of studies to illustrate findings[4], in order to inform future research directions.

Athlete motivation, encompassing autonomy-supportive practice, controlling coaching or the motivational climate, has been the major focus of research to date. Typically, studies have promoted the use of autonomy-supportive practice (i.e., permitting athlete choice, empowerment and allowing learning to take place from mistakes independently), and advised against controlling forms of coaching, in order to satisfy athletes' basic psychological needs and instil more self-determined forms of motivation (Almagro, Sáenz-López, Moreno-Murcia, & Spray, 2015; Amorose & Anderson-Butcher, 2015; Hein & Jõesaar, 2015; Pope & Wilson, 2012; Reynolds & McDonough, 2015; Sheldon & Watson, 2011). These findings are consistent with Vella and Perlman's (2014) review of common approaches to coaching which presents a similar relationship between autonomy-support, basic psychological needs and intrinsic or autonomous motivation. A proportionately small number of studies in the present review reported conflicting findings, however. For example, Smith et al. (2016) noted a negative relationship between coach perceived dimensions of autonomy support and athletes' autonomous motivation, which was attributed to a possible misjudgement of the environment coaches presumed they created. Studies interested in the motivational climate, have also generally promoted task-oriented environments rather than ego-oriented environments (Reinboth & Duda, 2006; Smith et al., 2016). Coaching practice aligned with autonomy support and task mastery has been broadly related to fostering outcomes of increased well-being (Draugelis, Martin, & Garn, 2014), vitality (Reinboth & Duda, 2006), enjoyment (Van

[4] A full list of the number of coaching practice and athlete outcome variables present within the included studies is available upon request from the first author.

de Pol, Kavussanu, & Ring, 2012), and sport persistence (Rottensteiner, Konttinen, & Laakso, 2015).

Relationships between coach behaviour and team cohesion were another area of repeated attention, often using the Leadership Scale for Sport and Group Environment Questionnaire (e.g., Gardner, Shields, Bredemeier, & Bostrom, 1996). There are again equivocal findings associated with different contexts, suggesting that varying types of coach behaviour can promote or negate task and social cohesion of teams. However, research on this topic has widely linked greater task and social cohesion to perceived (from athletes' perspectives) use of high levels of training and instruction, democratic behaviour, social support and positive feedback, and low levels of autocratic behaviour (Gardner et al., 1996; Ramzaninezhad & Keshtan, 2009; Shields, Gardner, Bredemeier, & Bostro, 1997; Westre & Weiss, 1991; Yusof, Vasuthevan, & Shah, 2008).

A number of papers investigated the relationship between coaching practice and self-esteem, self-confidence or self-efficacy. Again, demonstrating the dominance of such topics within the literature, autonomy support and coach involvement was reported to predict self-esteem (e.g., Gagne, 2003), with this relationship often being mediated through athletes' feelings of competence (Coatsworth & Conroy, 2009). Change-oriented feedback quality and quantity were also found to be common predictors of self-esteem (e.g., Carpentier & Mageau, 2013). Further, White and Bennie (2015) linked enhanced self-efficacy to coaches' use of constructive feedback on skill technique in gymnasts. In contrast to these positive relationships, Nordin-Bates, Quested, Walker, and Redding (2012) found fluctuations in the perceived motivational climate did not predict changes in self-esteem. Reinboth and Duda (2004) did report perceptions of ability to play a role in this relationship, however; reported self-esteem was found to be lowest among low perceived ability athletes when encountering

high ego-involving features, but high among athletes in a high task-involving environment, regardless of perceptions of ability.

A smaller number of papers investigated the relationship between aspects of coaching practice on athlete performance. Some of these papers have investigated the relationships between coach behaviour and performance in terms of competitive outcome/win percentage. Interestingly, Weiss and Friedrichs (1986) found higher frequencies of coach social support to be associated with a lower win/loss percentage and rewarding coach behaviour to be the best predictor of a positive win/loss percentage. This is in direct contrast with much literature focusing on coach behaviour and acute performance (i.e., ratings of performance, or performance data within matches or sessions, as opposed to match outcomes). For example, training and instruction, democratic behaviour, autocratic behaviour, social support, and rewarding behaviours of the coach have been found to be predictive of coach ratings of performance, both independently (i.e., when considered as individual standalone behaviours) and interactively (i.e., when multiple behaviors are combined; Garland & Barry, 1990). Use of more punitive coaching behaviours (e.g., scold or punishment), were generally related to decreases in athlete performance (e.g., Walters, Payne, Schluter, & Thomson, 2015).

Autonomy-support from the coach was again a predominant theme within the performance category, implying that higher levels of autonomy-support promotes enhanced athlete performance, both in terms of match outcome (e.g., Cheon, Reeve, Lee, & Lee, 2015) and more acute measures (e.g., Gillet, Vallerand, Amoura, & Baldes, 2010; Pope & Wilson, 2015). A small pool of papers has, more recently, investigated the complex impact of coaching practice on immediate performance within sessions or matches. For instance, as earlier introduced Mouchet et al. (2014) video recorded coaching practice and performance within a full rugby match, alongside semi-structured and explication interviews with coaches, to identify how the coaching practice and strategies delivered had an impact on the

667 performance of athletes. Findings included the coach providing instruction to calm the
668 players, and a subsequent observation of players controlling their emotions in response to
669 hostile playing conditions.

670 Principally then, research within this review has focused heavily on the
671 psychological/psychosocial domain, likely due to a reliance on quantitative methodology and
672 the use of questionnaires, easily validated and deployed within multiple contexts. The large
673 focus on and promotion of autonomy-supportive practice and empowering coaching has
674 recently come under criticism from Denison, Mills, and Konoval (2017), due to its reductive
675 assumptions about enhancing coach effectiveness. It is argued that autonomy-supportive
676 approaches are largely coaching 'rhetoric within a context that normalizes maximum coach
677 control', due to the lack of consideration of the underpinning influence of power and
678 disciplinary practices (Denison et al., 2017, p. 773). This reinforces the need for research
679 focusing on the relationship between practice and outcomes to consider the wider enmeshed
680 socio-cultural, political, institutional, interpersonal and individual issues, in line with a multi-
681 layered ontology (North, 2017).

682 As the result of such a vast spectrum of impact relating to differing types of coaching
683 practice on athlete outcomes, confusion around the transference of recommendations to
684 coaching practice can easily arise. As an example, Amorose and Nolan-Sellers (2016) found
685 coaches ignoring mistakes was negatively related to athlete perceptions of competence. This
686 highlights a somewhat contradictory finding in the sense that coaches are frequently
687 encouraged to permit athletes to make their own mistakes and problem solve independently
688 (i.e., be more autonomy-supportive; Mageau & Vallerand, 2003), to enhance competence.
689 Based on such findings, practitioners may be confused about when they should intervene to
690 avoid potential decreases to perceptions of competence, and when to allow athletes to
691 regulate their own learning to enhance perceptions of competence. Given the equivocal

nature of research findings here, and the technocratic rationality characteristic of much coach education (Piggott, 2012), it is of little surprise that coach development initiatives have been poorly informed by the literature (Vella & Perlman, 2014).

This review has highlighted that relationships between practice and outcomes are, at present, often represented as a dyadic, unidimensional and homogeneous affair, as if practice is only capable of having an impact on athletes it is directed towards, and that it will likely have a stable effect if repeated. A critical realist approach to future research could consider *what* works for *whom*, *when*, *why*, and *under which circumstances*, within a given context. Focus should be given to the causal mechanisms underlying naturalistic practice and its influence, as opposed to uncritically viewing successful outcomes (e.g., positive performance) as being definitively the result of effective coaching practice. Enhancing the sophistication of research in these ways would permit more critical interrogation of *how* and *why* coaching practice is influential (or ineffective) at different times and in different situations. We therefore advocate research which explores both the intended and unintended consequences of coaching practice.

Such divergence in the influence of coaching practice, is consistent with, and can be captured by emergence, as proposed by CR (Elder-Vass, 2010). Instead of simply viewing mechanisms of influence as the additive summation of their parts, a critical realist approach to future research would explore the interaction between the parts of mechanisms (e.g., how materially real objects, as well as power dynamics, habitus, historical or structural relations and agential decision making may interact in coaching and its influence on others). Mechanisms should be recognised as capable of being 'continuously active, due to their enduring properties and powers, despite their outcomes displaying variability in open systems' (Scambler, 2012, p. 132) – in critical realist terms they can be relatively enduring or *transfactual* (Bhaskar, 1975). Further, the powers of mechanisms may exist unrealised (i.e.,

not causally influence), or be exercised unrealised (e.g., be present but go unnoticed; Archer, 1998). Drawing attention to, and apprehending the complex nature of the influence of coaching practice in this way could help practitioners to more effectively anticipate, understand and reflect upon the influence of their actions.

In line with the primary functions of the coach, identified within the International Sport Coaching Framework (International Council for Coaching Excellence, Association of Summer Olympic International Federations, & Leeds Beckett University, 2013), emergent representations of coaching would enhance coaches' abilities to build relationships (through increased awareness of the potential influence of their practice on individual athletes), conduct practices and prepare for and manage competitions (through more close consideration of how practice and behaviour can be delivered to effectively influence athletes), and read and react to the field (through more-evidence based approaches to support effective decision making, aligned with development of a diverse range of outcomes). More indirectly, clarity in comprehending the complex, emergent mechanisms through which coaching practice influences athletes would support coaches' capabilities to set a vision (through understanding how their practice and influence on athletes aligns with an overall philosophy) and shape the environment (through an enhanced ability to align the recruitment of personnel, facilities, resources and practices with development of specific outcomes).

Critical realist research could support the generation of emergent representations of coaching by acknowledging a multi-layered, laminated ontology of sport coaching (North, 2017). Using intensive methodology and retroductive analysis, understanding of the causal mechanisms which underpin the influence of coaching practice could be achieved. Typical questions may look like: 'how does mechanism M, when enacted by agent A, tend to alter outcome O?' (Brannan et al., 2017, p. 27). Following such frameworks to research would provide more authentic, relevant and critical perspectives for coaches and coach educators, as

opposed to the current diet of largely simplistic, standardised, technocratic content (Townsend & Cushion, 2017). The identification of causal mechanisms, through methodological approaches described above, would better position us to emancipate social structures (Bhaskar, 1986), and would begin to bring research closer to the 'coalface' of coaching practice, helping to narrow the perceived 'theory-practice gap' (Bush, Silk, Andrews, & Lauder, 2013; Lyle, 2018).

**Peripheral Excluded Papers**

Many papers fell just outside of the inclusion criteria. It is the intention of the following section to describe the nature of such papers in order to provide a scope of the wider literature within this area. Primarily, papers were excluded because they were non-naturalistic; in many studies the researcher had manipulated the coaching practice carried out, to observe the subsequent impact on the athlete outcomes of interest (e.g., Hodges & Lee, 1999; More & Franks, 1996). Such approaches negate wide calls within coaching literature for academics to 'better illustrate the coaching process in terms of remaining true to its dynamic, complex, messy reality' (Cushion et al., 2006, p. 84).

A large number of papers, which examined the impact of small-sided games were excluded. Typically, these studies did not involve the coach, and the researcher constrained the small-sided game conditions to assess the impact on physiological or technical outcomes (e.g., Bennett et al., 2016; Torres-Ronda et al., 2015; Travassos, Vilar, Araújo, & McGarry, 2014). Where studies did involve coaches the researcher generally constrained the manner in which they could operate (i.e., no feedback or encouragement was permitted) in order to avoid confounding the results (e.g., Silva et al., 2014). The impact of naturally occurring coaching practice should be the focus of empirical research, not a feature that is controlled so as to mitigate its extraneous impact on data collected. Studies would then be able to provide

more evidence looking closely at the impact of coaching, as opposed to purely the impact of session design, which is rarely delivered in isolation from coach behaviour.

Many qualitative papers did not provide an empirical link explaining how coaching practice was related to athlete outcomes. Studies instead often investigated, in isolation, perceptions of coaching practice (in some cases simply assuming this to be effective in producing outcomes; e.g., Bengoechea, Strean, & Williams, 2004), or outcomes which were perceived to be desirable (without considering how these were actually connected to coaching practice; e.g., Romand & Pantaléon, 2007). Although these provide useful insights into what practitioners intended to do, or which outcomes they intended to foster, these research approaches ignored the mechanisms through which outcomes were actually shaped by coaching practice.

### Limitations

The scope, and scale of the current study presented many challenges. In order to identify a wide range of coaching practice and athlete outcomes, within a multitude of research designs, the search strategy and protocol were intentionally left relatively open. Included studies reported a wide range of disciplinary approaches and variables, with varying lexicons adopted, making the review of some data incredibly complex. Research working towards more universal terms (e.g., coaching process) would aid understanding and comparison of research in this field. While it is plausible that articles suitable for inclusion were overlooked due to the sheer scale of the review, it is tenable to suggest that the included studies provide a representative base, to support the claims made in the present study.

## Conclusion

The purpose of this paper was to use a systematic search protocol to review research investigating the relationships between coaching practice and athlete outcomes within naturalistic settings. The analysis highlighted that research has largely operated within the confines of the psychological discipline through a positivistic lens, adopting single-method research approaches and consulting a singular perspective. Stemming from a fixation on correlational and cross-sectional research designs (often with regression analyses), researchers, and perhaps practitioners, have widely conceptualised relationships between coaching practice and athlete outcomes simplistically, as unidimensional, linear and homogeneous. In this sense, a critical realist critique has located the 'known unknowns'. In other words, this study has illuminated what we cannot currently understand through the adoption of predominant approaches to research in this area. Given the importance of coaches' self-awareness and reported struggles in accurately reflecting upon their coaching practice (Millar, Oldham, & Donovan, 2011) it is essential that future research aims to further coach knowledge and stimulate reflection in relation to *how*, *when*, *why*, and *under which circumstances* practice *influences* athlete outcomes (accounting for greater heterogeneity).

The lack of research addressing these questions perhaps helps to explain why, even with increased research attention in the field, there has been little apparent impact on coaching practice or coach education (Lyle & Cushion, 2010). Further work investigating their influence would help to address the need for a more clearly defined purpose and social function of the coach (Duffy et al., 2011). CR provides one avenue through which research could extend beyond *knowledge for understanding* in order to also pursue *causal explanatory knowledge*. Such knowledge is arguably well positioned to help practitioners in reflecting upon their own contextual circumstances, as part of research-informed training and education, in an attempt to emancipate their ability to positively influence athletes (Bhaskar, 2015). An increase in the number of studies conducted alone will not necessarily result in

such desirable eventualities, however. Attention must also be paid further to the meta-theoretical, methodological and conceptual underpinning of future work.

Accordingly, there is a distinct need for research to focus on the more holistic connections between the micro-, meso- and macro-structure of coaching practice, without treating athletes as a homogenous entity. In other words, research should acknowledge that experiences and outcomes of coaching will be nuanced and shaped by intricate networks of emergent (causal) relations and interactions, between higher- and lower-order ontological entities. Indeed, conducting the critique as part of the present paper stimulated an important question to be further considered: is the notion of 'outcomes' or 'outputs' of coaching suitable to explain the realities of how coaching works. As a result of the present review, we suggest not. Coaching concerns a constant (emergent) interaction between structure, agency, and other entities (e.g., material things) whereby coaching practice and its *influence(s)* are temporally shaped by previous (inter)action, and shape subsequent (inter)action (Elder-Vass, 2010). Perhaps then, a fruitful line of inquiry into the emergent, relational *influence* of coaching practice could build upon and extend a small pool of research which, rather than looking for snapshot 'outputs' of coaching (as seen in studies retrieved within the present paper), has instead critically explored how coaches and athletes act in the light of both social structure and their conscious capacity to act as agents, and of how this changes (or not; and why) over time (e.g., Cushion & Jones, 2006; Cushion & Jones, 2014; Purdy, Potrac, & Jones, 2008).

Future research could benefit from using multiple methods and engaging a range of key stakeholders associated with the coaching context. A critical realist approach innervating deeper into causal explanatory accounts, identifying emergent entities, powers and mechanisms would be well positioned to make inroads into developing our understanding of the *influence* of coaching practice. More specifically, this would help to conceptualise the

influence of practice in a more detailed and clear representation, thus increasing potential to strike a chord with practitioners (Gould, 2016). Good research will recognise and harness different experiences, accounting for causal mechanisms including interdisciplinary theory (e.g., biological, psychological, social) (North, 2017). This will permit a more sophisticated, fallible understanding better positioned to generate 'theoretically informed and empirically substantiated explanations' (Brannan et al., 2017, p. 27). In turn, more relatable and situated idiosyncratic evidence may be developed to inform coach education and the coach's ability to positively influence athletes and others.

**Acknowledgements**

We would like to thank Professor Steve Vincent for providing useful comments and insights on earlier drafts of this paper and its critical realist lens. We would also like to thank the editors and reviewers for providing supportive, stimulating, insightful and constructive comments in equal measure.

## References

Abraham, A., & , & Collins, D. (2011). Effective skill development: How should athletes' skills be developed? In D. Collins, A. Button, &, & H. Richards (Eds.), *Performance psychology: A practitioner's guide* (pp. 207-229). Edinburgh: Churchill Livingstone.

Allegranzi, B., Nejad, S. B., Combescure, C., Graafmans, W., Attar, H., Donaldson, L., & Pittet, D. (2011). Burden of endemic health-care-associated infection in developing countries: Systematic review and meta-analysis. *The Lancet, 377*(9761), 228-241.

Almagro, B. J., Sáenz-López, P., Moreno-Murcia, J. A., & Spray, C. (2015). Motivational factors in young Spanish athletes: A qualitative focus drawing from self-determination theory and achievement goal perspectives. *The Sport Psychologist, 29*(1), 15-28.

Amorose, A. J., & Anderson-Butcher, D. (2015). Exploring the independent and interactive effects of autonomy-supportive and controlling coaching behaviors on adolescent athletes' motivation for sport. *Sport, Exercise, and Performance Psychology, 4*(3), 206.

Amorose, A. J., & Nolan-Sellers, W. (2016). Testing the moderating effect of the perceived importance of the coach on the relationship between perceived coaching feedback and athletes' perceptions of competence. *International Journal of Sports Science & Coaching, 11*(6), 789-798.

Archer, M. (1998). Introduction: Realism in the social sciences. In M. Archer, R. Bhaskar, A. Collier, T. Lawson, & A. Norrie (Eds.), *Critical realism: Essential readings* (pp. 189-205). London: Routledge.

Archer, M. S. (2003). *Structure, agency and the internal conversation*. Cambridge: Cambridge University Press.

Archer, M. S. (2007). The ontological status of subjectivity: The missing link between structure and agency. In C. Lawson, J. S. Latsis, & N. Martins (Eds.), *Contributions to social ontology* (pp. 17-31). London: Routledge.

Archer, M., Decoteau, C., Gorski, P., Little, D., Porpora, D., Rutzou, T., Smith, C., Steinmetz, G., & Vandenberghe, F. (2016). What is critical realism? *Perspectives, 38*(2), 4–9.

Baker, J., Yardley, J., & Côté, J. (2003). Coach behaviors and athlete satisfaction in team and individual sports. *International Journal of Sport Psychology, 34*, 226-239.

Beckman, E., Rossi, T., Hanrahan, S., Rynne, S., & Dorovolomo, J. (2017). The effectiveness of a cricket programme for engaging people with a disability in physical activity in Fiji. *International Journal of Disability, Development and Education*, 1-15. doi:10.1080/1034912X.2017.1363380

Belfrage, C., & Hauf, F. (2016). The gentle art of retroduction: Critical realism, cultural political economy and critical grounded theory. *Organization Studies, 38*(2), 251-271.

Bengoechea, E. G., Strean, W. B., & Williams, D. J. (2004). Understanding and promoting fun in youth sport: Coaches' perspectives. *Physical Education & Sport Pedagogy*, *9*(2), 197-214.

Bennett, K. J., Scott, B. R., Fransen, J., Elsworthy, N., Sanctuary, C. E., Gabbett, T. J., & Dascombe, B. J. (2016). Examining the skill involvements of under-16 rugby league players during a small-sided game and match-play. *International Journal of Sports Science & Coaching, 11*(4), 532-537.

Bennie, A., Apoifis, N., Caron, J., Falcão, W., Marlin, D., Bengoechea, E. G., ... & George, E. (2017). A guide to conducting systematic reviews of coaching science research. *International Sport Coaching Journal*, *4*(2), 191-205.

Benton, T., & Craib, I. (2001). *Philosophy of social science*. Basingstoke, England: Palgrave.

908 Bhaskar, R. (1975). *A realist theory of science*. Leeds: Leeds Books Ltd.

909 Bhaskar, R. (1978). On the possibility of social scientific knowledge and the limits of
910 naturalism. *Journal for the Theory of Social Behaviour, 8*(1), 1-28.

911 Bhaskar, R. (1986). *Scientific realism and human emancipation*. London: Verso.

912 Bhaskar, R. (2010). Contexts of interdisciplinarity: Interdisciplinarity and climate change. In
913 R. Bhaskar, K. G. Frank, P. Høyer, P. Næss, & J. Parker (Eds.), *Interdisciplinarity*
914 *and climate change: Transforming knowledge and practice for our global future*.
915 Abingdon: Routledge.

916 Bhaskar, R. (2011). *Reclaiming reality.* London: Routledge.

917 Bhaskar, R. (2015). *The possibility of naturalism: A philosophical critique of the*
918 *contemporary human sciences* (4th ed.). Abingdon, Oxon: Routledge.

919 Bhaskar, R. (2016). *Enlightened common sense: The philosophy of critical realism*. New
920 York: Routledge.

921 Biddle, S., Wang, C. J., Kavussanu, M., & Spray, C. (2003). Correlates of achievement goal
922 orientations in physical activity: A systematic review of research. *European Journal*
923 *of Sport Science, 3*(5), 1-20.

924 Black, N. (1996). Why we need observational studies to evaluate the effectiveness of health
925 care. *BMJ: British Medical Journal*, *312*(7040), 1215-1218.

926 Bourdieu, P., & Wacquant, L. J. D. (1992). *An invitation to reflexive sociology*. Oxford:
927 Polity Press.

928 Brannan, M. J., Fleetwood, S., O'Mahoney, J., & Vincent, S. (2017). Critical Essay: Meta-
929 analysis: A critical realist critique and alternative. *Human Relations, 70*(1), 11-39.

930 Brown, D. J., & Fletcher, D. (2017). Effects of psychological and psychosocial interventions
931 on sport performance: A meta-analysis. *Sports Medicine*, *47*(1), 77-99.

Brustad, R. J. (1997). A critical-post modern perspective on knowledge development in human movement. In J. M. Fernandez-Balboa (Ed.), *Critical postmodernism in human movement, physical education, and sport* (pp. 87-98). Albany, New York: State University of New York.

Bush, A. J., Silk, M. L., Andrews, D. L., & Lauder, H. (2013). *Sports coaching research: Context, consequences and consciousness*. London, UK: Routledge

Carpentier, J., & Mageau, G. A. (2013). When change-oriented feedback enhances motivation, well-being and performance: A look at autonomy-supportive feedback in sport. *Psychology of Sport and Exercise, 14*(3), 423-435.

Cheon, S. H., Reeve, J., Lee, J., & Lee, Y. (2015). Giving and receiving autonomy support in a high-stakes sport context: A field-based experiment during the 2012 London Paralympic Games. *Psychology of Sport and Exercise*, *19*, 59-69.

Claringbould, I., Knoppers, A., & Jacobs, F. (2015). Young athletes and their coaches: Disciplinary processes and habitus development. *Leisure Studies*, *34*(3), 319-334.

Clark, A. M., MacIntyre, P. D., & Cruickshank, J. (2007). A critical realist approach to understanding and evaluating heart health programmes. *Health, 11*(4), 513-539.

Clegg, S. (2005). Evidence-based practice in educational research: A critical realist critique of systematic review. *British Journal of Sociology of Education*, *26*(3), 415-428.

Coatsworth, J. D., & Conroy, D. E. (2009). The effects of autonomy-supportive coaching, need satisfaction, and self-perceptions on initiative and identity in youth swimmers. *Developmental Psychology, 45*(2), 320.

Collier, A. (1994). *Critical realism: An introduction to Roy Bhaskar's philosophy*. London: Verso.

Cope, E., Partington, M., & Harvey, S. (2016). A review of the use of a systematic observation method in coaching research between 1997-2016. *Journal of Sports Sciences, 35*(20), 2042-2050.

Côté, J., & Gilbert, W. (2009). An integrative definition of coaching effectiveness and expertise. *International Journal of Sports Science & Coaching*, *4*(3), 307-323.

Crossley, N. (2001). The phenomenological habitus and its construction. *Theory and Society*, *30*(1), 81-120.

Cushion, C. (2007). Modelling the complexity of the coaching process. *International Journal of Sports Science & Coaching*, *2*(4), 395-401.

Cushion, C., Armour, K. M., & Jones, R. L. (2006). Locating the coaching process in practice: Models 'for'and 'of' coaching. *Physical Education and Sport Pedagogy*, *11*(1), 83-99.

Cushion, C., & Jones, R. L. (2006). Power, discourse, and symbolic violence in professional youth soccer: The case of Albion Football Club. *Sociology of Sport Journal*, *23*(2), 142-161.

Cushion, C. J., & Jones, R. L. (2014). A Bourdieusian analysis of cultural reproduction: Socialisation and the 'hidden curriculum' in professional football. *Sport, Education and Society*, *19*(3), 276-298.

Danermark, B., Ekström, M., Jakobsen, L., & Karlsson, J. C. (1997). *Explaining society: Critical realism in the social sciences*. London: Routledge.

De Brún, C., & Pearce-Smith, N. (2009). Citation pearl searching. In C. De Brún, N. Pearce-Smith, C. Heneghan, R. Perera, & D. Badenoch (Eds.), *Searching skills toolkit: Finding the evidence* (pp. 95-99). Oxford, United Kingdom: Wiley-Blackwell.

Denison, J., & Avner, Z. (2011). Positive coaching: Ethical practices for athlete development. *Quest*, *63*(2), 209-227.

980 Denison, J., Mills, J. P., & Konoval, T. (2017). Sports' disciplinary legacy and the challenge
981 of 'coaching differently'. *Sport, Education and Society*, *22*(6), 772-783.
982 Dixon-Woods, M., Bonas, S., Booth, A., Jones, D. R., Miller, T., Sutton, A. J., . . . Young, B.
983 (2006a). How can systematic reviews incorporate qualitative research? A critical
984 perspective. *Qualitative Research, 6*(1), 27-44.
985 Dixon-Woods, M., Cavers, D., Agarwal, S., Annandale, E., Arthur, A., Harvey, J., . . . Smith,
986 L. (2006b). Conducting a critical interpretive synthesis of the literature on access to
987 healthcare by vulnerable groups. *BMC Medical Research Methodology, 6*(1), 1-13.
988 Draugelis, S., Martin, J., & Garn, A. (2014). Psychosocial predictors of well-being in
989 collegiate dancers. *The Sport Psychologist, 28*(1), 1-9.
990 Duffy, P., Hartley, H., Bales, J., Crespo, M., Dick, F., Vardhan, D., . . . Curado, J. (2011).
991 Sport coaching as a 'profession': Challenges and future directions. *International*
992 *Journal of Coaching Science, 5*(2), 93-123.
993 Elder-Vass, D. (2007). Reconciling Archer and Bourdieu in an emergentist theory of action.
994 *Sociological Theory*, *25*(4), 325-346.
995 Elder-Vass, D. (2010). *The causal power of social structures: Emergence, structure and*
996 *agency*. Cambridge: Cambridge University Press.
997 Fleetwood, S. (2004). An ontology for organisation and management studies. In S. Fleetwood
998 & S. Ackroyd (Eds.), *Critical realist applications in organisation and management*
999 *studies* (pp. 27-53). London: Routledge.
1000 Fransen, K., Decroos, S., Broek, G. V., & Boen, F. (2016). Leading from the top or leading
1001 from within? A comparison between coaches' and athletes' leadership as predictors of
1002 team identification, team confidence, and team cohesion. *International Journal of*
1003 *Sports Science & Coaching*, *11*(6), 757-771.

Fraser-Thomas, J., Côté, J., & Deakin, J. (2008). Understanding dropout and prolonged engagement in adolescent competitive sport. *Psychology of Sport and Exercise, 9*(5), 645-662.

Free, C., Phillips, G., Watson, L., Galli, L., Felix, L., Edwards, P., . . . Haines, A. (2013). The effectiveness of mobile-health technologies to improve health care service delivery processes: A systematic review and meta-analysis. *PLoS Medicine, 10*(1), e1001363.

Gagne, M. (2003). Autonomy support and need satisfaction in the motivation and well-being of gymnasts. *Journal of Applied Sport Psychology, 15*(4), 372-390.

Gardner, D. E., Shields, D. L. L., Bredemeier, B. J. L., & Bostrom, A. (1996). The relationship between perceived coaching behaviors and team cohesion among baseball and softball players. *The Sport Psychologist, 10*(4), 367-381.

Garland, D. J., & Barry, J. R. (1990). Personality and leader behaviors in collegiate football: A multidimensional approach to performance. *Journal of Research in Personality, 24*(3), 355-370.

Gearity, B. T., & Murray, M. A. (2011). Athletes' experiences of the psychological effects of poor coaching. *Psychology of Sport and Exercise, 12*(3), 213-221.

Gilbert, W. D., Gilbert, J. N., & Trudel, P. (2001). Coaching strategies for youth sports: Part 1: Athlete behavior and athlete performance. *Journal of Physical Education, Recreation & Dance, 72*(4), 29-33.

Gilbert, W. D., & Trudel, P. (2004a). Analysis of coaching science research published from 1970–2001. *Research Quarterly for Exercise and Sport, 75*(4), 388-399.

Gilbert, W. D., & Trudel, P. (2004b). Role of the coach: How model youth team sport coaches frame their roles. *The Sport Psychologist, 18*(1), 21-43.

Gillet, N., Vallerand, R. J., Amoura, S., & Baldes, B. (2010). Influence of coaches' autonomy support on athletes' motivation and sport performance: A test of the hierarchical

model of intrinsic and extrinsic motivation. *Psychology of Sport and Exercise, 11*(2), 155-161.

Goudas, M. (1998). Motivational climate and intrinsic motivation of young basketball players. *Perceptual and Motor Skills*, *86*(1), 323-327.

Gould, D. (2016). Conducting impactful coaching science research: The forgotten role of knowledge integration and dissemination. *International Sport Coaching Journal*, *3*(2), 197-203.

Gould, D., & Carson, S. (2008). Life skills development through sport: Current status and future directions. *International Review of Sport and Exercise Psychology, 1*(1), 58-78.

Hastie, P. A., Calderón, A., Rolim, R. J., & Guarino, A. J. (2013). The development of skill and knowledge during a sport education season of track and field athletics. *Research Quarterly for Exercise and Sport*, *84*(3), 336-344.

Hein, V., & Jõesaar, H. (2015). How perceived autonomy support from adults and peer motivational climate are related with self-determined motivation among young athletes. *International Journal of Sport and Exercise Psychology*, *13*(3), 193-204.

Hodges, N. J., & Lee, T. D. (1999). The role of augmented information prior to learning a bimanual visual-motor coordination task: Do instructions of the movement pattern facilitate learning relative to discovery learning? *British Journal of Psychology, 90*(3), 389-403.

Holt, N. L., & Neely, K. C. (2011). Positive youth development through sport: A review. *Revista Iberoamericana de Psicologia del Ejercicio y el Deporte*, *6*(2), 299-316.

Horn, T. S. (2008). Coaching effectiveness in the sport domain. In T. S. Horn (Ed.), *Advances in sport psychology* (pp. 309-354). Champaign, IL: Human Kinetics.

International Council for Coaching Excellence, Association of Summer Olympic International Federations, & Leeds Beckett University. (2013). *International Sport*

*Coaching Framework: Version 1.2.* Champaign, IL: Human Kinetics. Retrieved from https://www.icce.ws/_assets/files/iscf-1.2-10-7-15.pdf

Jones, R. L., Armour, K. M., & Potrac, P. (2002). Understanding the coaching process: A framework for social analysis. *Quest, 54*(1), 34-48.

Jones, R. L., Edwards, C., & Viotto Filho, I. T. (2016). Activity theory, complexity and sports coaching: An epistemology for a discipline. *Sport, Education and Society, 21*(2), 200-216.

Jones, R., Potrac, P., Cushion, C., & , & Rongland, L. T. (2011). *The sociology of coaching*. London: Routledge.

Jones, R. L., & Wallace, M. (2005). Another bad day at the training ground: Coping with ambiguity in the coaching context. *Sport, Education and Society, 10*(1), 119-134.

Kahan, D. (1999). Coaching behavior: A review of the systematic observation research literature. *Applied Research in Coaching and Athletics Annual, 14*, 17-58.

Kangasniemi, M., Kallio, H., & Pietilä, A. M. (2014). Towards environmentally responsible nursing: A critical interpretive synthesis. *Journal of Advanced Nursing, 70*(7), 1465-1478.

Kidman, L. (2001). What is empowerment? In L. Kidman (Ed.), *Developing decision makers: An empowerment approach to coaching* (Vol. 1, pp. 11-21). Christchurch, New Zealand: Innovative Print Communications Ltd.

Klotz, A. (2001). Can we speak a common constructivist language? In K. M. Fierke & K. E. Jørgensen (Eds.), *Constructing international relations: The next generation* (pp. 223-235). Armonk, New York: M.E. Sharpe.

Langan, E., Blake, C., & Lonsdale, C. (2013). Systematic review of the effectiveness of interpersonal coach education interventions on athlete outcomes. *Psychology of Sport and Exercise, 14*(1), 37-49.

Light, R. L., & Robert, J. E. (2010). The impact of game sense pedagogy on Australian rugby coaches' practice: A question of pedagogy. *Physical Education and Sport Pedagogy, 15*(2), 103-115.

Lyle, J. (1999). The coaching process: An overview. In N. Cross & J. Lyle (Eds.), *The coaching process: Principles and practice for sport* (pp. 3-24). Oxford: Butterworth-Heinemann.

Lyle, J. W. B. (2007). Modelling the complexity of the coaching process: A commentary. *International Journal of Sports Science and Coaching, 2*(4), 407-409.

Lyle, J. (2018). The transferability of sport coaching research: A critical commentary. *Quest*. Advance online publication. doi: 10.1080/00336297.2018.1453846

Lyle, J., & Cushion, C. (2010). *Sports coaching: Professionalisation and practice*. Edinburgh: Churchill Livingstone Elsevier.

Mageau, G. A., & Vallerand, R. J. (2003). The coach–athlete relationship: A motivational model. *Journal of Sports Science, 21*(11), 883-904.

Mallett, C. J., & Rynne, S. B. (2010). Holism in sports coaching: Beyond humanistic psychology: A commentary. *International Journal of Sports Science and Coaching, 5*(4), 453-457.

Martin, J., Sugarman, J., & , & Thompson, J. (2003). *Psychology and the question of agency*. Albany, NY: State University of New York Press.

Mays, N., Pope, C., & Popay, J. (2005). Systematically reviewing qualitative and quantitative evidence to inform management and policy-making in the health field. *Journal of Health Services Research & Policy, 10*(1), 6-20.

McCalpin, M., Evans, B., & Côté, J. (2017). Young female soccer players' perceptions of their modified sport environment. *The Sport Psychologist, 31*(1), 65-77.

McMahon, J., & Penney, D. (2013). Body pedagogies, coaching and culture: Three Australian swimmers' lived experiences. *Physical Education and Sport Pedagogy, 18*(3), 317-335.

Miles, A. (2009). On a Medicine of the Whole Person: Away from scientistic reductionism and towards the embrace of the complex in clinical practice. *Journal of Evaluation in Clinical Practice, 15*(6), 941-949.

Millar, S. K., Oldham, A. R. H., & Donovan, M. (2011). Coaches' self-awareness of timing, nature and intent of verbal instructions to athletes. *International Journal of Sports Science & Coaching, 6*(4), 503-513.

Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G. (2009). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *Annals of Internal Medicine, 151*(4), 264-269.

More, K. G., & Franks, I. M. (1996). Analysis and modification of verbal coaching behaviour: The usefulness of a data-driven intervention strategy. *Journal of Sports Sciences, 14*(6), 523-543.

Morgan, H. J., & Bush, A. J. (2016). Sports coach as transformative leader: Arresting school disengagement through community sport-based initiatives. *Sport, Education and Society, 21*(5), 759-777.

Moser, P. L., Hauffe, H., Lorenz, I. H., Hager, M., Tiefenthaler, W., Lorenz, H. M., . . . Kolbitsch, C. (2004). Publication output in telemedicine during the period January 1964 to July 2003. *Journal of Telemedicine and Telecare, 10*(2), 72-77.

Mouchet, A., Harvey, S., & Light, R. (2014). A study on in-match rugby coaches' communications with players: A holistic approach. *Physical Education and Sport Pedagogy, 19*(3), 320-336.

Myer, G. D., Jayanthi, N., Difiori, J. P., Faigenbaum, A. D., Kiefer, A. W., Logerstedt, D., & Micheli, L. J. (2015). Sport specialization, part I: Does early sports specialization increase negative outcomes and reduce the opportunity for success in young athletes? *Sports Health, 7*(5), 437-442.

Nordin-Bates, S. M., Quested, E., Walker, I. J., & Redding, E. (2012). Climate change in the dance studio: Findings from the UK Centres for Advanced Training. *Sport, Exercise, and Performance Psychology, 1*(1), 3.

North, J. (2013a). A critical realist approach to theorising coaching practice. In P. Potrac, W. Gilbert, & J. Denison (Eds.), *Routledge handbook of sports coaching*. London: Routledge.

North, J. (2013b). Philosophical underpinnings of coaching practice research. *Quest, 65*(3), 278-299.

North, J. (2017). *Sport coaching research and practice: Ontology, interdisciplinarity and critical realism*. New York: Routledge.

O'Boyle, I. (2014). Determining best practice in performance monitoring and evaluation of sport coaches: Lessons from the traditional business environment. *International Journal of Sports Science & Coaching, 9*(1), 233-246.

O'Mahoney, J., & Vincent, S. (2014). Critical realism as an empirical project: A beginner's guide. In P. K. Edwards, J. O'Mahoney, & S. Vincent (Eds.), *Studying organisations using critical realism* (pp. 1-20). Oxford: Oxford University Press.

Park, S., Lavallee, D., & Tod, D. (2013). Athletes' career transition out of sport: A systematic review. *International Review of Sport and Exercise Psychology, 6*(1), 22-53.

Partington, M., & Cushion, C. (2013). An investigation of the practice activities and coaching behaviors of professional top-level youth soccer coaches. *Scandinavian Journal of Medicine & Science in Sports, 23*(3), 374-382.

Pawson, R. (2002). Evidence-based policy: The promise of 'realist synthesis'. *Evaluation, 8*(3), 340-358.

Pawson, R. (2006). *Evidence-based policy: A realist perspective*. London: SAGE.

Piggott, D. (2012). Coaches' experiences of formal coach education: A critical sociological investigation. *Sport, Education and Society, 17*(4), 535-554.

Pope, J. P., & Wilson, P. M. (2012). Understanding motivational processes in university rugby players: A preliminary test of the hierarchical model of intrinsic and extrinsic motivation at the contextual level. *International Journal of Sports Science & Coaching, 7*(1), 89-107.

Pope, J. P., & Wilson, P. M. (2015). Testing a sequence of relationships from interpersonal coaching styles to rugby performance, guided by the coach–athlete motivation model. *International Journal of Sport and Exercise Psychology, 13*(3), 258-272.

Potrac, P., Brewer, C., Jones, R., Armour, K., & Hoff, J. (2000). Toward an holistic understanding of the coaching process. *Quest, 52*(2), 186-199.

Potrac, P., Jones, R., & Cushion, C. (2007). Understanding power and the coach's role in professional English soccer: A preliminary investigation of coach behaviour. *Soccer and Society, 8*(1), 33-49.

Potrac, P., Jones, R., & Nelson, L. (2014). Interpretivism. In L. Nelson, R. Groom, & P. Potrac (Eds.), *Research Methods in Sports Coaching* (pp. 31-41). Abingdon, Oxon: Routledge.

Price, M. S., & Weiss, M. R. (2013). Relationships among coach leadership, peer leadership, and adolescent athletes' psychosocial and team outcomes: A test of transformational leadership theory. *Journal of Applied Sport Psychology, 25*(2), 265-279.

Purdy, L. G., & Jones, R. L. (2011). Choppy waters: Elite rowers' perceptions of coaching. *Sociology of Sport Journal, 28*(3), 329-346.

Purdy, L., Potrac, P., & Jones, R. (2008). Power, consent and resistance: An autoethnography of competitive rowing. *Sport, Education and Society*, *13*(3), 319-336.

Ramzaninezhad, R., & Keshtan, M. H. (2009). The relationship between coach's leadership styles and team cohesion in Iran football clubs professional league. *Brazilian Journal of Biomotricity*, *3*(2), 111-120.

Rangeon, S., Gilbert, W., & Bruner, M. (2012). Mapping the world of coaching science: A citation network analysis. *Journal of Coaching Education, 5*(1), 83-108.

Reinboth, M., & Duda, J. L. (2004). The motivational climate, perceived ability, and athletes' psychological and physical well-being. *The Sport Psychologist, 18*(3), 237-251.

Reinboth, M., & Duda, J. L. (2006). Perceived motivational climate, need satisfaction and indices of well-being in team sports: A longitudinal perspective. *Psychology of Sport and Exercise, 7*(3), 269-286.

Reynolds, A. J., & McDonough, M. H. (2015). Moderated and mediated effects of coach autonomy support, coach involvement, and psychological need satisfaction on motivation in youth soccer. *The Sport Psychologist, 29*(1), 51-61.

Romand, P., & Pantaléon, N. (2007). A qualitative study of rugby coaches' opinions about the display of moral character. *The Sport Psychologist*, *21*(1), 58-77.

Rottensteiner, C., Konttinen, N., & Laakso, L. (2015). Sustained participation in youth sports related to coach-athlete relationship and coach-created motivational climate. *International Sport Coaching Journal, 2*(1), 29-38.

Rumbold, J. L., Fletcher, D., & Daniels, K. (2012). A systematic review of stress management interventions with sport performers. *Sport, Exercise, and Performance Psychology, 1*(3), 173-193.

Sallis, J. F., Prochaska, J. J., & Taylor, W. C. (2000). A review of correlates of physical activity of children and adolescents. *Medicine and Science in Sports and Exercise, 32*(5), 963-975.

Sayer, A. (1992). *Method in social science: A realist approach* (2nd ed.). Abingdon, Oxon: Routledge.

Sayer, A. (2000). *Realism and social science*. London: Sage.

Scambler, G. (2012). Archer, morphogenesis and the role of agency in the sociology of health inequalities. In G. Scrambler (Ed.), *Contemporary theorists for medical sociology* (pp. 131-149). London: Routledge.

Sedgwick, P. (2014). Cross sectional studies: Advantages and disadvantages. *British Medical Journal, 348*, 1-2.

Sheldon, K. M., & Watson, A. (2011). Coach's autonomy support is especially important for varsity compared to club and recreational athletes. *International Journal of Sports Science & Coaching, 6*(1), 109-123.

Shields, D. L. L., Gardner, D. E., Bredemeier, B. J. L., & Bostro, A. (1997). The relationship between leadership behaviors and group cohesion in team sports. *The Journal of Psychology, 131*(2), 196-210.

Siddiqi, N., House, A. O., & Holmes, J. D. (2006). Occurrence and outcome of delirium in medical in-patients: A systematic literature review. *Age and Ageing, 35*(4), 350-364.

Silva, P., Duarte, R., Sampaio, J., Aguiar, P., Davids, K., Araújo, D., & Garganta, J. (2014). Field dimension and skill level constrain team tactical behaviours in small-sided and conditioned games in football. *Journal of Sports Sciences, 32*(20), 1888-1896.

Smith, N., Tessier, D., Tzioumakis, Y., Fabra, P., Quested, E., Appleton, P., . . . Duda, J. L. (2016). The relationship between observed and perceived assessments of the coach-

created motivational environment and links to athlete motivation. *Psychology of Sport and Exercise, 23*, 51-63.

Strean, W. B. (1998). Possibilities for qualitative research in sport psychology. *The Sport Psychologist*, *12*(3), 333-345.

Surr, C. A., Gates, C., Irving, D., Oyebode, J., Smith, S. J., Parveen, S., . . . Dennison, A. (2017). Effective dementia education and training for the health and social care workforce: A systematic review of the literature. *Review of Educational Research, 87*(5), 966-1002.

Tew, G. A., Brabyn, S., Cook, L., & Peckham, E. (2016). The completeness of intervention descriptions in randomised trials of supervised exercise training in peripheral arterial disease. *PloS One*, *11*(3), 1-14.

Thomas, J., & Harden, A. (2008). Methods for the thematic synthesis of qualitative research in systematic reviews. *BMC Medical Research Methodology*, *8*(45), 1-10.

Torres-Ronda, L., Gonçalves, B., Marcelino, R., Torrents, C., Vicente, E., & Sampaio, J. (2015). Heart rate, time-motion, and body impacts when changing the number of teammates and opponents in soccer small-sided games. *The Journal of Strength & Conditioning Research*, *29*(10), 2723-2730.

Townsend, R. C., & Cushion, C. (2017). Elite cricket coach education: A Bourdieusian analysis. *Sport, Education and Society*, *22*(4), 528-546.

Travassos, B., Vilar, L., Araújo, D., & McGarry, T. (2014). Tactical performance changes with equal vs unequal numbers of players in small-sided football games. *International Journal of Performance Analysis in Sport*, *14*(2), 594-605.

Turnnidge, J., & Côté, J. (2016). Applying transformational leadership theory to coaching research in youth sport: A systematic literature review. *International Journal of Sport and Exercise Psychology*, 1-16. doi:10.1080/1612197X.2016.1189948

1249 Van de Pol, P. K. C., Kavussanu, M., & Ring, C. (2012). Goal orientations, perceived
1250 motivational climate, and motivational outcomes in football: A comparison between
1251 training and competition contexts. *Psychology of Sport and Exercise, 13*(4), 491-499.
1252 Vazou, S., Ntoumanis, N., & Duda, J. L. (2006). Predicting young athletes' motivational
1253 indices as a function of their perceptions of the coach-and peer-created climate.
1254 *Psychology of Sport and Exercise, 7*(2), 215-233.
1255 Vella, S. A., Oades, L. G., & Crowe, T. P. (2010). The application of coach leadership
1256 models to coaching practice: Current state and future directions. *International Journal*
1257 *of Sports Science & Coaching, 5*(3), 425-434.
1258 Vella, S. A., & Perlman, D. J. (2014). Mastery, autonomy and transformational approaches to
1259 coaching: Common features and applications. *International Sport Coaching*
1260 *Journal, 1*(3), 173-179.
1261 Vickery, W., Dascombe, B., Duffield, R., Kellett, A., & Portus, M. (2013). Battlezone: An
1262 examination of the physiological responses, movement demands and reproducibility
1263 of small-sided cricket games. *Journal of Sports Sciences, 31*(1), 77-86.
1264 Walters, S. R., Payne, D., Schluter, P. J., & Thomson, R. W. (2015). 'It just makes you feel
1265 invincible': A Foucauldian analysis of children's experiences of organised team
1266 sports. *Sport, Education and Society, 20*(2), 241-257.
1267 Weiler, R., Mechelen, W., Fuller, C., & Verhagen, E. (2016). Sport injuries sustained by
1268 athletes with disability: A systematic review. *Sports Medicine, 46*(8), 1141-1153.
1269 Weiss, M. R., & Friedrichs, W. D. (1986). The influence of leader behaviors, coach
1270 attributes, and institutional variables on performance and satisfaction of collegiate
1271 basketball teams. *Journal of Sport Psychology, 8*(4), 332-346.

Westre, K. R., & Weiss, M. R. (1991). The relationship between perceived coaching behaviors and group cohesion in high school football teams. *The Sport Psychologist, 5*(1), 41-54.

White, R. L., & Bennie, A. (2015). Resilience in youth sport: A qualitative investigation of gymnastics coach and athlete perceptions. *International Journal of Sports Science & Coaching, 10*(2-3), 379-393.

Williams, S. J., & Kendall, L. (2007). Perceptions of elite coaches and sports scientists of the research needs for elite coaching practice. *Journal of Sports Sciences, 25*(14), 1577-1586.

Wiltshire, G. (2018). A case for critical realism in the pursuit of interdisciplinarity and impact. *Qualitative Research in Sport, Exercise and Health*. Advance online publication. doi:10.1080/2159676X.2018.1467482

Yusof, A., Vasuthevan, M., & Shah, P. M. (2008). The relationship between perceived coaching behaviours and team cohesion among Malaysian national junior athletes. *International Journal of Interdisciplinary Social Sciences, 3*(4), 1-6.

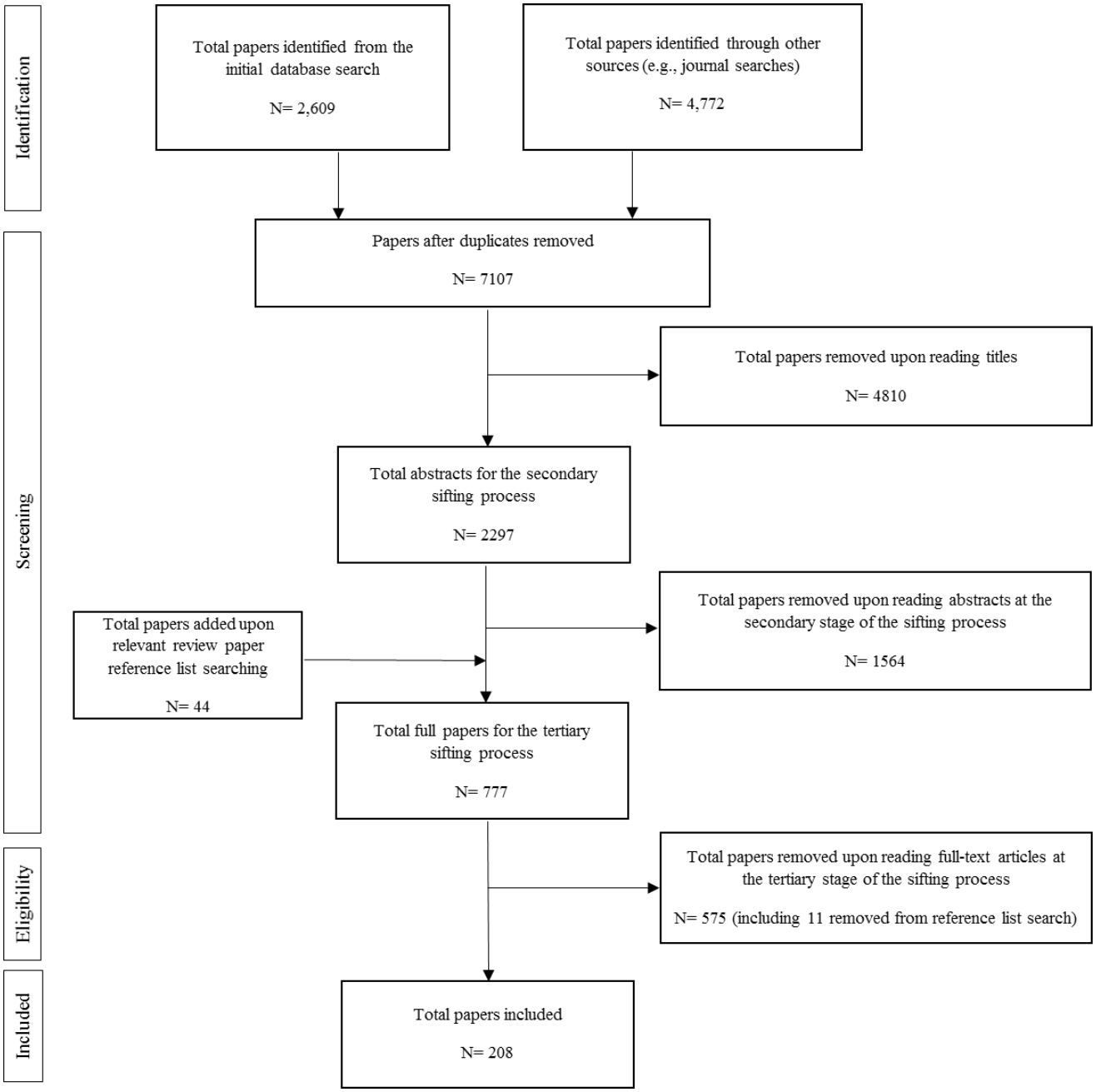


Figure 1 – PRISMA flow diagram.

Table 1 - Journals Searched

| Journal |
| --- |
| Journal of Sports Sciences |
| Behavior Modification |
| Physical Education and Sport Pedagogy |
| Journal of Sport and Exercise Psychology |
| Journal of Applied Behavior Analysis |
| International Journal of Exercise Science |
| International Journal of Sport and Exercise Psychology |
| International Journal of Sports Science and Coaching |
| International Sport Coaching Journal |
| Journal of Sport Behavior |
| Journal of Sports Science and Medicine |
| Journal of Science and Medicine in Sport |
| International Review of Sport and Exercise Psychology |
| Sports Coaching Review |
| The Sport Psychologist |
| Coaching: An International Journal of Theory, Research and Practice |
| Journal of Strength and Conditioning Research |
| Sport Sciences for Health |
| Qualitative Research in Sport, Exercise and Health |
| Scandinavian Journal of Medicine and Science in Sports |

Table 2 – Year of publication of studies.

| Year of publication | Number of studies | Studies (%) | Yearly Mean |
|---|---|---|---|
| 1978-1982 | 1 | 0.5 | 0.2 |
| 1983-1987 | 3 | 1.4 | 0.6 |
| 1988-1992 | 5 | 2.4 | 1 |
| 1993-1997 | 3 | 1.4 | 0.6 |
| 1998-2002 | 12 | 5.8 | 2.4 |
| 2003-2007 | 23 | 11.1 | 4.6 |
| 2008-2012 | 73 | 35.1 | 14.6 |
| 2013-2017 | 88 | 42.3 | 17.6 |
| Total | 208 | 100 | 5.8 |

1323 Table 3 – Research design of studies.

| Research design | Number of studies |
|---|---|
| Quantitative | 54 |
| Qualitative | 23 |
| Quantitative (cross-sectional) | 56 |
| Mixed-method | 4 |
| Quantitative (correlational) | 15 |
| Multi-method (observational, cross-sectional) | 1 |
| Multi-method (quantitative, cross-sectional) | 4 |
| Quantitative (longitudinal) | 14 |
| Multi-method (longitudinal, quantitative) | 2 |
| Multi-method (quantitative) | 9 |
| Multi-method (qualitative) | 3 |
| Multi-method (quantitative, cross-sectional, longitudinal) | 1 |
| Quantitative (prospective) | 5 |
| Mixed-method (observational single group) | 1 |
| Qualitative (cross-case) | 1 |
| Multi-method (quantitative, randomised controlled trial) | 1 |
| Quantitative (non-experimental) | 1 |
| Multi-method (experimental longitudinal, quantitative) | 1 |
| quantitative (correlational, multivariate) | 1 |
| Quantitative (time-lagged) | 2 |
| Quantitative (field correlational) | 1 |
| Quantitative (longitudinal, correlational) | 2 |
| Qualitative (case study narrative) | 1 |
| Qualitative (case study) | 1 |
| Qualitative (diary) | 1 |
| Quantitative (correlational, prospective) | 1 |
| Quantitative (cross-sectional, correlational) | 1 |
| Quantitative (prospective, longitudinal) | 1 |
| Total | 208 |

Table 4 – Research method adopted within studies.

| Research method | Number of studies |
|---|---|
| Questionnaire | 167 |
| Independent-rater observation | 1 |
| Observation | 18 |
| State space grid | 1 |
| Physiological measures | 5 |
| Coach ratings | 2 |
| Interview | 28 |
| Field notes | 1 |
| Competition performance data | 13 |
| Focus group | 3 |
| Narrative ethnography | 2 |
| Autoethnography | 3 |
| Memory writing | 1 |
| Historiometric analysis | 1 |
| Psychological tasks | 1 |
| Literary resource analysis | 1 |
| Drawing exercise & photography | 1 |
| Total | 249 |

The total equals 249 because some studies adopted more than one research method.

1339 Table 5 – Perspectives acknowledged within studies.

| Perspective | Number of studies |
|---|---|
| Athletes | 187 |
| Coaches | 33 |
| Observers/independent raters | 14 |
| Researchers | 13 |
| National Governing Bodies | 2 |
| Sport Psychology Consultants | 1 |
| Total | 250 |

1340 The total equals 250 because some studies acknowledged more than one perspective.

1341

1342

1343

1344