Exploring sport coaches' experiences of online learning since 2017: A systematic review.

Recent technological advances and the COVID-19 pandemic have accelerated the adoption of online coach learning. To support effectiveness, such learning should be informed by evidenced based research. In response, this systematic review synthesises research on online coach learning published since 2017. Following PRISMA guidelines, a comprehensive search across ten databases identified 19 relevant studies that were appraised using the Mixed Methods Appraisal Tool. Reflexive thematic analysis generated an overview of theoretical, methodological, and practical insights. Findings suggest that online coach learning offers perceived benefits including knowledge acquisition, increased confidence, and enhanced reflective skills. However, the existing literature frequently lacks philosophical and conceptual clarity, methodological rigour, and analysis of measurable impacts in practice. Overall, while evidence is promising, in the absence of more conceptually grounded and methodologically robust studies, the efficacy of online coach learning remains questionable. In response, future research should employ learning theories aligned with the virtual domain.

Keywords: learning, sport coaching, coach learning, technology.

Introduction

Online learning is a type of Technology Enhanced Learning (TEL) that involves synchronous or asynchronous learning accessed through the world wide web (Singh & Thurman, 2023). The term is often used interchangeably with other terms (e.g. e-learning, web-based learning, virtual learning). There has been an increased prevalence of online learning since the 1980s (Moore & Kearsley, 2012). Since then, Raja & Nagasubramani (2018) have observed technological developments and learners' ever improving technological skills as influences on increased online learning practice. More recently, it has been noted by Callary et al. (2021) and Paudel (2021) that the SARS covid-19 pandemic prompted much learning provision to move online. Thus, while online learning is not new, it presents an increasingly prevalent opportunity for learning.

Outside of the sport domain, research has followed the growth in online learning, with several academic reviews summarising key developments in the field. Early reviews by Berge & Mrozowski (2001), Tallent-Runnels et al. (2006) and Zawacki-Richter et al. (2009) identified recurring themes. For instance, research often focussed on instructional design issues, the convenience of online learning, and learners' cognitive and emotional experiences. More recently,

Martin et al. (2020) accumulated the findings of these previous reviews and explored research on recent technological developments, such as the formation of Web 2.0[1] and Web 3.0[2], as opposed to Web 1.0[3]. They established three notable arguments (a) engagement, interaction, community, and participation are important factors in online learning; (b) there is more to be known about topics such as online learning leadership, management, access, and instructor characteristics; and (c) studies often fail to explore the long-term impact of online learning. Despite these insights from research outside of sport, it remains unclear how online learning is experienced in specific areas such as online sport coach learning. This is the focus of this study.

Coach Learning (In-person and online)

Since the early 2000s', in-person coach learning has been the subject of much coaching research (Rangeon et al. 2012). For instance, utilising Coombs & Ahmed's formal (i.e., time bound certified courses), non-formal (i.e., mentoring), and informal (i.e. 'coffee shop' style conversations) framework (Coombs; 1989; Coombs & Ahmed, 1974), Nelson et al. (2006) highlighted that coaches frequently engage in large-scale formal coach certification programmes, such as national governing body (NGB) led coaching awards. Such programmes have been criticised for a lack of relevance to coaches' everyday practice (Chesterfield et al. 2010; Mallett et al. 2009; Sawiuk et al. 2019), the need to impression manage to achieve certification (Rynne et al. 2009), and the inclusion of pseudo-scientific content within *some* formal coach education curricula (Townsend & Cushion, 2017).

[1] Web 2.0 refers to an interactive approach to use of the internet, harnessing collective intelligence, rich user experiences and supports user participation and collaboration (O'Reilly, 2005)

[2] Web 3.0 refers to the semantic technologies, decentralised networks, and AI-driven agents to create a more intelligent and personalised web experience (Rudman & Brewer, 2016)

[3] Web 1.0 is referred to as the read-only web, where users could view information but had little to no ability to interact with or contribute to it (Cormode & Krishnamurthy, 2008)

Alternatively, whilst some pedagogical practices, such as in-situ visits to coaches' contexts and the use of problem-based learning are not without challenges (e.g., resources), they have received positive reports (Chapman et al. 2020; MacDonald et al. 2010; Trudel et al. 2010). Therefore, generalisations from research on in-person coach learning should be treated cautiously because coach learning provisions are constructed differently across countries, sports, and domains i.e., participation focused coaches and performance focused coaches.

Much of the existing coach learning research focuses on in-person coach learning rather than the increasingly prevalent online coach learning provision. Contrasting with this, technological developments (e.g., Web 3.0), and the SARS Covid-19 Pandemic, have led to increasing prevalence of online coach learning via formal courses, non-formal webinars, and informal collaborative opportunities (Cushion & Townsend, 2018). For instance, the English Football Association, International Tennis Federation, Athletics Australia all provide online coach learning opportunities. This proliferation is supplemented by other online coach learning provision including blogs, online mentoring, and social media repositories. Despite this proliferation, breadth, and complexity, scrutiny of online coach learning provision is only beginning to grow (Perez-Caramero et al. 2022). Whilst innovations in practice often occur before research, nonetheless, there is a need for research to evaluate existing progress and inform future online sport coaching developments.

Given the increased prevalence and rapid development of online coach learning (see Atkinson et al. 2022; Szedlak et al. 2023; Koh et al. 2025), there is a need to synthesise what we know about this provision as a means of supporting policy makers, course designers, researchers and ultimately coaches. Cushion & Townsend's (2018) review of the overarching area of technology-enhanced learning (TEL) is perhaps the most credible and relevant of existing reviews. That review helpfully identified that the efficacy of TEL is defined by how and why technology is used, rather

than its mere presence. The value of technology appears to be in enhancing teaching and learning interactions via contextually relevant applications of technology. However, whilst TEL does bear similarities to online learning, it is not the same; therefore, we do not know if being online enhances coach learning[4]. For instance, Cushion & Townsend's (2018) review included Mead et al. (2016) analysis of video technology to elicit self-reflection as a method of coach learning. Learning in this instance may have been enhanced by technology, but it did not necessarily occur online. Additionally, the rapid development of technology includes Massive Open Online Courses (MOOCs) (See Martindale, 2014). These MOOCs often provide asynchronous (i.e. self-paced, flexible, independent of live instructors) learning content such as pre-recorded material (Hrastinski, 2008). Through asynchronous material, MOOCs cover a variety of topics, with an emphasis on open accessibility (Spector, 2014). The proliferation of MOOCs, alongside the growth of convenient social media, has enabled low-cost access to online learning across geographical regions. Thus, the technological capacity for online learning has changed quantitatively and qualitatively since Cushion and Townsend's (2018) review. Furthermore, there have been calls (see Walton et al., 2024) for those who support online coach learning to use learning theory in their design and delivery. Currently it is unclear if learning theory supports online coach learning. Accordingly, the aim of this review is to synthesise research of coaches' experience of online learning since 2017. Doing so will provide an appraisal of online coach learning provision, while also critically directing future research in this significant area.

[4] Coach learning is a broad term including formal coach education, coach development, provision provided by NGB's, higher education institutions and private institutions. This includes a wide variety of purposes, designs and activities.

To achieve this aim, the following sub-questions have been developed, relative to literature since 2017:

1) What have been the methodological strengths and shortcomings of studies exploring coaches' experiences of online learning?
2) What theories have been used to research coaches' experiences of online coach learning?
3) What has research, since 2017, found about coaches' experiences of online coach learning?

Method

To address the aims of synthesising research of coaches' experience of online learning since 2017, a systematic review which included qualitative and quantitative studies was undertaken. Our review protocol was registered at the International Database of Education Systematic Reviews (see IDESR000090). Interpretivism was identified as an appropriate philosophical paradigm for this review, given its emphasis on the subjective meanings individuals ascribe to their experiences. This approach recognises the nuanced and context-dependent nature of online coach learning, where learners' perceptions, interactions, and lived realities play a central role (Cohen, Manion, & Morrison, 2018). By focusing on meaning-making processes, interpretivism also enables researchers to gain an empathetic understanding of the complexities involved in online coach learning. Thus, the interpretivist paradigm aligns with the aim of synthesising the research on coaches' experience of online learning since 2017.

Search Strategy

A systematic search was conducted across academic databases including Web of Science databases (WOS, MEDLINE, SciIELO), SCOPUS, EBSCO (SportDiscus, ERIC, Education Research, CINAHL), PsycINFO and Google Scholar, following PRISMA guidelines (See Figure 1.) (Moher et al. 2009). The SPIDER search protocol (Cooke et al. 2012) was used to define our search terms (See Table 1.). The active search for studies ended in 2022.

Table 1 – Search Strings

INSERT TABLE 1 HERE

To enhance coverage, a citation search was conducted targeting key sport coaching related journals including International Sports Coaching Journal, Sports Coaching Review, and International Journal of Sports Science & Coaching, as well as reference lists within included studies.

The systematic and manual search strategy was informed by an Inclusion and Exclusion Criteria (See Table 2.). We acknowledge the developing nature of online coach learning and therefore adopted an inclusive approach, incorporating studies that used varied and interchangeable terminology. Criteria included all modes of coach learning (formal/informal/non-formal). These range from online learning experiences designed with explicit educational intent (e.g., courses, webinars, or formal online communities of practice), through to informal content consumption, such as blogs or social media posts. We also considered the pedagogical overlap between sport coaching and PE teaching. While distinct roles, in some contexts both teachers and coaches engage with the same learning provision e.g., in the UK many PE teachers will have Level 1 or Level 2 coaching awards. Consequently, we included studies involving PE teachers, when they also participated in sport coaching, either professionally or in a voluntary capacity. This decision was made to maintain relevance to the domain of coach learning while acknowledging the practical realities of dual roles in the field.

Table 2: Inclusion and Exclusion Criteria

INSERT TABLE 2 HERE

Search Procedure

In accordance with PRISMA guidelines (Moher et al. 2009), the search procedure used a three-stage process (See Figure 1.). The full-text screening process involved 100% blind double screen process and was supported by Rayyan (Ouzzani et al. 2016). Following this, 21 studies without agreement between blind reviewers were discussed in a group meeting to determine their inclusion with reference to criteria. Following this stage, 11 studies were included in the review. This was supplemented by the manual search, which yielded an additional 8 studies. Thus, the final number of studies included in this review was 19.

Figure 1: PRISMA

INSERT FIGURE 1 HERE

Quality Appraisal

To assess study quality, the Mixed Methods Appraisal Tool (MMAT) (Hong et al. 2018) was applied. The MMAT (See Tables 3. & 4.) includes appraisal criteria (Hong et al. 2018) that helps reviewers give an *initial* assessment of the methodological quality of quantitative, qualitative, and mixed methods studies. Previous research has reported the MMAT's validity and reliability as ranging from moderate to perfect in relation to its specific criteria, and as substantial when considering the overall quality score of the evaluated studies (O'Cathain, 2010; Pace, 2012). Using the MMAT, each study was assessed against the criterion as fulfilled (✓), unfulfilled (-) or unclear (?). Aligned with the MMAT protocol (Hong et al. 2018), results did not determine the inclusion or exclusion of studies. Rather the MMAT was used to inform the analysis of studies in the meta-method findings. For example, three studies received no affirmative ratings on the MMAT criteria. These were still included in the synthesis reflecting our commitment to inclusivity, the relatively small evidence base in this area, and the risk that omitting these studies could withhold unique perspectives. However, we recognise studies that do not achieve MMAT criteria may have

methodological limitations. As such, we have taken care not to over-weigh their findings in the analysis and refer to them cautiously throughout the findings.

Table 3 – MMAT Criteria

INSERT TABLE 3 HERE

Table 4 – MMAT Results

INSERT TABLE 4 HERE

Data Extraction & Analysis

All 19 studies were read on multiple occasions, so we became fully immersed in the data. A data extraction table, supported by themes identified in Martin et al. (2020) was used as a tool to extract relevant data. An NVivo (Lumivero, 2015) worksheet supported by a Microsoft Excel (Microsoft Excel, 2023) spreadsheet was used to extract key data.

Reflecting the pragmatic approach, this mixed-method review used a QUAL-quan integrated design (Creswell & Plano-Clark, 2011), where quantitative data supplemented qualitative findings. This was appropriate because only 4 of 19 included studies contained quantitative data. Aligned with the study aims and informed by Martin et al. (2020), an abductive reflexive thematic analysis (Braun et al. 2016; Braun and Clarke, 2012) approach was undertaken to analyse qualitative data. This deviates from the protocol, where we intended to do a content analysis. However, a reflexive thematic analysis was deemed a more flexible approach that enabled a synthesis of online coach learning research since 2017 and addresses the three research questions.

As per Braun and Clarke (2012) a reflexive thematic analysis for each research question took place in 6 phases: 1. Data familiarisation, 2. Initial coding, 3. Theme generation, adopting a semantic approach, allowing codes to explore the experiences of the practitioners (Braun et al. 2016), 4. Theme review, with the assistance of critical friends, 5. Link generation between themes, 6. Creation of higher order themes. These themes were developed using a formative 'thematic map' (see supplementary file), which acted as a guide to verbalise and compare the themes (Braun & Clarke, 2006) and key memos derived during data analysis. Supplementing the qualitative analysis, a Microsoft Excel spreadsheet was used to extract key numerical findings, including raw scores, mean values and percentages (%) from the respective quantitative studies. Following this, we created two hand-written 'mind maps' (see supplementary file), to integrate the quantitative findings with the qualitative thematic map, and to organise insights in relation to the research questions. This process is consistent with an integrated mixed-methods design (Creswell & Plano-Clark, 2017) and informed the synthesis and findings that follow.

Trustworthiness of the Review

Several steps were taken to ensure a trustworthy review including registering the protocol in advance, using SPIDER and PRISMA protocols, 100% blind review at stage 3, using a recognised data analysis procedure, and using the MMAT to report on the quality of studies. To assess the methodological quality of this review, we adopted the AMSTAR 2 tool (Shea et al. 2017). The AMSTAR 2 tool is considered more appropriate for evaluating systematic reviews including both qualitative and quantitative studies (Munn et al., 2018), than the GRADE tool (Guyatt et al., 2008), which was initially proposed in the protocol. Using AMSTAR 2, we found high confidence in the results of the systematic review, although we recognise that we included studies which did not explicitly state their exclusion criteria. That said, whilst useful starting points to evaluate quality, we recognise that tools such as AMSTAR 2 and indeed the MMAT are somewhat limited in their ability

to evaluate complex social research in a developing field. Accordingly, we used these as a starting point and endeavoured to be critical. Likewise readers should interpret the findings from their own critical perspective.

Results

Aligned with the research aims to synthesise coaches' experience of online learning research since 2017, findings are presented in three sections: review of methods, theories, and findings (See Figure 2). The following table (Table 5.) will detail the methodological properties of the included studies.

Figure 2: Thematic Map of methodological, theoretical and practical themes of online coach learning

INSERT FIGURE 2 HERE

Purpose 1: Review of Methods

Table 5: Methodological properties of included studies, informed by Martin et al. (2020)

INSERT TABLE 5 HERE

Theme 1: Online coach learning has been researched using a narrow range of methodologies and methods.

Of the 17 studies that collected qualitative data, 11 used interviews and/or focus groups (e.g. Koh et al. 2018; Leeder et al. 2023; Stoszkowski et al. 2017). For instance, Stoszkowski et al. (2017) used focus groups, enabling student coaches to challenge each other through critical discussion and construct insights on their learning experiences via reflective blogs. While valuable for developing understanding through discussion, the prevalence of interviews and focus groups across the extant literature does reveal a narrow range of methods. It is also noteworthy that, some studies (e.g., Browne & Lyle, 2018) did not provide detailed or explicit information about their interview procedures. Moreover, due to methods used, there remains a significant gap in our understanding of how online coach education influences coaches' behaviours, professional practices, and, by extension, the experiences of the athletes they work with. The complexity of assessing such outcomes poses substantial methodological challenges, necessitating the use of longitudinal research methods.

Greater method and indeed, methodological, pluralism across studies may enable researchers to derive new, critical, and more rigorous insights on the phenomenon of online coach learning. For instance, Culhane & Elliott (2016) assert that imaginative ethnographic methods could effectively convey and critically analyse cultural and social life. This could help the field further understand the longer-term impact of online coach learning, a concern highlighted by Martin et al. (2020). The related approaches of 'digital ethnography' (Pink et al. 2015) and 'netnography' (Kozinets, 2015) may similarly provide insights on the social nature and the importance of interaction in online coach learning. Similarly, digital textual analysis, and data mining could reveal patterns in online coach learning (Lee et al. 2008). Additionally, established methodological approaches such as grounded

theory, phenomenology and autoethnography have highlighted considerations in coach learning and coaching practice (Nelson et al. 2025), but remain underutilised in online coach learning research.

Theme 2: Author/Coach Relationships are often present in coach learning research

In 7 of the 19 studies, researchers had substantial prior relationships with participants, often recruiting students from their own academic environments (e.g., Browne & Lyle, 2018; Luguetti et al. 2019; Stoszkowski et al. 2017; 2021; 2022). Prior relationship between researchers and participants can yield benefits such as an assured mutual respect and empathy between researchers and participants (Yassour-Borochowitz, 2004). However, it has been found that the power that teachers may hold over students can impact the behaviour of the students (Yong, 2019). This point is especially pertinent for the 7 studies that recruited undergraduate students. In these studies, it was clear that the intentions of the coach developers were to facilitate student learning (See Table 6.), and some studies attempted to mitigate the risk inherent in a researcher-student relationship. For example, Stoszkowski et al. (2020) and Browne & Lyle (2018) stated that participants were assured that their module grade would not be impacted by participation. All studies that used students as participants also stated that they had procedural ethical approval. Thus, existing studies may have benefitted from close relationships between educators and learners. Nonetheless, for those seeking to conduct future research with more objective or post-positivist leanings, programme planning and evaluation frameworks like RE-AIM (Glasgow et al. 1999), used in previous education research (e.g. Michie et al. 2011), could offer structured approaches to support coach learning interventions, which in turn could enhance coaches' learning experiences and impact coach behaviours. Furthermore, it is important to acknowledge that undergraduate student coaches are frequently novice practitioners and, in many instances, do not actively engage in coaching practice (Martin-Silva et al. 2015). This raises a critical question regarding the extent to which student coaches can provide high-quality data to inform online coach learning provision.

Theme 3: Unclear philosophical positions and steps to ensure rigour.

While Spencer et al. (2014) recognise that researchers can often struggle to navigate philosophical issues (epistemology, ontology), an explicit philosophical position can add clarity regarding the authors' intentions and rigour. Unfortunately, the philosophical position was unclear for 11 of the 18 qualitative and mixed-methods studies in this review (see Table 6.). Exceptions include three explicitly interpretivist studies (i.e., Bernsten et al. 2019; Leeder et al. 2023; Stoszkowski et al. 2017). Other studies (e.g., Browne and Lyle, 2018; Luguetti et al. 2019) implied interpretivist or critical leanings without making this explicit. Nevertheless, for most studies (see Table 6.) the absence of a clear philosophical approach is a concern. For instance, in the absence of a clear philosophical position, it can be difficult to ensure rigour (Smith & McGannon, 2018). Indeed, our review reveals inconsistencies in the description of rigour within studies. Specifically, 13 of the 19 studies failed to explicitly discuss steps undertaken to ensure critical findings. An exception includes Koh et al. (2018) who transparently described their attempts to develop trustworthiness, commenting on the reliability of coding via a peer review process and member checking procedure. While others may question the appropriateness of such steps to qualitative data (see Smith & McGannon, 2018), Koh et al. (2018) also note the credibility of the interviewer as primary data collector by providing a detailed background. Similarly, Santos et al. (2019) showed transparency in their own study with a section titled 'Study Quality'. They provided key details such as how coach education content was created, the coach education context, and how the author's background may help the quality of the study.

While research on online coach learning is predominantly qualitative, four studies incorporated quantitative data collection and analysis, three of which used mixed methods approaches (Harvey et al. 2020; Murray et al. 2023; Poucher et al. 2021). Transparency in the reporting of mixed-methods design is essential, as it enables readers to accurately interpret the

rationale, implementation and integration of methods (Bishop, 2014). A critical concern identified in this review was the lack of clarity and detail in how mixed-methods designs were reported. While Creswell & Plano-Clark (2017) outline several mixed-methods designs (e.g. explanatory, exploratory, triangulation, embedded/integrated), none of the studies reviewed explicitly identified which framework they adopted. All quantitative studies included both descriptive and inferential statistics in their results. Although three of the four studies incorporating quantitative data employed surveys, they measured distinct variables (e.g., coaching behaviours, functions of online coach learning) across varied populations (e.g., coaches from both participation and performance domains). Across these studies, there is limited homogeneity among the quantitative research designs, presenting challenges for meaningful comparisons.

Overall, despite some positive examples, quality varied significantly across studies, as indicated by the MMAT assessment. For instance, Harvey et al. (2020) demonstrated a well-defined research question and robust data collection/analysis procedures. In contrast, other studies had weaker MMAT assessment, largely due to unclear research designs, insufficient sampling strategies, or inconsistent application of data collection tools. Table 6. demonstrates that most studies did not detail explicit philosophical positions nor steps undertaken to ensure rigour.

Theme 4: Limited research on some coaching contexts in online coach learning (e.g. adult high performance and disability).

Existing research has yet to explore many coaches' experiences of online coach learning. Most notably, coaches in adult high-performance contexts and coaches in disability sport are largely absent from existing studies. For instance, out of the 19 studies reviewed, 17 explicitly stated the domain coaches work in (See Table 6.). Of those 17, 14 studies focussed on coaches in participation contexts, whilst 7 focussed on coaches in performance contexts, with some studies including coaches working in both participation and performance contexts. Only 1 study (He et al. 2018) explicitly

concentrated on coaches working in adult high-performance contexts. Indeed, several key questions remain unexplored, such as whether, and to what extent, coaches in high performance contexts engage in online learning, and what their perceptions and experiences are. Rynne & Mallett (2014) have previously reported that coach education for coaches working in high performance context lacks structure, and whilst that may not necessarily be problematic, it leaves us to consider whether the absence of research on online learning for coaches in high performance contexts might reflect this unstructured coach learning provision.

Critically, no studies in this review addressed coaching in disability sport or explicitly included disabled coaches (i.e., coaches with impairments). This omission presents an important limitation, as prior research has highlighted the unique and tailored training requirements of coaching in disability sport contexts (e.g., Townsend et al. 2021; Huntley et al. 2021; Hardwick et al. 2020). For instance, disability sport coaches often need access to specialised knowledge (e.g., physiological or medical needs of their athletes) (Huntley et al. 2021), and it is unclear if such context-specific knowledge is adequately delivered or learnt through online coach learning. Consequently, there remains uncertainty about whether existing online learning opportunities effectively address the distinct needs of disability sport coaches. This represents a critical gap in the literature and underscores the need for further research in this area. Coupled with a narrow range of methods (theme 1), pre-existing relationships between researchers and learners (theme 2), and unclear philosophical positions, this suggests the need for more rigorous, multivocal and and varied methodologies in future online coach learning research.

Purpose 2: Review of Theory

Theme 1: Learning theory is often underused and disparate in practice/existing research

As previous research has highlighted (e.g. Cushion & Nelson, 2013; North, 2013; 2017), coaching and coach learning researchers have historically used a range of theories, drawn from

diverse areas such as education, medicine, science, and disciplines (e.g., sociology, psychology, pedagogy) to inform their work. This review finds that online coach learning research follows a similar trend. There is no dominant learning theory underpinning the studies (Table.7). Instead, studies in this review used a variety of learning theories, often developed in non-coaching contexts. For example, Leeder et al. (2023) adopted the work of Jennifer Moon (2001; 2004) to view coach learning through a constructivist lens. Leeder et al. (2023) highlighted the relevance of Moon's (2001; 2004) learning theories to short courses. With this established, Leeder et al. (2023) stated that surface rather than deep learning appeared to take place in online courses. In this way, Moon's theories enabled the critical evaluation of coach learning provision. It also provides theoretical transferability for readers to consider their own learning provision.

Notwithstanding the value of utilising theories to consider online coach learning only 7 out of 19 studies used an explicit learning theory. From these 7, 4 used learning theory to inform the development of online coach learning provision (Lara Bercial et al. 2019; Santos et al. 2019; Bernsten et al. 2019; Browne & Lyle, 2018), whereas 3 studies used learning theory as a post-hoc means of evaluating learning practice. This suggests that many studies are a-theoretical, but it does not mean that all provision is necessarily a-theoretically designed. Rather, we are mindful of Patton's (2011) caution to consider whether the post hoc use of learning theories is truly reflective of the learning processes used in the design and delivery of the respective online coach learning provision. Instead, we acknowledge that course designers, situated within their everyday practice, inevitably draw upon their own implicit theories and understandings, even if they do not explicitly label them as such. Thus, in future work we encourage online coaching researchers to consider implicit and explicit theoretical and philosophical influences on the design of online coach education. Indeed, the perspectives of course designers and policy makers warrant further attention.

Table 6: Learning theories within the included studies.

INSERT TABLE 6 HERE

Theme 2: Where are the learning theories that consider online learning?

While many studies did not explicitly utilise any learning theory (see Table 7.), and while coaching specific learning theories are largely absent (See Purpose 2: Theme 1), we also recognise that when existing online coach learning literature has used theory, these theoretical perspectives have largely been adopted from in-person learning research (e.g. Luguetti et al. 2019). More precisely, few studies have applied learning theories specifically developed to explore online learning. For instance, while Lara-Bercial et al.'s (2019) work is grounded in social constructivism (i.e., Vygotsky, 1978), and Santos et al. (2019) draw upon constructionist critical pedagogy (i.e., Buckingham, 1996) to provide valuable understandings of the coach learning processes, they may insufficiently address the distinct elements of online learning environments. As such, there is a pressing need to critically consider whether alternative or adapted frameworks are necessary to capture the dynamics of online learning. For instance, except for Bernsten et al. (2019), the included studies do not draw upon the work of Richard Mayer (2003; 2008). Mayer's work focuses on the effective design of multimedia learning (i.e. use of images, videos) and the findings would appear directly relevant to those who design online coach learning. Likewise, other relevant multimedia and virtual learning theories were not considered in the studies. For example, connectivism, or 'connective knowledge' (Siemens, 2005; 2009) considers the impact of technology in education on the basis that learning and knowledge rests in diversity of opinions. Through a connectivist lens, course designers can use graphics and web technologies to create interactive environments for students to virtually share perspectives (Chittaro & Ranon, 2007). Connectivism therefore has much to offer those designing, implementing and evaluating online coach learning that includes the use of webinars and draws on content available via social media platforms such as YouTube. Similarly,

post-humanism (see Bayne, 2016) considers the intersection of the human and non-human entities such as machines, computers, and technologies (Foster, 2005). Here, new technological advances (e.g., virtual calls, asynchronous courses, artificial intelligence (AI)) are seen as augmenting and inextricably linked to human experience of teaching and learning. This does not mean technology replaces teachers (read coach educators/developers), but rather a post-humanist lens prompts consideration of how nonhuman entities can work in conjunction with human teachers (e.g., AI as a coach learning tool). Given the growing influence of nonhuman entities, such as digital technologies, algorithms, and AI, on learning processes globally, we argue that post humanist perspectives may provide critical consideration of online coach learning (Bayne, 2018). To date, however, no studies of online coach learning have drawn on post-humanism, nor connectivism, while Mayer's work also appears underutilised. This suggests the need for more studies of online coach learning to be informed by relevant multimedia and virtual theories.

Theme 3: Conceptual uncertainty: What constitutes 'online coach learning'?

Across and within the studies in this review several terms have been used including online learning (Leeder et al. 2023), e-learning (e.g. Lara-Bercial et al. 2023), and online education (e.g. Driska, 2018). In the wider education field researchers have often struggled to define online learning (Singh & Thurman, 2023). When factoring in the complex and contested nature of sport coaching where debate still exists about what is a coach, coaching and contexts (see Lyle & Cushion, 2016), it is understandable that defining online coach learning is also difficult. Furthermore, terms such as coach education (e.g. Driska, 2018), coach learning (e.g. Harvey et al. 2020), and coach development (Langdon et al. 2023), have been used. Additionally, online and in-person learning may be blended, as might formal/informal/non-formal learning in online settings. We also note the critical issue of defining learning often remains unaddressed in many studies. Coupled with the dynamic nature of evolving technology, these complexities mean that it is not surprising that studies have struggled to provide conceptual clarity when exploring online coach learning. This absence of conceptual

436 certainty is problematic because it can be unclear what mode of online coach learning researchers are
437 investigating. Without such clarity, it is not always obvious what practices are occurring, or how
438 online coach learning is experienced. Accordingly, it can be difficult to provide and accept specific
439 recommendations from online coach learning research. This poses a risk to the research field by
440 encouraging comparisons without adequately accounting for the nuanced and complex nature of
441 different provisions Indeed, in the absence of conceptual definitions, research is in danger of
442 focussing on *technology* rather than *learning* in and via technology.
443
444 Since this review was undertaken, Szedlak et al. (2023) have provided a working definition
445 of online coach learning. Whilst this is helpful for current studies, however both Szeldak and this
446 review recognise the need for more precise conceptual understanding. In the face of conceptual
447 ambiguity in the field, this review adopted a broad and inclusive approach with the aim to synthesise
448 research of coaches' experience of online learning since 2017. Given the broad scope of this review,
449 and the absence of conceptual clarity in the field our insights remain somewhat general in relation to
450 the complex and ill-defined phenomenon of online coach learning. Establishing conceptual clarity is
451 therefore essential, as it enables a more rigorous and critical examination of both existing research
452 and current practices. This process may necessitate the consideration of established frameworks,
453 such as Technological, Pedagogical, and Content Knowledge (Mishra & Koehler, 2006; Koehler &
454 Mishra, 2009). Furthermore, we acknowledge that attaining greater conceptual clarity may require
455 ongoing contributions from both practitioners and experts because the field is developing and
456 learning is complex. This is not a new issue however, as Lyle (2002; Lyle & Cushion, 2016) has long
457 argued, there is a need for conceptual validity in the coaching field. Supplementing work Lyle and
458 Szedlak et al., we make a similar call for conceptual clarity in the specific area of online coach
459 learning.
460 ***Purpose 3: Review of Findings***

Table 7: Topic (informed by Martin et al. 2020) Explored in Included studies

INSERT TABLE 7 HERE (PART 1)

INSERT TABLE 7 HERE (PART 2)

Theme 1: Convenient, and accessible learning is valued by sport coaches

In this review, 10 studies (e.g.: Bernsten et al. 2019; Browne & Lyle, 2018) showed accessible online material is reported to enhance coaches' learning experiences (See Table 8.). For instance, participation coaches in Leeder et al. (2023, p.6) stated:

> it was much more accessible, and I understand during lockdown that it worked well as people were still able to access the Level one course and also, I think if you got anything wrong, you could go back and do it again.

As research has previously noted, the SARS covid-19 pandemic accelerated online learning provision (e.g., Callary et al. 2021; Paudel, 2021). In this period, learning design which was accessible for coaches was crucial. Beyond ease of access, studies also emphasised the important role of multimedia in learning. Coaches working in participation contexts found verbal and auditory content to be highly engaging (Stoszkowski et al. 2022), while a coach working in a performance context highlighted how videos helped develop his knowledge on intervention styles in coaching practice (Bernsten et al. 2019). Critically, there is limited available information regarding the interviews (e.g. range of duration, tools used) in which coaches emphasised these points and therefore, these findings should be interpreted with caution. However, the inclusion of multimedia is generally perceived to support coach learning (see also Driska, 2018; Poucher et al. 2021). Further emphasising the importance of convenient content, Harvey et al. (2020) showed 44% of the coaches surveyed use Twitter (now X) multiple times per day, and 27% of coaches daily, with coaches often citing ease of access as a rationale to social media for educational needs. Studies also showed that learning provision, which was difficult to navigate, led to poor experiences as highlighted by Driska (2018, p.270): "some technical barriers of the course (i.e., course content not accessible after course completion) impeded future conversation." Additionally, He et al. (2021) found language barriers often restricted Chinese performance coaches on the Internet. Due to this, these coaches often resorted to watching videos. This illustrates that poor platform and provision design, which is

deemed inconvenient or inaccessible for coaches, could obstruct learning, prompting coaches to seek more user-friendly alternatives. To summarise the extant literature, accessible and convenient learning provision, may lead to coaches perceiving online supported coach learning positively. That said it should be noted that in all ten studies, there was no explicit evidence that coach developers were focused on ensuring an accessible learning environment, and we remind readers that there are no studies in this review explicitly involving disabled coaches.

Theme 2: Interaction between learners can positively influence coaches' experience of online coach learning

Across both participation and performance coaching domains, studies in this review demonstrate that interaction between coaches can enhance perceptions of online learning experiences (see He et al. 2018; Langdon et al. 2022; Leeder et al. 2023; Santos et al. 2019). For example, participation coaches in Leeder et al. (2023, p.8) showed a desire for interaction:

> Being able to ask more in-depth questions would have been helpful. The knowledge on the online courses is finite whereas when face-to-face with an experienced coach [tutor] there is a greater depth of knowledge to be gained.

The opportunity to interact with tutors and peers alike allows coaches to ask bespoke questions, which coaches in Leeder et al. (2023, p.8) described as "invaluable". Furthermore, Harvey et al. (2020) demonstrated how coaches seek frequent interaction in their learning experiences, as 60% state their primary use of Twitter (now X) is networking. These coaches shared a conscious effort to network on social media, because there are 'professional coaches' on social media to learn from who may otherwise be difficult to reach. It becomes apparent from the evidence of these studies that interaction may positively impact learner satisfaction. This supports the conception that online coach

learning could be a social activity (see theoretical review). It is also consistent with historical research (e.g., Coldevin et al. 1985; Zawacki-Richter et al. 2009), which has long established that interaction is a critical part of 'distance education'.

What is concerning, given the importance of interaction, is that participation coaches in Leeder et al. (2023) see interaction with tutors as difficult, in comparison to in-person learning. Although we recognise learning can also take place independently, and prior research (Anderson, 2003) cautions that not all online interaction is positive, without interaction with tutors, coaches may experience less engagement (Ciampolini et al. 2019; Reddan et al. 2016) and learning may be limited (Webb & Leeder, 2022). We must also be aware that some coaches find online coach learning difficult. For instance, whilst there is evidence from existing studies that coaches may prioritise a high level of interaction with peers, others may value interaction with tutors, whilst other may prefer an asynchronous approach with limited interaction. Therefore, it is crucial for coach developers to assess and align their approaches with the varying interactive needs of coaches and for further theoretically informed research (e.g., using connectivism) to explore coaches' online interactions in more detail. To do this, there is a need to know more about the pedagogies and experiences of online coach developers.

Theme 3: Coaches perceive online learning can increase knowledge, their reflective practice, and confidence in their coaching practice

Influenced by coach friendly learning design (Theme 1.), and social interaction (Theme 2.), coaches working in participation and performance contexts perceived online coach learning as a means to improving knowledge acquisition (Driska, 2018; Grant et al. 2020; Harvey et al. 2020; Koh et al. 2018; Leeder et al. 2023; Poucher et al. 2021; Santos et al. 2019; Stoszkowski et al. 2017; 2022), increasing confidence in practice (Harvey et al. 2020; Stoszkowski et al. 2017; 2022) and developing reflective skills (Bernsten et al. 2019; Driska, 2018; Leeder et al. 2023; Santos et al. 2019; Stoszkowski et al. 2017; 2022). For instance, coaches perceived enhanced knowledge, and an

improved awareness and understanding of theoretical concepts as a potential benefit of online learning practice, as demonstrated by participation coaches in Stoszkowski et al. (2017, p.413), who utilised online shared blogs:

> it's probably the best assignment that I've done in terms of learning … it's debateable if you actually learn anything with the other assignments … I've actually learned stuff out of this one, whereas I don't think I have in many others.

Interestingly, student coaches in Stoszkowski et al. (2017) highlighted the value of a formal assignment as a means of supporting knowledge acquisition. They identified aspects such as the assignment's format, accessibility, and its ability to help link theory to practice as key benefits. However, it is important to interpret the findings of Stoszkowski et al. (2017) with caution, due to an undergraduate settings (see Purpose 1: Theme 2), and low score on MMAT. Nonetheless, similar results were reported by Murray et al. (2022) where coaches agreed or strongly agreed that their knowledge was enhanced through online coach learning methods such as video-on-demand, interactive video learning, and directed learning.

While some studies, such as those by Leeder et al. (2023), have highlighted that short online courses often lead to surface learning, where coaches may adopt a 'copy and paste' approach to passing, reflective processes can still occur in online learning environments. For instance, several studies (Bernsten et al. 2019; Driska et al. 2018; Leeder et al. 2023; Santos et al. 2018; Stoszkowski et al. 2017; 2022) have reported coaches experiencing instances of 'deep' learning which are linked to reflective practice. This suggests that coaches can engage in meaningful self-reflection within the online context. Overall, then, while much caution should be undertaken, early research into online coach learning suggest that coaches experienced improved knowledge, reflective practice, and increased confidence.

Theme 4: Unexplored areas in online coaching learning research

This review highlights significant gaps in online coach learning literature. Most notably, findings do not report the impact that online coach learning has on coaches' practices, and indeed the impact on athletes are also absent. For example, no papers in this review researched whether the respective methods of online coach learning had a long-lasting impact on the behaviour of coaches. This means the efficacy of online coach learning is yet to be verified. Therefore, evidence-based comparisons to face-to-face learning should not be made at this stage.

Other areas that require future research include course leadership, management, ethics, policy and instructor characteristics in online coach learning (see Table 8. & 9.). Specifically, 12 of the 19 studies did not examine course leadership, and 13 did not explore course management. Exploring leadership and management in online coach learning is crucial because the intentions of course developers and influences upon them, may shape the learning design increasingly experienced by coaches. The included studies revealed no consistent rationale for online coaching provision, with intentions varying from health education to fostering reflective practice, and several studies failing to clearly define the purpose of the coach learning being explored, regardless of coaching domain. Despite scoring low on MMAT, Lara-Bercial et al. (2021) is one of few studies that provided in-depth reports on the iCoachKids course objectives, design and rationale. However, aside from rare exceptions like this study, existing research often replicates the non-sport finding of Martin et al. (2020), who noted that online learning research often focuses on topics such as learner engagement. However, it is recognised that coaches' motivation to engage in coach learning may significantly influence their engagement, which warrants further longitudinal investigation. Studies rarely focus on the leadership, management, ethics, policy, and instructor characteristics that influence this learner engagement. Thus, as with the broader field of online learning, these areas (e.g., impact, leadership, ethics) should become the focus of future online coach learning research. Related to this,

591 although this review was designed to explore coaches' experiences, current literature appears to lack
592 multivocal insights (e.g. developers, policy makers, athletes, coaches in disability sport and disabled
593 sport coaches). Such perspectives may be helpful in generating a greater understanding of the online
594 coach learning processes, practices and impact.

595

596 **Discussion**

597 This review aimed to synthesise research on coaches' experience of online learning since
598 2017. Findings reveal that coaches across participation and performance domains perceive online
599 coach learning to yield several benefits such as a sense of increased knowledge (e.g., Driska, 2018;
600 Grant et al. 2020), confidence in practice (e.g., Harvey et al. 2020; Stoszkowski et al. 2017) and
601 improved reflective practice (e.g., Bernsten et al. 2019; Leeder et al. 2023). Accessible learning
602 design (e.g., Bernsten et al. 2019; Browne & Lyle, 2018), and quality interaction (e.g., He et al.
603 2018; Langdon et al. 2022) were perceived as key determinants of these benefits.

604 Critically, much extant online coach learning research does not use an explicit learning
605 theory. Of those studies that do use learning theories (e.g., Leeder et al. 2023; Santos et al. 2019),
606 none use a learning theory primarily focussed on learning in virtual environments. (e.g.,
607 connectivism, see Siemens, 2005; 2009). Thus, at this point, it is unclear how online coach learning
608 is experienced when learning is explicitly supported or evaluated by a digital learning theory. This is
609 significant, given that there are practical considerations, such as the nature of online connection
610 (Siemens, 2005), which must be considered in the virtual domain. Relative to connection, interaction
611 appears to be an important factor in developing effective online coach learning. Across the sample,
612 some formal online coach learning (e.g., Leeder et al. 2023) and informal learning modes such as
613 blogs (e.g., Stoszkowski et al. 2017) have shown promise, with the potential to support coaches to
614 acquire knowledge, or develop reflective skills. Wider research (e.g., Martin et al. 2020; Singh &

615 Thurman, 2023) similarly supports that value of interaction in online learning. Of course, the gamut
616 of online platforms may mean that such interaction can be facilitated asynchronously (i.e., peer-
617 computer interaction) or synchronously (i.e., peer-tutor interaction). These platforms may require
618 different pedagogical approaches and may be best suited to different pedagogical aims. Additionally
619 online interaction may not always need to directly occur between coach educators and coaches.
620 Rather interaction could manifest between coaches themselves, depending on both pedagogical
621 strategies, theories of learning used, and platform capabilities.

622 Moving beyond *how* coaches learn online, we were intrigued by *which* coaches have had
623 engaged with online coach learning. Studies in this review often focussed on undergraduate coaches
624 as participants (e.g., Browne & Lyle, 2018; Luguetti et al. 2019), with few studies exploring high
625 performance coaches' or disability sport coaches' experiences. More broadly, across the sample
626 participant characteristics are often reported without much detail, which restricts the ability to draw
627 meaningful conclusions about those involved. As a result, this review was unable to determine how
628 perceived benefits and challenges of online coach learning may vary according to learner attributes
629 such as age, gender, prior knowledge, or motivations. This is remiss because the review illustrates
630 that accessibility is fundamental to online coach learning. It is therefore necessary to understand
631 which coaches are included and excluded from online learning provision. For instance, wider online
632 learning has been shown to be beneficial for those technologically proficient (Raja &
633 Nagasubramani, 2018). However, others, (e.g., older generations, disadvantaged populations) may be
634 excluded from learning online because they do not have access to digital technology (i.e., digital
635 inequality) (Tate & Warschauer, 2022; British Academy, 2022). Related to this, one of the more
636 salient aspects to consider is the digital literacy and skills of coaches. Digital literacy is defined as
637 'the capabilities required to thrive in and beyond education, in an age when digital forms of
638 information and communication predominate' (Littlejohn et al. 2012, p.547). This is important
639 because it has been shown in other fields (e.g., higher education) that a lack of digital literacy can

lead to learners being marginalised (Spante et al. 2018). Thus, it remains to be seen if the benefits of online coach learning are experienced by all coaches.

Strengths and Limitations

This systematic review employed a rigorous methodological approach, including a protocol registered on IDESR (https://idesr.org/article/IDESR000090), a 100% blind peer review screening process, and the use of the MMAT (Hong et al. 2018) quality appraisal tool as a basis for a robust evaluation of the included studies. The scope of the review was comprehensive, examining methods, theories, and practical findings across the literature. Given the increasing prominence of online coach learning research internationally, this rigorous paper is particularly significant, addressing a rapidly growing area of study. However, there are several limitations to this review. The literature search was conducted prior to Szedlak et al.'s (2023) working definition, which, if used, may have led to the inclusion or exclusion of alternative studies. More recent developments in AI and virtual reality were also not included in the searches. These developments reflect the 'movable feast' that is technological developments and necessitate that reviews such as this are provided to support researchers, policy makers, practitioners.

Future Research and Practitioner Implications

Whilst the authors are conscious of the valuable working definition of online coach learning from Szedlak et al. (2023), further research is needed to conceptually and practically document the complex nature of online coach learning including AI and virtual reality. Doing so may help to alleviate conceptual ambiguities and provide contextually precise analyses of online coach learning. Secondly, various topics identified by Martin et al. (2020) as fundamental to understanding online learning remain underexplored within the context of online coach learning. These include

institutional support, policy and management, course design, and course assessment. Thirdly, the lived experiences and pedagogical practices of online coach developers are largely absent from existing research. Additionally, the experiences, activities and pedagogies of individuals who provide informal online coaching material such as content creators, social media educators, and coaching-related influencers are also worth exploring. Finally, there is little analysis of the impact of specific types of online learning on various coaches' practices (e.g., disabled coaches or those with low digital literacy). There is also little analysis that connects online coach learning to athletes' experiences, learning or performances. To address this absence of impact studies, longitudinal research that moves beyond a 'washout effect' is essential. This may necessitate a broad array of research methodologies (e.g., digital ethnography). Doing so would provide a comprehensive analysis of online coach learning from policy makers through coach educators, content creators and eventually to athletes.

This review has important implications for policy makers, course designers and coach educators. Evidence suggests that online coach learning is best experienced by coaches when it is accessibly designed (e.g., Bernsten et al. 2019; Leeder et al. 2023), interactive (He et al. 2018; Langdon et al. 2022), and utilises multimedia features (e.g., Driska, 2018; Poucher et al. 2021). Such provision may however be costly to develop (Huang & Lanford, 2024). In the absence of a robust evidence base that evidences the long-term impact of online coach learning, practitioners should therefore critically consider the efficacy of such investment. For instance, what is the opportunity cost of allocating budgets to online provision rather than in-person forms of coach learning (e.g., in-person mentoring, in-person communities of practice). If practitioners do invest in online coach learning, it is imperative that they develop provision that is well designed to support learners. Here, online pedagogies and digital learning theories may add value. Moreover, research on existing in-person coach education, shows the importance of alignment between policy makers, course designers and coach educators (Dempsey et al. 2022). Likewise, in online coach learning a shared

689 understanding of online pedagogies may help alignment between policy makers, course designers
690 and coach educators. Furthermore, policy makers, course designers and coach educators may also
691 need to consider how they support coaches' digital literacy alongside the development of alternative
692 provision for those experiencing digital poverty.

693

694 **Conclusion**

695 Reflecting the significant growth of provision, this systematic review explored existing research on
696 online coach learning from 2017. 19 studies were examined and critically reviewed with references
697 to methods, theory and findings. The current body of research suggests that when it is accessible and
698 interactive, online coach learning is positively experienced with examples including a greater sense
699 of knowledge and confidence. Online coach learning therefore appears to hold potential as a mode of
700 professional development, albeit the practice remains in relatively early stages. Notwithstanding this
701 potential, the findings indicate that significant gaps remain in our understanding of those who
702 facilitate online learning for coaches, particularly with respect to their professional identities,
703 pedagogical activities, and lived experiences. Moreover, there is insufficient evidence to determine
704 whether participation in online coach learning produces sustained changes in coaches' practice or
705 behaviour. Additionally, the existing research base suffers from a lack of philosophical and
706 conceptual clarity. To advance the field more research is needed to understand how online learning
707 influences coaching practice, to determine the contextual and personal factors that affect its
708 effectiveness, and to develop evidence-based principles for designing and implementing online
709 coach learning provision. In sum, whilst online learning provision is often promising from the
710 perspective of coaches, there is currently a lack of robust empirical evidence to establish the long-
711 term impact of online coach learning on coaching behaviour and practice.

712

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