

Exploring sport coaches' experiences of using a contemporary pedagogical approach to coaching: An international perspective

STONE, Joseph <<http://orcid.org/0000-0002-9861-4443>>, ROTHWELL, Martyn <<http://orcid.org/0000-0002-3545-0066>>, SHUTTLEWORTH, Richard and DAVIDS, Keith <<http://orcid.org/0000-0003-1398-6123>>

Available from Sheffield Hallam University Research Archive (SHURA) at:

<http://shura.shu.ac.uk/26142/>

This document is the author deposited version. You are advised to consult the publisher's version if you wish to cite from it.

Published version

STONE, Joseph, ROTHWELL, Martyn, SHUTTLEWORTH, Richard and DAVIDS, Keith (2020). Exploring sport coaches' experiences of using a contemporary pedagogical approach to coaching: An international perspective. *Qualitative Research in Sport, Exercise and Health*.

Copyright and re-use policy

See <http://shura.shu.ac.uk/information.html>

1 **Exploring sport coaches' experiences of using a contemporary pedagogical**
2 **approach to coaching: An international perspective**

3

4

5

6 Stone, J.A¹., Rothwell, M¹., Shuttleworth, R¹., & Davids, K.¹

7

8

9

10 ¹Sport and Physical Activity Research Centre, Department of Sport and Physical Activity,
11 Sheffield Hallam University, UK.

12

13

14

15 Correspondence concerning this article should be addressed to Joseph Stone, A213, Sheffield
16 Hallam University, Collegiate Hall, Collegiate Crescent, Sheffield, S10 2BP. E-mail:
17 Joseph.stone@shu.ac.uk

18

19

20

21

22

23

24

25

26

27

28

29

30

31 **Exploring sport coaches' experiences of using a contemporary pedagogical**
32 **approach to coaching: An international perspective**

33

34 Nonlinear contemporary coaching approaches are becoming more prominent in academic
35 research, although there is still limited take-up by sport practitioners. Research has
36 investigated why coaches continue to use *traditional* reproductive pedagogical approaches.
37 However, there is limited understanding of insights and experiences of sport coaches who
38 have switched to contemporary approaches in practice. This study aimed to: (i) explore
39 insights of coaches who are adopting contemporary approaches to understand why they
40 eschewed more traditional approaches, and (ii), gain information on their experiences when
41 implementing these contemporary approaches into their practice. To address these aims
42 fifteen, experienced professional individual and team sports coaches from a range of
43 countries (i.e. Australia, Netherlands, Portugal, Sweden, UK, USA), were interviewed.
44 Thematic analysis revealed 59 lower-order themes and 10 higher-order themes, organised
45 into 3 dimensions; (i) factors underpinning the coaches' approach to athlete learning; (ii)
46 learning approaches; and (iii), responses to contemporary pedagogical approaches. Coaches
47 reported a typical culture of traditional methods of learning within their sports, which they
48 believed were not effective in developing athlete performance. Hence, they elected to adopt a
49 contemporary non-linear, individualised, adaptive approach, emphasising representative
50 learning designs. Results suggested that typical reactions to this approach included resistance
51 from stakeholders. However, coaches continued to use this approach and expressed the
52 importance of effective communication with stakeholders to enable acceptance of the
53 contemporary approaches of learning. Findings suggest how continued integration between
54 experiential and empirical knowledge of practitioners may increase the acceptance of
55 contemporary pedagogical approaches, facilitating acceptance of new approaches to learning.

56

57 **Introduction**

58 Sport coaching is traditionally guided by a reproductive, coach-led approach (Piggott 2015).
 59 This perception of athlete learning has traditionally been characterised by highly structured
 60 teaching with demonstration of techniques, copious verbal instructions with corrective
 61 feedback, and repetitive attempts to reproduce coach-prescribed movement templates during
 62 drills designed in isolation from information in the performance environment (Davids et al.
 63 2017). Traditional approaches to coaching have faced criticisms for the limited impact on
 64 learning due to limitations of linear learning theories (e.g., the power law of learning), the
 65 individuality of emergent movement behaviours, and the inherent non-linearity of the
 66 learning process (Newell, 1991; Araújo et al. 2010; Chow et al. 2016). Hence, alternative
 67 contemporary approaches to learning design have been proposed and utilised which
 68 encourage a more athlete-centred, non-linear perspective on athlete learning and development
 69 in sub-elite and elite sports organisations (e.g., Chow et al. 2011; Correia et al. 2019; Clark,
 70 McEwan, and Christie 2019; Fitzpatrick, Davids, and Stone 2018; McKay and O’Connor
 71 2018; Woods et al. 2019, Browne et al. 2019).

72 One contemporary nonlinear approach conceptualises athletes as complex adaptive
 73 systems (Renshaw et al. 2019), guided by the theoretical framework of ecological dynamics,
 74 highlighting the importance of complex, dynamic interactions in person-environment
 75 relationships (Handford et al. 1997). Renshaw et al. (2019) proposed a nonlinear model of
 76 motor learning, such as a constraints-led approach, which views mind, body, and the
 77 environment as continuously influencing each other to shape behaviour. The constraint-led
 78 approach promotes the understanding of how goal-directed behaviour can emerge as a
 79 consequence of attempting to satisfy the interacting constraints (task, environment, and
 80 performer) in a learning or performance situation (see Renshaw et al. 2019). The constraints
 81 of the learning environment shape the affordances (opportunities or invitations for action)

CONTEMPORARY PEDAGOGICAL APPROACHES TO COACHING

82 (Gibson 1979) available in a performance landscape for athletes (see Kiverstein, van Dijk,
83 and Rietveld 2019 for a discussion on affordance landscapes). However, a constraints-led
84 approach only promotes the understanding of how skills are acquired from a motor learning
85 domain and does not provide a framework for designing motor learning programs (Chow
86 2013). Nonlinear pedagogy (NLP) can advance the constraints-led approach providing an
87 approach to learning that has underpinning pedagogical principles to support athlete
88 development as complex adaptive systems (Chow et al. 2011). NLP emphasises the need to
89 design representative and facilitative learning environments, guided by key principles of
90 information-movement coupling, manipulation of constraints, leveraging functional
91 variability, and reduction of conscious control of movement (i.e. external focus of attention)
92 (see Chow 2013 for detailed overview of NPL).

93 The less predictable outcomes that emerge through the dynamic learner-environment
94 interactions within an NLP-informed pedagogical approach present considerable challenges
95 to practitioners (Chow 2013). To successfully coach using principles of NLP, requires
96 practitioners to have a clear understanding of the learning process from an ecological
97 dynamic's perspective and excellent observational and analytical skills (Butler 2014; Moy et
98 al. 2015). Current observation of practice shows that coaches of all levels still require
99 assistance in ensuring that key elements underpinning such contemporary approaches are
100 correctly considered when designing practice tasks (Renshaw et al. 2019; Slade 2015).
101 Hence, there is a bias towards continued use of traditional approaches with sport practitioners
102 struggling to use more contemporary methodologies, instead finding it easier to continue
103 using traditional methods (Denison and Avner 2011; Ross, Gupta, and Sander 2018).

104 Although nonlinear contemporary coaching approaches are becoming more prominent
105 in academic research, take-up by practitioners is still somewhat limited (Almond 2010;
106 Renshaw et al. 2019). Previous research has investigated why sport coaches continue to

107 employ these traditional coaching methods (Moy et al. 2015; Piggott 2015; Ross, Gupta, and
108 Sanders 2018), despite evidence supporting the merits of contemporary approaches (e.g.,
109 Clark, McEwan, and Christie 2019; Fitzpatrick, Davids, and Stone 2018; McCosker et al.
110 2019; McKay and O'Connor 2018; Woods et al. 2019). This appears to result in a
111 disconnection between what empirical research suggests may be a good pedagogical
112 approach, and what coaches choose to adopt to do in practice (Jones, Morgan, and Harris
113 2012). For example, coaches continue to focus on instructing athletes towards adopting “gold
114 stand movement patterns” in comparison to providing learners with opportunities to modify
115 their movement behaviours appropriately in the search for functional coordination solutions
116 (Rothwell, Stone and Davids, 2019). One way to start to address this disconnection is by
117 encouraging coaches to consider implementing contemporary theoretical driven approaches
118 which are guided by the experiential knowledge of coaches using these contemporary
119 practices, an approach used by sport scientists to provide insights into applied scientific
120 research (e.g., Phillips et al. 2014; Greenwood, Davids, and Renshaw 2014; Burnie et al.
121 2018; McCosker et al. 2019). From evaluating coaches' experiences in their work contexts, a
122 better understanding can be developed on the pragmatic constraints of coaching in different
123 performance contexts (Cooper and Allen 2018).

124 In line with a proposal (North 2013) for a more focused approach in empirical sports
125 coaching research that has a value-laden practical applicability, the aim of this study was to
126 explore insights and experiences of coaches who are adopting contemporary, theoretically-
127 driven, nonlinear pedagogical approaches. Our main aim was to provide coaches with a
128 'voice' to consider why they have adopted these contemporary methodologies, how they are
129 utilised, and the experiences they face(d) in this challenge. These insights may help to inform
130 future coach education programmes and provide practical recommendations to support other

131 coaches to critically evaluate and explore the use of nonlinear contemporary methods in their
132 practice.

133 **Method**

134 **Research Design**

135 This study was informed by our relativist ontology and constructionist epistemology, which
136 are underpinned by an interpretive paradigm (Sparkes and Smith 2016). Individual, semi-
137 structured interviews were deemed the most appropriate method for this study as they present
138 opportunities for interviewees to share their experiences of coaching and their current
139 approach to enhancing athlete learning (Sparkes and Smith 2016). The study allowed
140 interviewees to provide rich insights in describing events relevant to personal coaching
141 experiences, enabling an in-depth exploration of how their practice approach has been
142 shaped, their current coaching approaches, and the resulting experiences of utilising these
143 approaches (e.g., Jacobs, Claringbould, and Knoppers 2016; Cooper and Allen 2018).

144

145 **Interviewees**

146 Interviewees were purposefully sampled, based on the authors' prior interactions with
147 each coach via their professional network of sport coaches developed through academic
148 conferences, coach education events, and sharing of knowledge on applied practice. Each
149 coach was initially contacted via email based on their extensive coaching experience, and
150 current adoption of a contemporary model of learning to guide their coaching practice.
151 Fifteen, experienced professional sports coaches (12 males; 3 females) from a range of
152 countries (i.e. Australia, Netherlands, Portugal, Sweden, UK, USA), from individual and
153 team sports (3 Soccer, 2 Rugby Union, 2 Rugby League, 2 Swimming, 1 Figure Skating, 2
154 Volleyball, 1 Golf, 1 Field Hockey and 1 Athletics) volunteered to be interviewed.

155 To ensure anonymity of coaches, their specific roles are not outlined. However, for
156 context, interviewees ranged from working within national level sports teams, coaching

CONTEMPORARY PEDAGOGICAL APPROACHES TO COACHING

157 Olympic level athletes and being employed within professional sport organisations. The
158 sample level of coaching experience, defined temporally, at the time of the interviews, ranged
159 from 9 to 28 years. This study was approved by the host Institutional Research Ethics
160 Committee and all interviewees provided informed consent prior to their participation.

161 **Data Collection**

162 A semi-structured interview guide was developed with open-ended questions and was
163 informed by the authors' knowledge of contemporary theoretical understanding of sport
164 pedagogy (e.g. Ecological dynamics theory and NLP, Davids et al. (2017)) and applied sport
165 coaching practice. The guide enabled each interviewee to be asked the same set of core
166 questions while allowing them to lead the conversation, elaborate, and discuss their
167 experiences (Patton 2002). Prior to beginning each interview, the aims of the research study
168 were discussed, at the same time assuring confidentiality, anonymity, and the freedom to
169 withdraw at any stage. Interviews were performed either face-to-face (6), or via video call (9)
170 with the semi-structured interview framework consisting of questions exploring: (1) general
171 background/familiarisation (e.g. 'can you tell me about your current coaching role?'), (2)
172 current coaching culture within the interviewee's sport (e.g. 'can you tell me about the
173 coaching culture within your sport?'), (3) personal coaching approach (e.g. 'can you tell me
174 about the coaching methods you use?'), (4) experiences that shaped the coaches's adoption of
175 that approach (e.g. 'Why do you use these coaching methods?'), (5) experiences and insights
176 using contemporary pedagogical approaches (e.g. 'How have the athletes adapted to these
177 methods?'), and (6), recommendations for practice (e.g. 'what recommendations would you
178 give for using these approaches?'). Interview lengths ranged between 35 and 99 minutes
179 (mean 52 minutes) in length and were recorded on a digital voice recorder, being transcribed
180 verbatim, with small grammatical changes made to improve text flow.

181 182 **Data Analysis**

CONTEMPORARY PEDAGOGICAL APPROACHES TO COACHING

183 A thematic analysis was conducted due to its suitability in extracting rich descriptive
184 accounts and for identifying common themes across interviewee cases (Braun, Clarke, and
185 Weate 2016). The thematic analysis of the interview transcripts was coded in Microsoft Excel
186 (Version 16, Microsoft Cooperation, Washington, United States). Accepting that theory-free
187 knowledge cannot be achieved (Guba and Lincoln 2005), during the thematic analysis the
188 research team did not adopt an 'either or approach' with regards to adopting an inductive or
189 deductive method (i.e., deductive approach: use of structure, theory or a pre-determined
190 framework, or inductive approach: with little pre-determined structure, theory or framework).
191 Rather, a more pragmatic line was followed that included employing inductive and
192 deductive approaches (Braun, Clarke, and Weate 2016) to analyse the recorded data set as
193 outlined below.

194 In line with Braun and Clarke's (2006) framework for thematic analysis procedures,
195 the first coding stage was initially undertaken by the lead author, who read through the
196 interview transcript several times, identifying language related to the aims of the research
197 (e.g. coaches talking about adopting contemporary pedagogical approaches, how these
198 approaches were used in practice, and the outcomes of these approaches). Initial lower order
199 codes were then developed by the lead author to ascribe basic meaning to the data. For
200 example, experiences described by coaches in some cases expressed clear meaning without
201 the application of a theoretical lens to interpret (e.g. the code "Coached how they were
202 coached" was labelled to the extract "I would say the predominant way people develop
203 knowledge in athletics is still how they were coached"). In contrast, other experiences
204 coaches expressed were interpreted from a theoretical position (e.g. the code "Task
205 Constraints" was labelled to this extract "I quite often get asked by coaches in hurdles oh can
206 I have your spacings and I say things like but they are not mine, they are Dave's or Jane's
207 [referring to the athlete]. The coach here does not explicitly state they are using task

208 constraints (a theoretical term) within the dialogue, but it is reasonable to infer this from the
209 content and wider context of the interview. After all transcripts were systematically coded,
210 and the lead author had become familiar with key messages and potential trends across
211 interviewees the analysis process moved on to theme development. Conceptually similar
212 codes and corresponding raw data extracts were identified and grouped where appropriate to
213 form higher order themes (e.g. the lower order themes of: Coach-led; Perfect technique;
214 Template model; Coached how they were coached, were grouped into a higher order theme
215 of Traditional Coaching). These themes were then listed, with the relevant codes and checked
216 against original data extracts to ensure they robustly represented the titled theme. The second
217 author then acted as a critical friend in developing and refining the themes by critiquing and
218 questioning the structure and content of previously constructed themes and revising and
219 renaming if appropriate. Finally, higher order themes were organised deductively into
220 general dimensions which aimed to represent a coherent account of meaning of the data
221 aligning to the aims of the research.

222

223 **Research Quality and Rigor**

224 With the authors adopting a relativist position, we endeavoured to provide good practice in
225 qualitative research and maintain trustworthiness, accepting the view that universal criteria
226 are included in a socially-constructed list of characteristics (Smith and McGannon 2018).
227 First, purposive sampling was adopted to ensure that the most appropriate coaches were
228 recruited to fully address the research question. Methodological rigor was facilitated by
229 conducting two pilot interviews with experienced sport coaches to evaluate format flexibility
230 and sequencing of interview questions in the context of the interviewee group. Subsequently,
231 some questions were removed due to repetition and other questions reworded to enhance their
232 clarity. From a relativist perspective, the authors accept that subjectivity can influence data

233 interpretation. To encourage reflexivity on the first author's presuppositions and how they
234 may have impacted on the construction of knowledge, the second and third authors acted as
235 "critical friends" (i.e. an evaluative process of critical dialogue between co-investigators to
236 challenge interpretations made) to provide a sounding board for reflection and exploration of
237 multiple and alternative explanations for emerging data (Smith and McGannon 2018). It is
238 important to acknowledge that the personal biography of the research team was a motivation
239 for undertaking the current study. Each author has worked within academic, practical and
240 applied scientific contexts in the specific theoretical underpinning and topic area of the
241 research. Therefore, it was accepted that this prior knowledge would influence emergent
242 findings. In particular, the extensive prior work of the authors in the use of ecological
243 dynamics and nonlinear pedagogy to inform sport coaching, human movement science, and
244 motor learning research should be acknowledged. This acceptance promotes the notion that
245 the researcher need not be assumed to enter the research process with 'an empty head', but
246 rather with knowledge of the area that increases rather than compromises the theoretical
247 sensitivity for interpreting findings (Weed 2009). The authors have attempted to illustrate
248 sincerity by being transparent about their biases and motivations, challenging whether they
249 are well-suited to explore the topic of interest, and, how these factors may have played a role
250 in the methods (Tracy 2010). The final criteria that we would like this research to be judged
251 on is credibility and, in particular, thick description of the data. By providing thick
252 descriptions of the data that offer enough detail to enable readers to come to their own
253 conclusions (Smith 2017), we aim to demonstrate both the complexity, and the specificity of
254 our interpretations of the coaches' experiences (Sparkes and Smith 2014).

255

256

Results and Discussion

257

258 Thematic analysis resulted in 59 lower-order themes and 10 higher-order themes, which were
259 organised into 3 dimensions (see Table 1). The results and discussion are presented in three
260 sections, based on the dimensions constructed. First, we discuss the factors underpinning the
261 sample of coaches' approach to athlete learning. We then outline the coaches' current
262 learning approaches in their coaching practice. Finally, we explore the reactions to these
263 coaching approaches from varying stakeholders.

264

265 **Factors underpinning the coaches' approach to athlete learning**

266

267 Within the experiences underpinning the samples' approach to athlete learning, three
268 higher order themes of *traditional culture*, *outcomes of traditional approach* and *changes in*
269 *approach* emerged.

270 **Traditional culture.** The dominant learning approach employed in the coaches'
271 experiences suggest that traditional coaching practice based on coach-led, instructional
272 approaches to athlete learning, involving provision of large amounts of specific instructions,
273 repetitive technique rehearsal allied to corrective feedback, are still prevalent in many
274 coaching environments (Williams, Alder, and Bush 2015) as this golf coach outlined:

275 Quite traditional. Traditional meaning a lot of driving range practice, a lot of video
276 practice, a lot of mechanical practice, which means working on movement form with
277 internal focus of attention so to speak and well yeah basically that is the traditional
278 coaching model (Golf-Coach).

279

280 Traditional coaching was based on encouraging athletes to try and achieve a *perfect*
281 *technique* based on ideal templates and prescription as this athletics coach stated:

282 I would say the dominant culture is very much a reproduction style based around
283 technical templates, so trying to prescribe models for athletes (Athletics-Coach1).

284

285 Coaches expressed how these reproductive coaching approaches were normally adopted
286 because of 'path dependence' (Ross, Gupta & Sanders, 2018), that is, they were following
287 how they had been coached when they were athletes (Denison and Avner 2011) or because

CONTEMPORARY PEDAGOGICAL APPROACHES TO COACHING

288 coaches were mimicking ideas from more experienced coaches (Stephenson and Jowett
289 2009), as expressed here:

290 I would say the predominant way people develop knowledge in athletics is still how
291 they were coached (Athletics-Coach1).

292
293 These findings demonstrate the importance of socio-cultural traditions and norms in guiding
294 many coaches' approaches to developing athlete learning (Rothwell, Davids, and Stone
295 2018). Coaches can find it hard to disturb the status quo and implement contemporary
296 theories in practice, which results in a dominant reproductive style still being evident in
297 coaching practice (Piggott 2012; Ross, Gupta, and Sanders 2018). This point was emphasised
298 when coaches discussed their own formal coach education, which did not tend to have a great
299 influence on their current approach to developing athlete learning. For example, this
300 swimming coach did not feel the education program fully prepared him for pedagogical
301 practice:

302 Do they prepare you? No, not really, but again it can be useful information if you
303 haven't come across it in another context. So I would say that it's inadequate if you
304 want to be good but it can be a useful source of information at some point (Swimming-
305 Coach1).

306
307 The views expressed by these coaches were similar to previous reports that formal coach
308 education in many situations did not have an impact on coaching practice (Nash and Sproule
309 2009; Chesterfield, Potrac, and Jones 2010). Some programs were considered out-dated, and
310 not particularly useful for developing coaching skills to deliver effective learning (Nelson,
311 Cushion, and Potrac 2012).

312 **Outcomes of traditional approach.** Despite a traditional coaching culture being
313 dominant in their sports, coaches expressed that this approach resulted in negative outcomes
314 for their athletes:

315 My personal opinion now, is it conducive for talent development? No. I think what we
316 are hoping for there is if we get enough numbers, then we will get some that stick. So I
317 don't think it is a very efficient way of developing talent (Athletics-Coach1).

318

CONTEMPORARY PEDAGOGICAL APPROACHES TO COACHING

319 As Vaeyens et al. (2009) highlighted, “talent programs” typically fail to produce significant
320 numbers of future elite athletes, while having high levels of drop-out-rates where sport
321 organisations are searching for the “one gifted athlete” (Fraser-Thomas, Côté, and Deakin
322 2008). Coaches discussed how an approach used in elite performance preparation coaching,
323 then replicated in development pathway coaching, is not always appropriate for sub-elite or
324 youth athletes. The continued use of a traditional approach was perceived to result in athletes
325 performing too predictably in team sports:

326 You have these 11 great players who are just good players but don’t know how to solve
327 any problems in the game so when they came up against a team like *team name*
328 they’re all like looking to the bench waiting for the coach to tell them how to solve the
329 problem (Football-Coach1).

330
331 Traditional approaches resulted in performers having difficulty in solving problems during
332 performance, reducing opportunities to develop decision making as they limit each athlete’s
333 ability to explore the performance environment when performers are not able to
334 autonomously respond to competitive dynamics (Holt, Ward, and Wallhead 2006).

335 **Changes of approach.** Despite the dominant traditional approaches evident within
336 each interviewee's sport, coaches discussed how a range of experiences had led to changes to
337 their approach to athlete learning, with many coaches describing a 'penny-dropping' moment
338 where their change of approach just fell into place:

339 Those were some of the penny-dropping moments that I would get and I didn’t know
340 the word constraints, I didn’t know the words non-linear pedagogy, but re-create the
341 game, do it in context with things I was starting to learn were more beneficial than
342 doing it out of context (Field-Hockey-Coach).

343
344 These moments, which led to a ‘paradigm shift’ in approach, are likely to have been
345 supported via attending coach development sessions, some of which the authors had led or
346 attended. The coaches explained how such development events with experts in contemporary
347 coaching approaches enabled them to connect what they were doing in practice, with the
348 theoretical terminology presented in academic research. These events were supported by their

CONTEMPORARY PEDAGOGICAL APPROACHES TO COACHING

349 own research, informal education and practical experiences. This stimulation for reflection
350 and change of methodology typically emerged from outside their own sport organisation as
351 this rugby league coach expresses:

352 It wasn't until I met someone from outside the sport who made me really think about
353 that and as I said I just started to read around different practices (Rugby-League-
354 Coach2).

355
356 Evidence here, supports the view that coaches rely upon a wide range of information sources
357 to inform their coaching practice, including books, conferences, journals, the popular press,
358 and social networking sites (Bailey et al. 2018; Stoszkowski and Collins 2017) as this figure-
359 skating coach expressed:

360 I started with pop science, pop science books and after I started reading those I started to
361 dig into the science underneath those. And the more I got into it the more excited I got
362 about it and now I just I can't go like a week without reading at least one book so I think
363 that self-education has been hugely important for me (Figure-Skating-Coach).

364
365 Coaches experiences here of informal coach education, learning, and development resonated
366 with Côté's (2006) proposal that formal courses should be designed as 'cooperative learning
367 opportunities', with knowledge created and shared in context. This would remove issues with
368 a 'one-size-fits-all' approach where the coaches' own experiences can be applied to
369 educational information, underpinning their own learning approaches. Elsewhere, this
370 approach has been recognised as the integration of knowledge from empirical (applied
371 scientific) and experiential (coaches' own analyses, understanding and experiences) sources
372 (Renshaw, Davids, Newcombe & Roberts, 2019). By creating more cooperative learning
373 environments, the uptake of information from more contemporary theoretical models of
374 learning could be more likely as coaches co-create their own knowledge, applying it to their
375 own context and practice designs.

376 **Learning approaches**

377
378 In the dimension of learning approaches, higher order themes *of holistic non-linearity*
379 *development, a movement outcome focus, coaches as environmental designers and athlete*

380 *ownership via instruction and feedback* were identified. The coaches' accounts highlighted
 381 how contemporary nonlinear approaches can be implemented into practical applied settings.
 382 Many approaches outlined by the coaches were aligned to the theoretical conceptualisation of
 383 ecological dynamics, either through explicit reference by the coaches to core elements of the
 384 theory in their practice or more implicit expression on their guiding practice which were
 385 interpreted by the authors as aligning with the principles of ecological dynamics. These
 386 learning approaches were predicated on an athlete-led, non-linear, individualised and
 387 problem-solving approach (Chow et al. 2011). Here, coaches expressed how they were not
 388 trying to continually instruct their athletes “what to do”, but rather create learning
 389 opportunities which challenged athletes to adapt their behaviours and become directed to the
 390 relations between: (i) what is intended (intentionality), (ii) information that they can perceive,
 391 and (iii), action possibilities that emerge in a performance environment (Chow et al. 2011).

392 **Holistic and nonlinear development.** Coaches were focused on holistic development
 393 of performers, rather than on acquisition of a specific sporting skill set to deal with the
 394 inherent complexity of the coaching process (Potrac et al. 2000). These coaches outlined how
 395 learning is about developing the person and forming the whole athlete first (See Athletics
 396 Skills model, Wormhoudt et al. 2018), rather than the reproduction of specific skills or
 397 winning of matches:

398 In kids my first concern is to form the athletes. They need to grow as a person and as
 399 athletes. As I have dedicated my coaching role to children, my main concern is about
 400 their development as a player, but also as a person. My main worry is to promote them
 401 a very good development as a player and here I am talking about technical and tactical
 402 issues, but also about cognitive issues. With this I mean the understanding of the game
 403 for instance. I am really worried about that performance regarding these issues, but as I
 404 am saying I am also worried about their development as a person and here we can talk
 405 about psychological issues, social issues, so it is very complex and it is difficult for me
 406 to say what is most important because everything is connected (Volleyball-Coach1).
 407

CONTEMPORARY PEDAGOGICAL APPROACHES TO COACHING

408 The coaches often expressed how every athlete had his/her own specific coaching needs,
409 rather than one general approach for all athletes:

410 Every kid now and every swimmer that walks through the door is a new philosophy. I
411 think that's the difference. I think if you'd have asked me 15 years ago I would have
412 had a philosophy and now I've got enough experience to be able to coach the
413 swimmers each with their own philosophy (Swimming-Coach2).
414

415 The coaches adopted a nonlinear view of athlete development and coaching which was
416 expressed as the athletes continually changing both physically and psychologically, as this
417 golf coach expressed:

418 Players' bodies physically change. They grow, they get stronger, they get weaker, they
419 get more flexible, they get less flexible. I also think there are changes more short term.
420 Some players are more vulnerable at times. The reasons may be hard to pinpoint and it
421 shows in their games. It is hard to change. Subtle changes and of course confidence
422 goes up and down as well. But let's look at the more long-term changes. I feel that I
423 need to be always alert and always watching (Golf-Coach1).
424

425 This nonlinear approach is theoretically predicated on the conceptualisation of the performer
426 as a complex neurobiological system from which purposive adaptive behaviors emerge from
427 the spontaneous interactions between system components under different task constraints
428 (Chow 2013). This perspective proposes that the most relevant information for decision
429 making and regulating action in performance environments is emergent during performer-
430 environment interactions (Davids et al. 2017). In practice, this view resulted in training which
431 was very adaptable, depending on the situation or emergence of training in a given session.
432 Finally, this nonlinear approach did not mean that technical elements of skills were never
433 focused on. Indeed, coaches highlighted that there is a time for more traditional technical
434 coaching in athlete development as this rugby league coach expresses:

435 I am working within a framework but I don't want it to be the kids turn up on a
436 Monday and know they're doing this or they're doing that. I try and flip it as much as I
437 can like a see-saw. I think that's almost where I find my work sits on a continuum, a
438 little bit in terms of game based scenario, constraint based learning, that type of thing
439 into your kind of closed skill, high repetition practices (RugbyLeague-Coach1).
440

441 This perspective resulted in coaches working along a continuum involving mainly
 442 these contemporary approaches, but sometimes, less frequently, moving towards more
 443 traditional technical coaching (See Renshaw et al. 2019). However, coaches still believed it
 444 was important to continually reflect on how representative these traditional methods were of
 445 competitive performance demands, while ensuring a decision-making element was included
 446 in the training. As Smith (2016) suggested, this integration of more traditional approaches
 447 (i.e. basic functional movements), alongside more contemporary methods (i.e. constraints led
 448 approach) can aid acceptance of these newer methods and help relieve some of the scepticism
 449 associated with their adoption. Furthermore, it suggests a combination of traditional and more
 450 contemporary approaches, used in the right context, is good for athletes learning.

451
 452 **Movement outcome focused.** The coaches expressed how they were not trying to ask
 453 their athletes to achieve an optimal movement solution, but rather were focused on enhanced
 454 functionality and increasing movement outcomes. These outcome-based approaches were
 455 focused on the macro components of movement (e.g. the combined movement of the whole
 456 body during a swimming stroke) rather than micro movement problems (e.g. small changes to
 457 hand position in a section of the stroke) as this swimming coach outlines:

458 It became obvious to me that like so you'd hear it takes 10,000 times to practice a skill
 459 before it gets done. I was like well so if I'm going to fix all 200 of those things, one the
 460 athlete's going to have to be super engaged and it's going to take forever (Swimming-
 461 Coach1).

462
 463 This approach linked with the coaches' views on nonlinear development, through
 464 harnessing the concept of degeneracy from neurobiology, broadly defined as the same
 465 movement outcomes being achieved with dissimilar movement patterns (Edelman and Gally
 466 2001) in each athlete. The result was that coaches were not looking to prescribe movement
 467 solutions, but instead were focusing on athletes adapting their behaviours to the performance
 468 environment. Bernstein (1967) defined dexterity as the ability to find a motor solution to

CONTEMPORARY PEDAGOGICAL APPROACHES TO COACHING

469 solve any emerging motor problem correctly, quickly, rationally, and resourcefully. Bernstein
470 (1967) identified the need for flexibility in skill development to encourage learners to seek
471 different solutions to the same or similar problems, thus advocating the need for practice
472 designs to incorporate variability into learning contexts. Adaptive variability is an important
473 phenomenon underpinning emergent movement patterning, playing a functional role in
474 learning and performance (Davids, Bennett, and Newell 2006). As Correia et al. (2019)
475 proposed, two aspects should be considered when introducing variability in practice designs.
476 First, practice should promote varying ways of achieving the same task goal, (i.e. helping
477 learners explore movement system degeneracy). Second, practice should promote athletes'
478 search, exploration, and exploitation of similar performance solutions to respond to different
479 problems. A belief in the importance of movement outcome variability was demonstrated by
480 this coach describing how the 'ideal way' of performing actions is always evolving as the
481 athlete develops:

482 And then of course there's the ideal way of doing things or you were landing this jump
483 last month and now you're struggling, let's go and review the video and see how we
484 can get back on track. I used to be that way and now I say last week or last month was
485 last month, you're a different person now so whatever worked then might not be the
486 right solution now (Figure-Skating-Coach).

487
488 Therefore, ensuring variability of actions was seen as important and practice often included
489 limited or no repetition of one specific movement pattern. Rather many coaches used
490 Bernstein's (1967) idea of 'repetition without repetition' to design practice task constraints.

491 **Coaches as environment designers.** The coaches in this sample perceived themselves
492 as *environmental designers* and what those environments offered, invited or encouraged
493 learners to explore was vital, needing alignment with a development focus. This learning
494 approach seeks to move away from a traditional view, towards one where learners are
495 encouraged to explore their learning, rather than coaches continually trying to provide
496 deterministic learning outcomes. Coaches discussed how the constraints-based model could

CONTEMPORARY PEDAGOGICAL APPROACHES TO COACHING

497 help them guide and understand how to design practice within the interacting constraints in
498 the environment:

499 It is about them trying to come to terms and making sense of the environment they are
500 in, so I would use the constraints model and I would look at you know the interacting
501 constraints on that athlete, so the ones that I am imposing typically are how I space my
502 hurdles, the height of the hurdles, if I put any kind of other information into the design
503 of the session, so I use hoopla hoops and tape on the floor and different things like that
504 (Athletics-Coach).

505 These environmental designs took shape in different ways, for example building scenarios
506 within the training session and ensuring no unopposed practice. Importantly as Roberts,
507 Newcombe, and Davids (2019) recently outlined, there is an under-appreciation of how
508 nuanced the successful application of a constraints-led approach can be, which often leads to
509 vague practice environments, lacking purpose. The coaches emphasised that a key point for
510 effective coaching was the ability to identify and manipulate information in the environment
511 to continually challenge athletes:

512 I quite often get asked by coaches in hurdles oh can I have your spacings and I say things
513 like but they are not mine, they are Dave's or Jane's [referring to the athlete]. They are
514 what I set tonight, so it is less about what the spacings are. (Athletic-Coach).

515
516 However, currently, for coaches looking to enhance the representativeness of practice there is
517 limited readily available resources to guide practice task design (see Slade 2015 for an
518 exception). For uptake of contemporary models, resources (see Renshaw et al. 2019 for an
519 example of resources emerging) and coach education materials need to be continually
520 developed to guide the effective use of these contemporary methods.

521 **Athlete ownership via instructions and feedback.** Coaches often discussed using
522 instructions which promoted an external focus of attention (i.e. where the performer's
523 attention is directed to the effect of the action, in comparison to an internal focus of attention
524 which is directed to the limb movements themselves) for the athletes. Directing attention to

CONTEMPORARY PEDAGOGICAL APPROACHES TO COACHING

525 external sources has been shown to support learning (Wulf, Lauterbach, and Toole 1999).
526 However, at the early stages of learning a functional movement pattern may not exist and
527 instructions may need to direct learners to a specific part of an affordance landscape
528 (affordances, or opportunities for action, exist in a varied landscape, for further explanation
529 see Kiverstein, van Dijk and Rietveld 2019), which needs to be searched in practice to help
530 them explore relevant functional performance solutions (Peh, Chow, and Davids 2011). Here,
531 this coach exemplifies how providing opportunities for athletes to gain performance feedback
532 by amplifying it, can guide them towards specific parts of the affordance landscape:

533 A couple of my solutions are make the feedback bigger and louder to them and so the
534 idea is they swim with a t-shirt and they go fast with a t-shirt because now they've got
535 all this extra drag and also their skin on their torso is not exposed to the water so it's
536 probably they can't feel as much and then you take the t-shirt off and hopefully now
537 they have a whole lot more sensory information and they can feel things better and
538 that's one way that maybe they can hopefully learn to adjust their body position to keep
539 it skinnier so it feels like the waters flowing over their body better (Swimming-Coach1)
540

541 These external instructions were typically coupled with a greater tendency for using
542 questioning during their coaching rather than providing prescriptive, explicit instructions.
543 Effective coaching has been suggested to position learners as active agents in the learning
544 process (Becker 2009; Cushion 2013). For this to work in practice, coaches need to move
545 away from high levels of instructional behaviours towards greater use of questioning (Davis
546 and Sumara 2003). Coaches in our sample talked a lot about shaping behaviours with
547 questions to promote a guided discovery learning approach (Mosston and Ashworth 2002).
548 Contemporary coaching methods such as the constraints-led approach, proposes questioning
549 to help a learner define a path of exploration to guide the discovery and exploitation of
550 information (Chow et al. 2016). However, the assumption that individual responses from
551 questioning of whole groups may instil deep understanding in the full group, or that it
552 instigates personal decision-making, should be taken with caution (Cope et al. 2016; Harvey
553 and Light 2015). Typically, despite coaches using questioning frequently, they often allow

CONTEMPORARY PEDAGOGICAL APPROACHES TO COACHING

554 little time for athletes to consider responses, and if answers are not given immediately, a
555 rephrased ‘closing’ of the question may follow to lead the performers towards the answer
556 (Cope et al. 2016). Hence, Cope et al. (2016) suggested that coaches need to develop a wide
557 spectrum of questions and a dialogical approach alongside complementary pedagogical
558 behaviours to challenge performers’ knowledge, techniques, skills, and strategies. However,
559 this can be difficult as coaching norms provide an overriding, powerful, and historical view of
560 what coaches *should* do and what coaching *should* look like (Cushion 2013). One norm
561 suggests that the coach *should* be positioned as the authority and responsible for decision-
562 making (Cushion 2013). Going against this tradition, the coaches in this sample preferred to
563 promote an authentic learner-centred approach:

564 I don’t like to be the centre of the process. The centre of the process is the athletes, so I
565 try to put some responsibilities during the tasks, during the whole process and I really
566 believe also in those kind of issues because it is very difficult for me as a coach to lead
567 with everything, so if I can put some responsibility and some important things of the
568 process in the athlete I think that is the clue (Volleyball-Coach2).

569
570 By enabling a learner-centred approach, coaches expressed how this approach could promote
571 athlete ownership of practice, enabling self-regulating athletes:

572
573 I think to me the idea that technical change happens in one intervention is kind of short
574 sighted. What I try to do, is help athletes learn how to coach themselves and so you
575 give them these concepts of what needs to happen when swimming... a lot of kids
576 surprisingly if you asked them, they have no idea what they’re doing. Like literally
577 they can’t feel anything, they can’t do anything because they’re just, their only way to
578 get feedback is from a coach. (Swimming-coach1)

579
580 This approach involved promoting the need for athletes to analyse their own performance and
581 them also guiding their own training which deepened athlete engagement in the learning
582 process. When coaches can use a hands-off approach during athlete support, it enables a self-
583 directed, problem-solving environment which can empower athletes to develop effective
584 behaviours during learning (Kidman and Lombardo 2010). This minimalist approach enables
585 the coach to direct a performer’s global search for a functional, successful movement

586 solution, and promote decision-making towards task solutions, linked to their own
 587 understanding of the problem. This shift of approach from *how to do it*, to more of a focus on
 588 *what you facilitate them to do* creates an environment of ‘repetition without repetition’. It
 589 provides athletes with freedom to seek and discover solutions to performance problems
 590 through exploration (Renshaw, Oldham, and Bawde 2012) and empowerment for the athletes.
 591 This process can result in performers developing problem solving, decision-making, and
 592 creative thinking skills, combined with increased understanding (Renshaw et al. 2019).

593 **Responses to Contemporary Approaches**

594 Within the dimension of responses to contemporary approaches, three higher-order themes
 595 emerged, *positive reaction*, *negative reaction* and *recommendations when using a*
 596 *contemporary learning approach*.

597 **Positive responses.** The contemporary learning approaches were generally supported by
 598 athletes as they experienced success from that approach to training:

599 I think the turning point for that was they had some success and started beating a couple of
 600 the top teams at home and away... And I think that for the first time the players realised
 601 that actually they adapted to what was in front of them (Rugby-Union-Coach2).
 602

603 Parents of the athletes were commonly very supportive of the coaches' contemporary learning
 604 approaches:

605 They're very supportive in terms of the mum and dad always say to us he's had a lot of
 606 interest from other clubs and they've always said we're not going anywhere, we're not
 607 going anywhere because we feel he's getting the right education here (Rugby-League-
 608 Coach1).
 609

610 Most of the positive outcomes were achieved through effective and continuous
 611 communication between the coach, athlete, and parents:

612 I have a very good relationship with the parents of my athletes because I communicate a
 613 lot with them I just explain to them why I do it and there is a lot of science to back what I
 614 am doing, but of course sometimes I have to be smart (Volleyball-Coach2).
 615

616 These positive responses once again reinforced that effective communication is vital in
 617 effective coaching practice (Pankhurst, Collins, and Macnamara 2013), especially at the
 618 development phase with not only athletes, but also parents buying into the coaches' approach.

CONTEMPORARY PEDAGOGICAL APPROACHES TO COACHING

619 However, coaches also indicated that it took a long time for athletes to adapt to their methods
620 of learning. But after a period of time, athletes started to see these contemporary approaches
621 as the actual norm. Finally, coaches highlighted how it was easier with younger athletes and
622 new coaches to accept their coaching approach, as they had had less exposure to more
623 traditional approaches:

624 I do think that I have got an opportunity now to kind of test out this idea if I get them
625 young enough maybe when they are young enough they are open to these ideas and kind
626 of more willing to have a go and they are not comparing it to something else (Athletics-
627 Coach).

628
629 **Negative responses.** Despite some positive responses, the coaches using these
630 contemporary learning approaches were typically going against the national governing
631 bodies' ideal coaching approaches, which often resulted in resistance from the NGB and other
632 coaches. They were perceived to be going against how things 'should be done' (Lemyre,
633 Trudel, and Durand-Bish 2007), resulting in many of the coaches not having 'credibility' in
634 that organisation as this athletics coach highlights:

635 Within my role within the *NGB* setup it didn't really carry any credibility. The
636 curriculum was all set around athlete preparation and so they were still hung up on those
637 traditional ideas and they did pay a heck of a lot of their internal budget to old school
638 coaches (Athletics-Coach).

639
640 Coaches discussed the need to do it their own way and not wanting to follow the NGB,
641 causing issues for both coach and NGB, as this swimming coach highlighted:

642 When you get people coming up through the system that want to do it their own way, not
643 necessarily because there's anything wrong with *NGB* swimming but just because that's
644 the only way you know and that's certainly my situation, it's hard for them to manage it
645 because it doesn't fit into their plan (Swimming-Coach2).

646
647 With many of the coaching recommendations of NGBs not being aligned with ideas of
648 contemporary approaches, coaches discussed it being a major challenge to change the
649 learning approach, which often resulted in resistance as this coach highlighted:

650 I think some people just maybe it's not worth it to them you know it's a lot of work. It's a
651 lot of work to kind of re-start and honestly you have to give up a lot, you give up a lot of
652 control. I think a lot of people want the 'I'm the coach, I'm in control, these kids are going

CONTEMPORARY PEDAGOGICAL APPROACHES TO COACHING

653 to swim faster because of me' and you have to give that up because you're not just telling
654 them what to do, you're not telling them, like it's not that there's no structure or anything
655 you know, you're giving them the freedom to figure out stuff on their own and that's kind
656 of scary (Swimming-Coach1).

657
658 Furthermore, athletes were often not used to a contemporary approach and, therefore, did not
659 always understand how to train using this approach. Finally, others explained how they were
660 seen as a 'weirdo', especially in highly traditional organisations:

661 I think people think I'm a weirdo. It would be interesting to see what other people think
662 but I think people would say that I don't know, I'm a clown. (Football-Coach4).

663
664
665 These findings around consistent negative reactions and concerns of other
666 stakeholders, go some way to explain why, despite the powerful theoretical conceptualisation
667 of these contemporary approaches, there is still slow uptake of these learning approaches in
668 practice. For a wider adoption of such approaches, applied scientific research, demonstrating
669 the benefits of taking up such approaches (e.g., Fitzpatrick, Davids, and Stone 2018), should
670 be developed to provide practical evidence to support the continued development of
671 contemporary approaches. The coaches' experiences of using a non-traditional approach often
672 highlighted an issue with adopting a more learner-centred, less autocratic style, in which
673 coaches can be perceived as "just standing around not doing much" (Williams, Alder, and
674 Bush 2015). Coaches explained how people looking at their sessions would say 'it looks like
675 I'm not coaching' as this coach explains:

676
677 He (club chairman) watched the session, he called me over afterwards and he said what
678 have you just done? So, I explained how the session was run and what I was looking at
679 and he actually called it lazy coaching, you're not doing any coaching there, for me
680 they're just playing games (Rugby-Union-Coach 2).

681
682 The coaches interviewed here, seem to have overcome previous issues with a change in
683 cultural shift associated with such approach, such as feeling a loss of credibility in a new
684 facilitative role (Roberts 2011) and not knowing when to intervene (Thomas, Morgan, and

685 Mesquita 2013). Coaches expressed their confidence with adopting a learner-centred
686 approach, despite their previous concerns (Goodyear and Dudley 2015), which could be due
687 to their greater experiences and wider educational opportunities. However, they did reinforce
688 previous reported difficulties that inexperienced coaches may be reluctant to use learner-
689 centred approaches due to limited understanding on how to interact when positioning
690 themselves as a designer of learning experiences (Goodyear and Dudley 2015). Researchers
691 have termed this as coaches' 'epistemological gap', the use of an approach but with limited
692 conceptual or practical understanding of it (Davis and Sumara 2003; Partington and Cushion
693 2013). Future research and practical coach education need to be developed to enable
694 continued education of coaches on how to apply these contemporary learning approaches
695 effectively into practice.

696 **Recommendations when using a contemporary learning approach.** Coaches were
697 asked for their recommendations, based on their experiences, for adopting a contemporary
698 learning approach. The recommendations from these insights and experiences of these
699 coaches for other coaches thinking about adopting such contemporary approaches was to
700 ensure that they used a conceptualised approach to learning to assist coaches to provide
701 quality experiences for athletes and help guide practice during these approaches (Copper and
702 Allen 2018). Furthermore, the need for good communication with other stakeholders was
703 highlighted, as well as to continue to educate themselves and explore varying approaches
704 which align with their adopted learning approach. Another recommendation was to stick to a
705 philosophy despite any negative reactions from stakeholders, as this Rugby coach expressed:

706 Yeah don't be put off by sort of constraints from other people. Set your own philosophy
707 and if that's the way you want to coach and the style of coaching that's what you stick to
708 (Rugby-Union-Coach2).

709
710 Importantly, the pressures of competitive success signify that many coaches and their
711 organizations are continually searching for new, advantageous ideas to improve their

CONTEMPORARY PEDAGOGICAL APPROACHES TO COACHING

712 learners' performance, potentially increasing their vulnerability to pseudoscientific ideas
713 (Bailey et al. 2018). This is where sound, empirically-evidenced, theoretical learning
714 approaches need to be encouraged to ensure the "latest fads and trends" do not get
715 uncritically adopted. Coaches here discussed how they felt it was important not to be
716 bothered what other people think of a learning approach:

717 I think because for me it's certainly I don't give a fuck what anyone thinks. And if you're
718 constantly thinking about I've got to be this way to suit this person or I've got to
719 assimilate into this way you can't ever listen to that thing and get that whatever it is, that
720 inspiration. You can't and you'll just be the same as everybody else which is mediocre
721 (Swimming-Coach2).

722
723 However, it is worth noting that the coaches here are still in the minority. For other, less
724 experienced coaches who are likely to have limited power or agency, to go against the
725 currently employed approaches within an organisation would constitute a considerable
726 challenge (Moy et al. 2015). Importantly, this approach to developing athlete learning needs
727 to be underpinned by contemporary evidence, emphasising the importance of engaging with
728 ongoing research during professional practice:

729

730 I would definitely want them to stay in touch with motor learning and performance
731 research. Because doing that they will not get lost. It might be a bit difficult to read if you
732 are not an academic and I would say don't be quick to jump to conclusions. Be aware that
733 you will probably never be completely right. And don't be afraid to test. Don't be afraid to
734 try different things (Golf-Coach).

735

736 Hence, as part of this continued process of research and development, reflection on current
737 approaches in practice was outlined as important. Many coaches highlighted that it will take
738 time, and failure is part of the process, but such experiences should not prevent a coach from
739 exploring the use of innovative approaches. Interviewee's also explained the need to be
740 *flexible* in a coaching approach which will enable innovative and effective training that
741 support individuals to learn. Coaches discussed how coaches with a multidisciplinary
742 background, with experience in a range of sports tended to have a better understanding of
743 contemporary approaches and that young coaches should gain experience in a range of sports:

744 But what I find interesting is that coaches that have cross sport experience have a much
745 easier time of understanding it [contemporary nonlinear approaches]. I am working with a

746 Czech coach in Prague and he has both tennis and ice hockey experience as a coach and he
747 has no problems whatsoever understanding it (Golf-Coach).
748

749 **Conclusion**

750 In conclusion, results presented here, indicate that traditional approaches to coaching
751 are still dominant. However, in line with both theoretical (e.g., Chow 2013), and empirical
752 (Fitzpatrick, Davids, and Stone 2018) evidence, the coaches interviewed here perceived
753 traditional approaches as not being the most conducive for learning. Hence, the coaches in
754 this sample adopted approaches to athlete learning which are based on a holistic, non-linear,
755 discontinuous perspective. The professional role of these coaches was viewed as an
756 ‘environmental designer’, emphasising athlete ownership of performance during practice
757 through implementing opportunities for ‘co-designing’ learning experiences. Coaches
758 expressed how these approaches could lead to more adaptive, engaged, versatile,
759 autonomous, and skilled athletes. Despite the coaches receiving some positive reactions and
760 contemporary approaches being well supported in coaching and motor learning literature,
761 they are still not widely accepted within some applied coaching settings (Williams, Alder,
762 and Bush 2015) as evidenced by reports of a wide range of negative outcomes from
763 interactions with NGBs, athletes, parents, and other coaches. This sample of coaches were
764 experienced and knew how to stick to their own philosophies. However, the challenge is still
765 evident, with the traditions of a sport, coaches' intuition, and imitation of other coaches
766 influencing the design of practice tasks, in which less-experienced coaches may find it hard
767 to express their autonomy (Cushion, Armour, and Jones 2003).

768 These findings present a challenge for sport pedagogues to develop evidence-based
769 methodologies which, through impactful education programmes, can help coaches understand
770 and evaluate the benefits of these contemporary approaches. Here, we have examined how
771 experienced coaches have implemented contemporary methods, however, for further uptake,
772 future research needs to examine how less experienced coaches can deal with the challenges

CONTEMPORARY PEDAGOGICAL APPROACHES TO COACHING

- 802 Braun, V., V. Clarke, and P. Weate. 2016. "Using Thematic Analysis in Sport and Exercise
803 Research." In *Routledge Handbook of Qualitative Research in Sport and Exercise*, 213–
804 27. London: Routledge
- 805 Browne, P.R., S. Robertson., A. Sweeting, & K. Davids. 2019. "Prevalence of interactions
806 and influence of performance constraints on kick outcomes across Australian Football
807 tiers: Implications for representative practice designs". *Human Movement Science*, 66,
808 621-630.
- 809 Burnie, L., P. Barratt, K. Davids, J. A. Stone, P. Worsfold, and J. Wheat. 2018. "Coaches'
810 Philosophies on the Transfer of Strength Training to Elite Sports Performance."
811 *International Journal of Sports Science & Coaching* 13 (5): 729–36.
812 doi:10.1177/1747954117747131.
- 813 Butler, J. 2014. "TGfU – Would You Know It if You Saw It? Benchmarks from the Tacit
814 Knowledge of the Founders." *European Physical Education Review* 20 (4): 465–88.
815 doi:10.1177/1356336X14534356.
- 816 Chesterfield, G., P. Potrac, and R. L. Jones. 2010. "'Studentship' and 'Impression
817 Management' in an Advanced Soccer Coach Education Award." *Sport, Education and
818 Society* 15 (3): 299–314. doi:10.1080/13573322.2010.493311.
- 819 Chow, J. Y. 2013. "Nonlinear Learning Underpinning Pedagogy: Evidence, Challenges, and
820 Implications." *Quest* 65 (4): 469–84. doi:10.1080/00336297.2013.807746.
- 821 Chow, J. Y., K. Davids, C. Button, and I. Renshaw. 2016. *Nonlinear Pedagogy in Skill
822 Acquisition: An Introduction*. London: Routledge.
- 823 Chow, J. Y., K. Davids, R. Hristovski, D. Araújo, and P. Passos. 2011. "Nonlinear Pedagogy:
824 Learning Design for Self-Organizing Neurobiological Systems." *New Ideas in
825 Psychology* 29 (2): 189–200. doi:10.1016/j.newideapsych.2010.10.001.
- 826 Chow, J. Y., K. Davids, R. Shuttleworth, and D. Araújo. 2016. "Ecological Dynamics and
827 Transfer from Practice to Performance in Sport." In *Skill Acquisition in Sport Research,
828 Theory and Practice.*, edited by A. M Williams, and N. Hodges. London: Routledge.
- 829 Clark, M. E., K. McEwan, and C. J. Christie. 2019. "The Effectiveness of Constraints-Led
830 Training on Skill Development in Interceptive Sports: A Systematic Review."
831 *International Journal of Sports Science & Coaching* 14 (2): 229-240
832 doi:10.1177/1747954118812461.
- 833 Cope, E., M. Partington, C. J. Cushion, and S. Harvey. 2016. "An Investigation of
834 Professional Top-Level Youth Football Coaches' Questioning Practice." *Qualitative*

CONTEMPORARY PEDAGOGICAL APPROACHES TO COACHING

- 835 *Research in Sport, Exercise and Health*, 8 (4) 380-393.
836 doi:10.1080/2159676X.2016.1157829
- 837 Correia, V., J. Carvalho, D. Araújo, E. Pereira, and K. Davids. 2019. "Principles of Nonlinear
838 Pedagogy in Sport Practice." *Physical Education and Sport Pedagogy* 24 (2): 117–32.
839 doi:10.1080/17408989.2018.1552673.
- 840 Côté, J. 2006. "The Development of Coaching Knowledge:." *International Journal of Sports
841 Science & Coaching* 1 (3): 217–22. doi:10.1260/174795406778604609.
- 842 Cooper, D. and J.B. Allen. (2018) The coaching process of the expert coach: a coach led
843 approach, *Sports Coaching Review*, 7:2, 142-170, DOI:
844 10.1080/21640629.2017.1361168
- 845 Cushion, C. J. 2013. "Applying Game Centered Approaches in Coaching: a Critical Analysis
846 of the 'Dilemmas of Practice' Impacting Change." *Sports Coaching Review* 2 (1): 61–76.
847 doi:10.1080/21640629.2013.861312.
- 848 Cushion, C. J., K. M. Armour, and R. L. Jones. 2003. "Coach Education and Continuing
849 Professional Development: Experience and Learning to Coach." *Quest* 55 (3): 1–17.
850 doi:10.1080/00336297.2003.10491800.
- 851 Davids, K., A. Gullich, R. Shuttleworth, and D. Araújo. 2017. "Understanding Environmental
852 and Task Constraints on Talent Development." In *Routledge Handbook of Talent
853 Identification and Development in Sport*, edited by J. Baker, S. Cobley, J. Schorer, and
854 N. Wattie.
- 855 Davids, K, S. Bennett, and K. M. Newell. 2006. *Movement System Variability*. Human
856 Kinetics.
- 857 Davis, B., and D. Sumara. 2003. "Why Aren't They Getting This? Working Through the
858 Regressive Myths of Constructivist Pedagogy." *Teaching Education* 14 (2): 123–40.
859 doi:10.1080/1047621032000092922.
- 860 Denison, J., and Z. Avner. 2011. "Positive Coaching: Ethical Practices for Athlete
861 Development." *Quest* 63 (2): 209–27. doi:10.1080/00336297.2011.10483677.
- 862 Edelman, G. M, and J. A. Gally. 2001. "Degeneracy and complexity in biological systems." *Proceedings of the National Academy of Sciences of the United States of America*, 20
863 (24): 13763-69.
864
- 865 Fitzpatrick, A., K. Davids, and J. A. Stone. 2018. "Effects of Scaling Task Constraints on
866 Emergent Behaviours in Children's Racquet Sports Performance." *Human Movement
867 Science* 58: 80–87. doi:10.1016/j.humov.2018.01.007.

CONTEMPORARY PEDAGOGICAL APPROACHES TO COACHING

- 868 Fraser-Thomas, J., J. Côté, and J. Deakin. 2008. "Understanding Dropout and Prolonged
869 Engagement in Adolescent Competitive Sport." *Psychology of Sport and Exercise* 9 (5):
870 645–62. doi:10.1016/j.psychsport.2007.08.003.
- 871 Gibson, J. J. 1979. "The theory of affordances". In R. E. Shaw & J. Bransford (Eds.),
872 *Perceiving, acting, and knowing: Toward an ecological psychology*. Hillsdale, NJ:
873 Lawrence Erlbaum Associates.
- 874 Goodyear, V., and D. Dudley. 2015. "'I'm a Facilitator of Learning!' Understanding What
875 Teachers and Students Do Within Student-Centered Physical Education Models." *Quest*
876 67 (3): 274–89. doi:10.1080/00336297.2015.1051236.
- 877 Greenwood, D., K. Davids, and I. Renshaw. 2014. "Experiential Knowledge of Expert
878 Coaches Can Help Identify Informational Constraints on Performance of Dynamic
879 Interceptive Actions." *Journal of Sports Sciences* 32 (4): 328–35.
880 doi:10.1080/02640414.2013.824599.
- 881 Guba, E. G, and Y. S. Lincoln. 2005. "Paradigmatic Controversies, Contradictions, and
882 Emerging Confluences." In *The Sage Handbook of Qualitative Research*, edited by N. K.
883 Denzin and Y. S. Lincoln. 191–215. London: Sage
- 884 Handford, C., K. Davids, S. Bennett, and C. Button. 1997. "Skill Acquisition in Sport: Some
885 Applications of an Evolving Practice Ecology." *Journal of Sports Sciences* 15 (6): 621–
886 40.
- 887 Harvey, S., and R. L. Light. 2015. "Questioning for Learning in Game-Based Approaches to
888 Teaching and Coaching." *Asia-Pacific Journal of Health, Sport and Physical Education*
889 6 (2): 175–90. doi:10.1080/18377122.2015.1051268.
- 890 Holt, J. E., P. Ward, and T. L. Wallhead. 2006. "The Transfer of Learning from Play
891 Practices to Game Play in Young Adult Soccer Players." *Physical Education and Sport*
892 *Pedagogy* 11 (2): 101–18. doi:10.1080/17408980600708270.
- 893 Jacobs, F., I. Claringbould, and A. Knoppers. 2016. "Becoming a 'Good Coach'." *Sport,*
894 *Education and Society* 21 (3): 411–30. doi:10.1080/13573322.2014.927756.
- 895 Jones, R., K. Morgan and K. Harris (2012) Developing coaching pedagogy: seeking a better
896 integration of theory and practice, *Sport, Education and Society*, 17:3, 313-
897 329, Doi:10.1080/13573322.2011.608936
- 898 Kidman, L., and B. Lombardo. 2010. *Athlete-Centred Coaching: Developing Decision*
899 *Makers*. IPC Print Resources.
- 900 Kiverstein, J., L. van Dijk, and E. Rietveld. 2019. "The field and landscape of
901 affordances: Koffka's two environments revisited." *Synthese* 1-18.

CONTEMPORARY PEDAGOGICAL APPROACHES TO COACHING

- 902 Lemyre, F., P. Trudel, and N. Durand-Bush. 2007. "How Youth-Sport Coaches Learn to
903 Coach." *The Sport Psychologist* 21 (2): 191–209. doi:10.1123/tsp.21.2.191.
- 904 Mccosker, C., I. Renshaw, D. Greenwood, K. Davids, and E. Gosden. 2019. "How
905 Performance Analysis of Elite Long Jumping Can Inform Representative Training
906 Design Through Identification of Key Constraints on Competitive Behaviours."
907 *European Journal of Sport Science* 8 (3): 1–9. doi:10.1080/17461391.2018.1564797.
- 908 Mckay, J., and D. O'Connor. 2018. "Practicing Unstructured Play in Team Ball Sports: a
909 Rugby Union Example." *International Sport Coaching Journal* 5 (3): 273–80.
910 doi:10.1123/iscj.2017-0095.
- 911 **Mosston, M., & Ashworth, S. (2002). *Teaching physical education*. London: Benjamin**
912 **Cummings, 1-358.**
- 913 Moy, B., I. Renshaw, K. Davids, and E. Brymer. 2015. "Overcoming Acculturation: Physical
914 Education Recruits' Experiences of an Alternative Pedagogical Approach to Games
915 Teaching." *Physical Education and Sport Pedagogy* 21 (4): 386–406.
916 doi:10.1080/17408989.2015.1017455.
- 917 Nash, C. S., and J. Sproule. 2009. "Career Development of Expert Coaches." *International*
918 *Journal of Sports Science & Coaching* 4 (1): 121–38.
- 919 Nelson, L., C. J. Cushion, and P. Potrac. 2012. "Enhancing the Provision of Coach
920 Education: the Recommendations of UK Coaching Practitioners." *Physical Education*
921 *and Sport Pedagogy* 18 (2): 204–18. doi:10.1080/17408989.2011.649725.
- 922 Newell, K.M. 1991. "Motor Skill Acquisition". *Annual Reviews in Psychology*, 42, 213-237.
- 923 North, J. 2013. "Philosophical Underpinnings of Coaching Practice Research." *Quest* 65 (3):
924 278–99. doi:10.1080/00336297.2013.773524.
- 925 Pankhurst, A., D. Collins, and Á. Macnamara. 2013. "Talent Development: Linking the
926 Stakeholders to the Process." *Journal of Sports Sciences* 31 (4): 370–80.
927 doi:10.1080/02640414.2012.733821.
- 928 Partington, M., and C. J. Cushion. 2013. "An Investigation of the Practice Activities and
929 Coaching Behaviors of Professional Top-Level Youth Soccer Coaches." *Scandinavian*
930 *Journal of Medicine & Science in Sports* 23 (3): 374–82. doi:10.1111/j.1600-
931 0838.2011.01383.x.
- 932 Patton, M. Q. 2002. *Qualitative Research & Evaluation Methods*. London: Sage.
- 933 Peh, S. Y., J. Y. Chow, and K. Davids. 2011. "Focus of Attention and Its Impact on
934 Movement Behaviour." *Journal of Science and Medicine in Sport* 14 (1): 70–78.
935 doi:10.1016/j.jsams.2010.07.002.

CONTEMPORARY PEDAGOGICAL APPROACHES TO COACHING

- 936 Phillips, E., K. Davids, I. Renshaw, and M. Portus. 2014. "Acquisition of Expertise in Cricket
937 Fast Bowling: Perceptions of Expert Players and Coaches." *Journal of Science and*
938 *Medicine in Sport* 17 (1): 85–90. doi:10.1016/j.jsams.2013.03.005.
- 939 Piggott, D. 2012. "Coaches' Experiences of Formal Coach Education: a Critical Sociological
940 Investigation." *Sport, Education and Society* 17 (4): 535–54.
941 doi:10.1080/13573322.2011.608949.
- 942 Piggott, D. 2015. "The Open Society and Coach Education: a Philosophical Agenda for
943 Policy Reform and Future Sociological Research." *Physical Education and Sport*
944 *Pedagogy* 20 (3): 283–98. doi:10.1080/17408989.2013.837435.
- 945 Potrac, P., C. Brewer, R. Jones, K. Armour, and J. Hoff. 2000. "Toward an holistic
946 understanding of the coaching process". *Quest*, 52, 186–199.
947 doi:10.1080/00336297.2000.10491709
- 948 Renshaw, I., A. R. Oldham, and M. Bawde. 2012. "Nonlinear Pedagogy Underpins Intrinsic
949 Motivation in Sports Coaching." *The Open Sports Sciences Journal*, 1–12.
- 950 Renshaw, I., D. Araújo, C. Button, J. Y. Chow, K. Davids, and B. Moy. 2015. "Why the
951 Constraints-Led Approach Is Not Teaching Games for Understanding: a Clarification."
952 *Physical Education and Sport Pedagogy* 21 (5): 459–80.
953 doi:10.1080/17408989.2015.1095870.
- 954 Renshaw, I., K. Davids, D. Newcombe, & W. Roberts. 2019. "The constraints-led approach:
955 Principles for Sport Coaching and Practice Design". Routledge: London and New York.
- 956 Roberts, S. J. 2011. "Teaching Games for Understanding: the Difficulties and Challenges
957 Experienced by Participation Cricket Coaches." *Physical Education and Sport Pedagogy*
958 16 (1): 33–48. doi:10.1080/17408980903273824.
- 959 Roberts, W. M., D. J. Newcombe, and K. Davids. 2019. "Application of a Constraints-Led
960 Approach to Pedagogy in Schools: Embarking on a Journey to Nurture Physical Literacy
961 in Primary Physical Education." *Physical Education and Sport Pedagogy* 24 (2): 162–75.
962 doi:10.1080/17408989.2018.1552675.
- 963 Ross, E., L. Gupta, and L. Sanders. 2018. "When Research Leads to Learning, but Not
964 Action in High Performance Sport." *Progress in Brain Research* 240: 201–17.
965 doi:10.1016/bs.pbr.2018.08.001.
- 966 Rothwell, M., K. Davids, and J. A. Stone. 2018. "Harnessing Socio-Cultural Constraints on
967 Athlete Development to Create a Form of Life." *Journal of Expertise* 1: 94–102.

- 968 Rothwell, M., Stone, J., and Davids, K. 2019. “Exploring forms of life in player development
 969 pathways: the case of british rugby league”. *Journal of Motor Learning and*
 970 *Development*, 7(2): 242-260.
- 971 Slade, D. G. 2015. “Do the Structures Used by International Hockey Coaches for Practising
 972 Field-Goal Shooting Reflect Game Centred Learning Within a Representative Learning
 973 Design?.” *International Journal of Sports Science & Coaching* 10 (4): 655–68.
 974 doi:10.1260/1747-9541.10.4.655.
- 975 Smith, B. 2017. “Generalizability in Qualitative Research: Misunderstandings, Opportunities
 976 and Recommendations for the Sports and Exercise Sciences.” *Qualitative Research in*
 977 *Sport, Exercise and Health* 1 (10): 137–49.
- 978 Smith, B, and A. C. Sparkes. 2016. *Routledge Handbook of Qualitative Research in Sport*
 979 *and Exercise*. London: Routledge.
- 980 Smith, B., and K. R. McGannon. 2018. “Developing Rigor in Qualitative Research: Problems
 981 and Opportunities Within Sport and Exercise Psychology.” *International Review of Sport*
 982 *and Exercise Psychology* 11 (1): 101–21. doi:10.1080/1750984X.2017.1317357.
- 983 Smith, W. 2016. “Fundamental Movement Skills and Fundamental Games Skills Are
 984 Complementary Pairs and Should Be Taught in Complementary Ways at All Stages of
 985 Skill Development.” *Sport, Education and Society* 21 (3): 431–442.
 986 doi:10.1080/13573322.2014.927757.
- 987 Sparkes, A. C., and B. Smith. 2014. *Qualitative Research Methods in Sport, Exercise and*
 988 *Health*. London: Routledge.
- 989 Stephenson, B., and S. Jowett. 2009. “Factors That Influence the Development of English
 990 Youth Soccer Coaches.” *International Journal of Coaching Science* 3 (1): 3–16.
- 991 Stoszkowski, J., and D. Collins. 2017. “Using Shared Online Blogs to Structure and Support
 992 Informal Coach Learning—Part 1: A Tool to Promote Reflection and Communities of
 993 Practice.” *Sport, Education and Society* 22 (2): 247–70.
 994 doi:10.1080/13573322.2015.1019447.
- 995 Thomas, G., K. Morgan, and I. Mesquita. 2013. “Examining the Implementation of a
 996 Teaching Games for Understanding Approach in Junior Rugby Using a Reflective
 997 Practice Design.” *Sports Coaching Review* 2 (1): 49–60.
 998 doi:10.1080/21640629.2013.855000.
- 999 Tracy, S. J. 2010. *Qualitative Research Methods*. John Wiley & Sons.

CONTEMPORARY PEDAGOGICAL APPROACHES TO COACHING

- 1000 Vaeyens, R., A. Güllich, C. R. Warr, and R. Philippaerts. 2009. "Talent Identification and
1001 Promotion Programmes of Olympic Athletes." *Journal of Sports Sciences* 27 (13): 1367–
1002 80. doi:10.1080/02640410903110974.
- 1003 Weed, R. 2009. "Research Quality in Considerations for Grounded Theory Research in Sport
1004 & Exercise Psychology." *Psychology of Sport and Exercise*, 10, 502–510.
1005 doi:10.1016/j.psychsport.2009.02.007.
- 1006 Williams, S., D. Alder, and A. Bush. 2015. "A Little Less Conversation; a Little More
1007 (Relational) Action Please. a Fictional Dialogue of Integrating Theory into Coaching
1008 Practice." *Sports Coaching Review* 4 (2): 115–38. doi:10.1080/21640629.2016.1158544.
- 1009 Woods, C, I McKeown, R Shuttleworth, K Davids, and S Robertson. 2019. "Training
1010 Programme Designs in Professional Team Sport: an Ecological Dynamics Exemplar"
1011 *Human Movement Science* 66: 318–26.
- 1012 Wormhoudt, R, G. J. P. Savelsbergh, J. W. Teunissen, and K. Davids. 2017. *The Athletic
1013 Skills Model: Optimizing Talent Development Through Movement Education*. Abingdon:
1014 Routledge.
- 1015 Wulf, G., B. Lauterbach, and T. Toole. 1999. "The Learning Advantages of an External
1016 Focus of Attention in Golf." *Research Quarterly for Exercise and Sport* 70 (2): 120–26.
1017 doi:10.1080/02701367.1999.10608029.
- 1018
1019
1020
1021
1022
1023
1024
1025
1026
1027
1028

CONTEMPORARY PEDAGOGICAL APPROACHES TO COACHING

1029 **Table 1.** Thematic map displaying the lower order, higher order and dimensions of the data set.

Lower Order	Higher Order	Dimension
Coach-led; Perfect technique; Template model; Coached how they were coached	Traditional culture	Factors underpinning the coaches approach to athlete learning
Negative outcomes; Predictable; No problem solving; Removal of decision making	Outcome of traditional approach	
Experience led to change; Penny dropping; Formal coach education; Fixed structure not working; Informal coach education	Change of approach	
Personal development; Individualised coaching; Form the athlete; Not all about winning; Continually changing athletes; No repetition; Variability; Complexity; Continuum	Holistic and non-linear development	Learning approaches
No optimal movement; Macro-not micro; Continually evolving	Movement outcome focused	
No unopposed practice; Technique with decision making; Scenario-based training; Manipulations important; Interacting constraints; Task constraints; Representative learning environments	Coach is an environment designer	
Louder feedback; External focus; Analogy; Implicit learning; Hands off coaching; Shape behaviour with questions; Self-regulating; Athlete guiding training; Responsibility; Learner centered; Empowerment; Decision makers	Athlete ownership via instructions and feedback	
Parental perspectives; Takes time; Success gets buy in; Younger athletes	Positive response	
Resistance; Parental perspectives; Looks like I'm not coaching; Hard to change tradition	Negative reaction	Response to contemporary pedagogical approaches
Stick to your approach; Communication; Lots of ways to solve problems; Reflection; Takes time; Multidisciplinary coaches; Flexibility	Recommendations when using a contemporary learning approach	

1030