

Examining the Relationships Between Coaching Practice and Athlete

‘Outcomes’: A Systematic Review and Critical Realist Critique

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

22

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

24

25

Introduction

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

37 Jones, Edwards, and Viotto Filho (2016) suggest the coach’s primary purpose is to
38 support athlete learning and performance enhancement. Yet, coaches have been found to
39 frame their roles in nuanced ways (Gilbert & Trudel, 2004b), and to focus only on learning
40 and performance would ignore a wider range of physical and psychosocial implications of
41 coaching (Mallett & Rynne, 2010). Indeed, one of the most prominent conceptualisations in
42 this regard suggests that coaches should purposefully pursue a broader range of athlete
43 outcomes, which can be considered ‘variations in athletes’ attitudes, behaviors, or
44 performance’ (Côté & Gilbert, 2009, p. 309). Specifically, Côté and Gilbert (2009) advocated
45 maximising athletes’ competence, confidence, connection and character. This lack of clarity
46 concerning the scope and variety of implications claimed of coaching underlines the often ill-
47 defined roles of the sport coach in society (Gilbert, Gilbert, & Trudel, 2001; Morgan & Bush,
48 2016) and the need for research that deals directly with the impact coaches have on their
49 participants.

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

55 limits the ability of (a) researchers to set research agendas and situate their work in
56 the larger context of coaching science, (b) coaches to access and realize the
57 potential of coaching research, and (c) coach educators to integrate the full scope
58 of coaching research into coach education programs. (Gilbert & Trudel, 2004a, p.
59 388).

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

68 A lack of connection between coaching practice and athlete outcomes remains a
69 prevalent issue within contemporary coaching literature (Lyle, 2018). Although North’s
70 (2017) critical realist critique of coaching science literature presented a potentially valuable
71 framework for interdisciplinary thinking and research with scope to advance the field, it
72 reviewed broad coaching literature (i.e., not solely dedicated to relationships between
73 coaching practice and athlete outcomes), was largely focused on coaching practice, and was
74 presented at a certain level of abstraction. Conceptualisation of the connections between
75 coaching practice and athlete outcomes, and consideration of how this domain can be
76 advanced, is important because the dearth of such work places a significant restraint on our

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

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

98 Method

99 Purpose and Function

100 Bennie et al. (2017) suggested that as coaching science research continues to expand
101 rigorous reviews are required to comprehend and bring meaning to the ever increasing
102 database of material. In order to access and refine the breadth of relevant literature now
103 presented in sport coaching a systematic search protocol was adopted in line with Preferred
104 Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA; Moher, Liberati,
105 Tetzlaff, & Altman, 2009). However, in order to understand the state of current literature and
106 its consequent implications for knowledge, rather than exclude research based upon pre-
107 determined positivist notions of methodological quality (i.e., to synthesise the statistical
108 evidence-base and provide recommendations for direct intervention - e.g., Brown & Fletcher,
109 2017), studies employing a wide range of approaches (e.g., quantitative, qualitative and
110 mixed-method) were included. Thus, conventions were followed for the integration of a
111 diverse body of work into systematic review methodology (e.g., Mays, Pope, & Popay,
112 2005), which is introduced in greater detail within the succeeding sections.

113 **Sources and Search Strategy**

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

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

126 [Insert Table 1 about here]

127 **Inclusion and Exclusion Criteria**

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

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

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

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

149 Contrasting with orthodox systematic review protocols (e.g., Allegranzi et al., 2011;
150 Free et al., 2013), and as alluded to earlier given the aims of the study, research was not
151 excluded on grounds of positivist notions of methodological rigour or methods used. Instead,
152 the main focus was on identifying research most pertinent to the central questions of the
153 review (Biddle, Wang, Kavussanu, & Spray, 2003). Borrowing directly from the work of
154 Pawson (2006), careful consideration was given to the relevance of research included; the key
155 question posed was is this study good enough to provide *some evidence* that will contribute to
156 the review? Consequently, the worth of each study was examined throughout the review
157 process, not determined beforehand. A key advantage of this approach, in contrast to the
158 strict methodological doctrine guiding some reviews (e.g., Free et al., 2013), was that it
159 permitted the inclusion of ‘trustworthy nuggets of information’ which responded to the aim
160 of the review, even if the studies were ‘technically deficient in some overall sense’ (Pawson,
161 2006, p. 90). For example, studies were included even if they had poorly interpreted results or
162 made unwarranted inferences, but nonetheless presented data which were relevant to
163 addressing the research questions.

164 **Sifting Process**

165 2609 articles from databases and 4772 articles from empirical journals were returned
166 (total $n = 7381$). After removing duplicate papers, 7107 articles remained and were taken
167 forward to stage 1 of the sifting process. Figure 1 depicts an overview of the full sifting
168 process, conducted in line with PRISMA guidelines (Moher et al., 2009), by stage. Studies
169 were assessed for relevance to the review in three stages, as recommended by Rumbold,
170 Fletcher, and Daniels (2012) and Weiler, Mechelen, Fuller, and Verhagen (2016). In

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

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

181 After stage 1, 4810 studies were excluded (see Figure 1). Subsequently, abstracts of
182 remaining articles were read and a further 1564 studies were removed (stage 2). Relevant
183 review paper reference lists were then searched to include any additional papers which met
184 the inclusion criteria at this stage ($n = 44$). Stage 3 involved reading through the full-texts of
185 articles to assess suitability for the review; 575 articles were removed at this stage. 202¹
186 articles remained after the full sifting process was completed. These were included in the data
187 extraction process.

188 [Insert Figure 1 about here]

189 **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.

190 Procedures for data extraction were adapted from similar reviews conducted within
191 the field of sport and physical activity (e.g., Park, Lavalley, & Tod, 2013; Sallis, Prochaska,
192 & Taylor, 2000). Detailed coding systems were designed to extract data related to: (a) the
193 paradigmatic, theoretical and methodological approaches utilised; (b) sample characteristics;
194 and (c) athlete outcomes impacted in some way by coaching practice². Wherever possible, a
195 form of coding was adopted where data were extracted and recorded in the same manner in
196 which it was originally reported.

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

211 Data analysis was carried out by the first author drawing on concepts of thematic and
212 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.

213 Surr et al., 2017), which are compatible with systematic search protocols (Thomas & Harden,
214 2008) and provide knowledge support (Mays et al., 2005). Specifically, this involved a
215 critical analysis of papers, both as individual entities, and in light of other included papers,
216 through thematic and conceptual comparison (Kangasniemi, Kallio, & Pietilä, 2014),
217 generating clear trends to be critically appraised through critical realist critique. Importantly,
218 these concepts from CIS permitted the incorporation of literature conducted from different
219 disciplinary positions and with varied research methods (Dixon-Woods et al., 2006b). The
220 product of the synthesis was not simply a neutral, objective accumulation of data. Instead, the
221 first author developed a critical realist reading of the findings, which is presented in the
222 *Results and Discussion*. This involved carefully considering predominant themes evident in
223 papers retrieved (e.g., the methodological approaches selected), in order to propose a
224 potential framework for advances to knowledge (Dixon-Woods et al., 2006b), again, aligning
225 with the vision of the present paper to inform future research, coaching practice and coach
226 education.

227 **An Introduction to Critical Realism**

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

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

262 Making such assertions regarding the world and our knowledge of it requires deeper
263 exploration of how we view its makeup. For Bhaskar (1975), the world is made up of three
264 layers, which represent *ontological depth*. These layers comprise the *empirical* (i.e., events
265 that are observed and experienced), the *actual* and the *real* (i.e., which consist of events, and
266 objects or structures causally interacting to produce these events, respectively). This stratified
267 view of ontology implies that everyday observable or experienced events (e.g., coaching
268 actions or responses) are caused by an underlying reality which is not directly understandable
269 to us through the events themselves or our observations or experiences of them (Bhaskar,
270 2011). Real objects and structures are seen to have causal powers or liabilities, and the
271 activation of these (through what is known as mechanisms) occurs at the level of the actual to
272 constitute events, but our experiences and observation of events exists only at the empirical
273 level (Archer, 2007). Causal forces (powers and liabilities) can only be understood through
274 their effects and in the social world many causal forces interact simultaneously, meaning they
275 are unable to be simply reduced to objects or structures at a lower level. These forces instead
276 interact in an *emergent* and relational fashion making the task of understanding events and
277 their underpinning causal properties incredibly complex (Elder-Vass, 2010). In more clearly
278 defining the notion of emergence, events cannot be understood as being simply the sum of
279 their parts. Instead, ‘it is the way that a set of parts is related to each other at a given point in
280 time that determines the joint effect they have on the world at that moment’ (Elder-Vass, p.
281 23). This process of interaction between the parts is also commonly referred to as the
282 ‘mechanism’.

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

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

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

307 **Results and Discussion**

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

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

312 **Publication Timeline**

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

319 [Insert Table 2 about here]

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

332 **Paradigms**

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

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

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

365 A small number of papers in the present review explicitly claimed to fall within an
366 interpretivist paradigm, viewing the world as socially constructed (e.g., Gearity & Murray,
367 2011; Light & Robert, 2010; McCalpin, Evans, & Côté, 2017). In response to the limitations
368 of positivism, interpretivist-informed researchers have argued that their paradigm is better
369 positioned to investigate the nuanced and complex nature of coaching due to its subjectivist
370 epistemology (Potrac, Jones, & Nelson, 2014). Valuably, interpretivism has progressed our
371 understanding of the lived experiences of both coaches and athletes in relation to how they
372 take meaning from coaching practice (e.g., Gearity & Murray, 2011). Rather than seeking
373 law-like regularities, this paradigm has strengthened our grasp of how athletes perceive and
374 may be *influenced* by coaching practice, through ongoing sense making. As such,
375 interpretivism has illuminated some of the ironies, complexities and tensions which must be
376 navigated as an inherent feature of coaching (Jones & Wallace, 2005). However, some
377 cognitivist informed researchers have suggested that these (predominantly sociological)
378 approaches place too heavy an emphasis on complexity, advocating instead the simplicity and
379 structure of models to encapsulate the core process of coaching (Abraham & Collins, 2011;
380 Lyle, 2007).

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

383 2014), because they do not consider ontology and individual epistemological beliefs to be
384 able to exist separately, they reject the idea that it is possible to move beyond observation or
385 experience of events (O'Mahoney & Vincent, 2014). As a result, tensions between relations
386 of structure and agency are present within constructivism (Klotz, 2001) and the extent to
387 which one or the other of these factors play a role in determining action remains a topic of
388 prominent debate (Purdy & Jones, 2011). This often polarised debate, has led to a lack of
389 research that connects the micro, meso and macro in the coaching process. Indeed, there
390 remains a need to pay attention to 'the detail of coaching practice, the forces that shape
391 coaching practice and the interconnections that run between them' (Cushion, 2007, p. 399).
392 Here, as is further argued, CR offers one potential avenue to explore how coaching practice is
393 embedded within, shapes, and is shaped by its broader context. For instance, Elder-Vass
394 (2007) suggested that we should account for both structural influences (i.e., through habitus),
395 and conscious agency or agential reflexivity when understanding the determination of human
396 action. In other words, human action should be viewed as the outcome of 'a continuous
397 interaction between dispositions and reflexivity' (Elder-Vass, 2007, p. 325). It is important to
398 acknowledge that this is only one conception of structure-agency relations and that other
399 accounts of such interaction are available (e.g., Archer, 2003; Bourdieu & Wacquant, 1992;
400 Crossley, 2001).

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

408 are able to distinguish reality from our knowledge of it, meaning explanatory or complex
409 causal accounts are severely restricted. CR, on the other hand, is able to distinguish
410 ontological realism from epistemic relativism and as such provides us with a basis to
411 understand the causal and explanatory mechanisms which underpin the how, when, why, and
412 under which circumstances coaching practice is related to athlete outcomes through
413 retroduction³. Importantly, what should be remembered here, is that prevailing paradigms in
414 this area (i.e., positivism and interpretivism) provide useful, albeit limited contributions to
415 such stratified causal explanation from a CR standpoint (Pawson, 2006).

416 Frustratingly, many studies in this review (e.g., Claringbould, Knoppers, & Jacobs,
417 2015), failed to acknowledge explicitly their underpinning paradigm, leaving ontological and
418 epistemological uncertainty. It is recommended that authors explicitly acknowledge and
419 consider the philosophical and paradigmatic assumptions underpinning their research. This
420 would aid interpretation by other researchers, as well as promote interdisciplinarity and
421 permeations across traditional boundaries (North, 2013b). Specifically, it would allow more
422 rigorous assessment of the quality of research according to its underlying ontological and
423 epistemological assumptions. Moreover, when considered alongside research design, it would
424 enable enhanced understanding of the scope and ability of the research to, for example, be
425 generalised, or to problematise through rich description.

426 **Research Design**

427 In line with other reviews of coaching literature (e.g., Gilbert & Trudel, 2004a), the
428 largest proportion of research ($n = 173$, 83.2%) was conducted using a quantitative approach
429 (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).

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

433 [Insert Table 3 about here]

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

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

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

457 **Methods**

458 The most frequently used research method was questionnaires, followed by interviews
459 and observation, with 17 different research methods being utilised in total (see Table 4). A
460 substantial proportion of papers used a single method design ($n = 174$, 83.7%). Studies
461 employing this approach have tended to use questionnaires to assess perceptions of coaching
462 practice as well as perceptions of athlete outcomes, before investigating the relationship
463 between these variables (e.g., Goudas, 1998; Price & Weiss, 2013). In implementing
464 questionnaires at one static time point (e.g., the end of the session) research of this nature has
465 often negated the *temporal* dimension (and by extension the influence of other variables)
466 surrounding the development of athlete outcomes. For instance, athletes' interpretations of
467 variables were likely to have changed throughout different time points in a session, rendering
468 the static time point measurement of somewhat restricted value. Only 34 (16.3%) papers
469 approached their research questions using more than one research method. The most frequent
470 combinations of methods were questionnaire and competition performance data ($n = 8$,
471 3.8%), questionnaire and observation ($n = 7$, 3.4%), questionnaire and physiological
472 measures ($n = 3$, 1.4%), and observation and interview ($n = 3$, 1.4%). These findings are
473 again consistent with broader coaching science reviews (e.g., Gilbert and Trudel, 2004a),
474 which reported that the largest percentage of coaching research had utilised a single-method
475 approach, mainly questionnaires.

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

478 need to approach phenomena through different methods (Bhaskar, 1975). This does not,
479 however, mean that any method can be applied uncritically to any question, or object of
480 study. ‘There should be congruence between the object of study, the assumptions about
481 society and the conceptions of how knowledge is possible, and one’s choice of design and
482 method’ (Danermark et al., 1997, p. 150). As the social world necessitates understanding of
483 open systems, ontological depth, facts as being theory-laden, and emergent powers
484 (according to CR), this clearly has implications for methodological choices (Danermark et al.,
485 1997). As such, the use of more intensive research designs (studying mechanisms in depth, as
486 opposed to patterns), using ethnographic research, including interviews with multiple
487 stakeholders and participant observation, has been argued to be best positioned to generate
488 causal theory within the sport coaching environment (North, 2017). Furthermore, given
489 actions can have an immediate impact on outcomes, but generally coaching will influence
490 athletes in a *sedimentary* way (i.e., in the longer-term; Sayer, 2000), the use of more
491 longitudinal data collection is needed to account for this. Making use of more sophisticated
492 methodologies would provide an added layer of understanding to research, which until now
493 has widely considered relationships between coaching practice and outcomes to be simple,
494 unidirectional and homogeneous.

495 [Insert Table 4 about here]

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

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

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

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

528 Scholars who continue to identify with the positivist paradigm could look to utilise
529 experimental or randomised control trial studies (with sophisticated methods to capture
530 outcomes) in order to explore the effectiveness of coaching interventions and understand
531 which direction causally inferred relationships are operating, recognising their often limited
532 external validity or generalisability (Black, 1996). Those researching from an interpretivist
533 standpoint should aim to generate deeper and more comprehensive *in situ* meaning (e.g.,
534 ethnographies of practice incorporating multiple methods). Arguably, such work would help
535 in contributing toward our (causal explanatory) understanding of sport coaching and its
536 influence on athletes, when included and drawn upon in further interdisciplinary work (North,
537 2017).

538 **Sports and Perspectives**

539 Representative of wider coaching literature (Cope et al., 2016; Cushion & Jones,
540 2006; Partington & Cushion, 2013; Potrac, Jones, & Cushion, 2007) the most prevalent sport
541 identified within articles pertaining to coaching practice and athlete outcomes was association
542 football (soccer) ($n = 91$ studies). Other more popular sports within studies were basketball
543 ($n = 61$ studies), swimming ($n = 40$ studies), volleyball ($n = 38$ studies), track and field ($n =$
544 31 studies), and tennis ($n = 24$ studies). In total, studies investigating the relationships
545 between naturalistic coaching practice and athlete outcomes encompassed 72 different sports.
546 It was not possible to synthesise the competitive level observed within studies, as there were
547 too many derivatives and too wide a lexicon of terms to be able to interpret cross-continental
548 equivalents. It is important that research is conducted in different contexts given, for
549 example, that preferences for coach behaviour have been found to differ between individual
550 and team sport athletes (Baker, Yardley, & Côté, 2003). Indeed, there is still clearly a need to
551 situate research in a more diverse range of sporting contexts to aid the dissemination and
552 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

577 other relevant stakeholders). Aligned more closely to 360-degree feedback processes, this has
578 been argued to be a superior approach to managing and evaluating coaching practice and
579 relations to outcomes (O’Boyle, 2014). As Bhaskar (2015) posited, however, a central feature
580 of CR is that claims to truth are resolved and compared through discussion and debate that
581 seeks, on a rational basis, to identify those findings or beliefs that appear to be truthful. While
582 acknowledging that human knowledge is socially produced, CR attempts to find the truth,
583 avoiding the view that all beliefs are always of equal truth value (Clark et al., 2007).
584 Therefore, depending upon the mode of reality being investigated, an inclusion of multiple
585 perspectives when generating causal theory must be grounded in terms of *judgmental*
586 *rationality* (i.e., evaluating whether theory can be justified on the basis of evidence available
587 to us, and if it is capable of explaining phenomena better than competing theories; North,
588 2017). It is also important to consider the practical adequacy and application to contexts
589 studied, as well as how enduring the theory is.

590 **Coaching Practice-Athlete Outcome Relationships**

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

597 from more to less popular themes), with examples of studies to illustrate findings⁴, in order to
598 inform future research directions.

599 Athlete motivation, encompassing autonomy-supportive practice, controlling
600 coaching or the motivational climate, has been the major focus of research to date. Typically,
601 studies have promoted the use of autonomy-supportive practice (i.e., permitting athlete
602 choice, empowerment and allowing learning to take place from mistakes independently), and
603 advised against controlling forms of coaching, in order to satisfy athletes' basic psychological
604 needs and instil more self-determined forms of motivation (Almagro, Sáenz-López, Moreno-
605 Murcia, & Spray, 2015; Amorose & Anderson-Butcher, 2015; Hein & Jöesaar, 2015; Pope &
606 Wilson, 2012; Reynolds & McDonough, 2015; Sheldon & Watson, 2011). These findings are
607 consistent with Vella and Perlman's (2014) review of common approaches to coaching which
608 presents a similar relationship between autonomy-support, basic psychological needs and
609 intrinsic or autonomous motivation. A proportionately small number of studies in the present
610 review reported conflicting findings, however. For example, Smith et al. (2016) noted a
611 negative relationship between coach perceived dimensions of autonomy support and athletes'
612 autonomous motivation, which was attributed to a possible misjudgement of the environment
613 coaches presumed they created. Studies interested in the motivational climate, have also
614 generally promoted task-oriented environments rather than ego-oriented environments
615 (Reinboth & Duda, 2006; Smith et al., 2016). Coaching practice aligned with autonomy
616 support and task mastery has been broadly related to fostering outcomes of increased well-
617 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.

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

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

630 A number of papers investigated the relationship between coaching practice and self-
631 esteem, self-confidence or self-efficacy. Again, demonstrating the dominance of such topics
632 within the literature, autonomy support and coach involvement was reported to predict self-
633 esteem (e.g., Gagne, 2003), with this relationship often being mediated through athletes'
634 feelings of competence (Coatsworth & Conroy, 2009). Change-oriented feedback quality and
635 quantity were also found to be common predictors of self-esteem (e.g., Carpentier & Mageau,
636 2013). Further, White and Bennie (2015) linked enhanced self-efficacy to coaches' use of
637 constructive feedback on skill technique in gymnasts. In contrast to these positive
638 relationships, Nordin-Bates, Quested, Walker, and Redding (2012) found fluctuations in the
639 perceived motivational climate did not predict changes in self-esteem. Reinboth and Duda
640 (2004) did report perceptions of ability to play a role in this relationship, however; reported
641 self-esteem was found to be lowest among low perceived ability athletes when encountering

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

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

658 Autonomy-support from the coach was again a predominant theme within the
659 performance category, implying that higher levels of autonomy-support promotes enhanced
660 athlete performance, both in terms of match outcome (e.g., Cheon, Reeve, Lee, & Lee, 2015)
661 and more acute measures (e.g., Gillet, Vallerand, Amoura, & Baldes, 2010; Pope & Wilson,
662 2015). A small pool of papers has, more recently, investigated the complex impact of
663 coaching practice on immediate performance within sessions or matches. For instance, as
664 earlier introduced Mouchet et al. (2014) video recorded coaching practice and performance
665 within a full rugby match, alongside semi-structured and explication interviews with coaches,
666 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

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

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

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

717 not causally influence), or be exercised unrealised (e.g., be present but go unnoticed; Archer,
718 1998). Drawing attention to, and apprehending the complex nature of the influence of
719 coaching practice in this way could help practitioners to more effectively anticipate,
720 understand and reflect upon the influence of their actions.

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

735 Critical realist research could support the generation of emergent representations of
736 coaching by acknowledging a multi-layered, laminated ontology of sport coaching (North,
737 2017). Using intensive methodology and retroductive analysis, understanding of the causal
738 mechanisms which underpin the influence of coaching practice could be achieved. Typical
739 questions may look like: 'how does mechanism M, when enacted by agent A, tend to alter
740 outcome O?' (Brannan et al., 2017, p. 27). Following such frameworks to research would
741 provide more authentic, relevant and critical perspectives for coaches and coach educators, as

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

748 **Peripheral Excluded Papers**

749 Many papers fell just outside of the inclusion criteria. It is the intention of the
750 following section to describe the nature of such papers in order to provide a scope of the
751 wider literature within this area. Primarily, papers were excluded because they were non-
752 naturalistic; in many studies the researcher had manipulated the coaching practice carried out,
753 to observe the subsequent impact on the athlete outcomes of interest (e.g., Hodges & Lee,
754 1999; More & Franks, 1996). Such approaches negate wide calls within coaching literature
755 for academics to ‘better illustrate the coaching process in terms of remaining true to its
756 dynamic, complex, messy reality’ (Cushion et al., 2006, p. 84).

757 A large number of papers, which examined the impact of small-sided games were
758 excluded. Typically, these studies did not involve the coach, and the researcher constrained
759 the small-sided game conditions to assess the impact on physiological or technical outcomes
760 (e.g., Bennett et al., 2016; Torres-Ronda et al., 2015; Travassos, Vilar, Araújo, & McGarry,
761 2014). Where studies did involve coaches the researcher generally constrained the manner in
762 which they could operate (i.e., no feedback or encouragement was permitted) in order to
763 avoid confounding the results (e.g., Silva et al., 2014). The impact of naturally occurring
764 coaching practice should be the focus of empirical research, not a feature that is controlled so
765 as to mitigate its extraneous impact on data collected. Studies would then be able to provide

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

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

777 **Limitations**

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

787 **Conclusion**

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

803 The lack of research addressing these questions perhaps helps to explain why, even
804 with increased research attention in the field, there has been little apparent impact on
805 coaching practice or coach education (Lyle & Cushion, 2010). Further work investigating
806 their influence would help to address the need for a more clearly defined purpose and social
807 function of the coach (Duffy et al., 2011). CR provides one avenue through which research
808 could extend beyond *knowledge for understanding* in order to also pursue *causal explanatory*
809 *knowledge*. Such knowledge is arguably well positioned to help practitioners in reflecting
810 upon their own contextual circumstances, as part of research-informed training and
811 education, in an attempt to emancipate their ability to positively influence athletes (Bhaskar,
812 2015). An increase in the number of studies conducted alone will not necessarily result in

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

815 Accordingly, there is a distinct need for research to focus on the more holistic
816 connections between the micro-, meso- and macro-structure of coaching practice, without
817 treating athletes as a homogenous entity. In other words, research should acknowledge that
818 experiences and outcomes of coaching will be nuanced and shaped by intricate networks of
819 emergent (causal) relations and interactions, between higher- and lower-order ontological
820 entities. Indeed, conducting the critique as part of the present paper stimulated an important
821 question to be further considered: is the notion of ‘outcomes’ or ‘outputs’ of coaching
822 suitable to explain the realities of how coaching works. As a result of the present review, we
823 suggest not. Coaching concerns a constant (emergent) interaction between structure, agency,
824 and other entities (e.g., material things) whereby coaching practice and its *influence(s)* are
825 temporally shaped by previous (inter)action, and shape subsequent (inter)action (Elder-Vass,
826 2010). Perhaps then, a fruitful line of inquiry into the emergent, relational *influence* of
827 coaching practice could build upon and extend a small pool of research which, rather than
828 looking for snapshot ‘outputs’ of coaching (as seen in studies retrieved within the present
829 paper), has instead critically explored how coaches and athletes act in the light of both social
830 structure and their conscious capacity to act as agents, and of how this changes (or not; and
831 why) over time (e.g., Cushion & Jones, 2006; Cushion & Jones, 2014; Purdy, Potrac, &
832 Jones, 2008).

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

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

846 **Acknowledgements**

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

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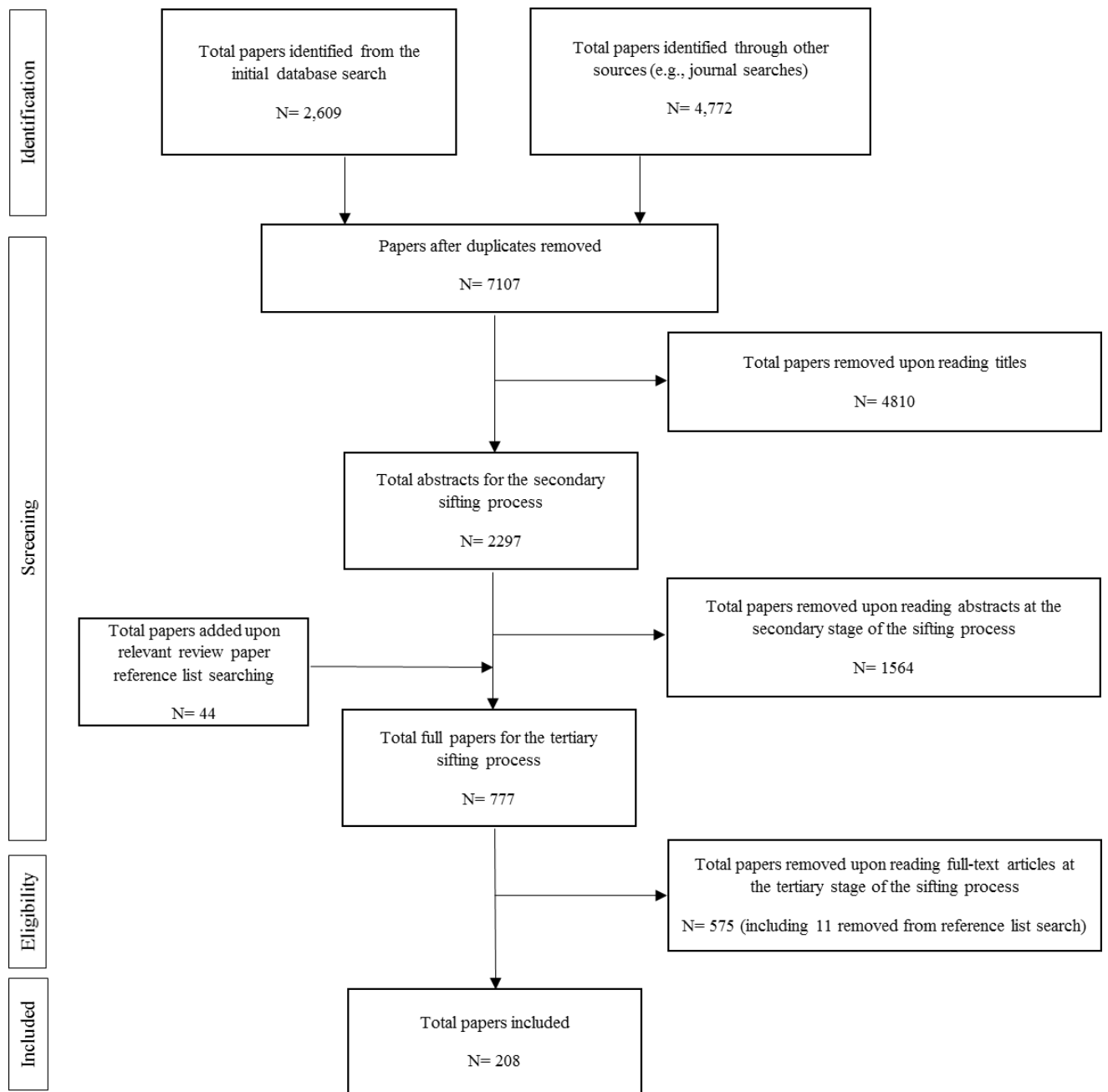
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1290 Figure 1 – PRISMA flow diagram.

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1297 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

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1303 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

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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

1324 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

1325 The total equals 249 because some studies adopted more than one research method.

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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.

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