A Systematic Review of Research into Coach Perspectives and Behaviours Regarding Doping and Anti-Doping.

Luke T. Barnes, Laurie B. Patterson, Susan H. Backhouse

Carnegie School of Sport

Leeds Beckett University

Author Note:

Luke T. Barnes, Laurie B. Patterson, Susan H. Backhouse: Carnegie School of Sport, Leeds Beckett University, Leeds, United Kingdom

Correspondence concerning this article should be addressed to Luke Barnes, Leeds Beckett University, Fairfax Hall 227, Headingley Campus, Leeds, LS6 3QS, United Kingdom. Email: L.T.Barnes@leedsbeckett.ac.uk

Abstract

Objectives: Doping threatens the integrity of sport and the health and wellbeing of athletes. Operating as both a risk and protective agent, coaches may influence athletes' (anti-)doping thoughts, feelings and behaviours. The objective of this study was to systematically review empirical coach anti-doping literature over a 20-year period between World Anti-Doping Agency formation (1999) and the present day (2019) to help better understand coaches' perspectives and behaviours in relation to doping and anti-doping in sport.

Design: A systematic review was conducted using PRISMA guidelines.

Methods: Electronic searches of seven databases, twenty-four journals and citation pearl growing identified published studies between 1999 and 2019.

Results: Thirty-eight studies were included in this review. Three higher order themes were identified (individual, behavioural and contextual factors), consisting of a total of five themes (self-reported behaviour, hypothetical behaviour, coach beliefs, knowledge, and psychosocial components). Findings documented a changing research landscape, which revealed a greater frequency of total publications and emergence of qualitative study designs in conjunction with the development and induction of the 2015 World Anti-Doping Code.

Conclusion: Over the last 20 years the anti-doping literature addressing coaches has developed and diversified from narrowly focused quantitative studies of coaches' knowledge and beliefs, to broader considerations of behavioural and contextual factors through the use of qualitative and mixed/multi-method designs. Although the existing literature sheds some light on coaches' perspectives and behaviours relating to doping prevention, further high-quality studies investigating the wider context surrounding coach behaviours, underpinned by meta-theory, are needed to fully understand the complexity of doping in sport and guide future policy and practice.

Keywords: sport; coaching; athlete support personnel; doping; anti-doping; drugs

A Systematic Review of Research into Coach Perspectives and Behaviours Regarding Doping and Anti-Doping.

Abstract

Objectives: Doping threatens the integrity of sport and the health and wellbeing of athletes. Operating as both a risk and protective agent, coaches may influence athletes' (anti-)doping thoughts, feelings and behaviours. The objective of this study was to systematically review empirical coach anti-doping literature over a 20-year period between World Anti-Doping Agency formation (1999) and the present day (2019) to help better understand coaches' perspectives and behaviours in relation to doping and anti-doping in sport.

Design: A systematic review was conducted using PRISMA guidelines.

Methods: Electronic searches of seven databases, twenty-four journals and citation pearl growing identified published studies between 1999 and 2019.

Results: Thirty-eight studies were included in this review. Three higher order themes were identified (individual, behavioural and contextual factors), consisting of a total of five themes (self-reported behaviour, hypothetical behaviour, coach beliefs, knowledge, and psychosocial components). Findings documented a changing research landscape, which revealed a greater frequency of total publications and emergence of qualitative study designs in conjunction with the development and induction of the 2015 World Anti-Doping Code.

Conclusion: Over the last 20 years the anti-doping literature addressing coaches has developed and diversified from narrowly focused quantitative studies of coaches' knowledge and beliefs, to broader considerations of behavioural and contextual factors through the use of qualitative and mixed/multi-method designs. Although the existing literature sheds some light on coaches' perspectives and behaviours relating to doping prevention, further high-quality studies investigating the wider context surrounding coach behaviours, underpinned by meta-theory, are needed to fully understand the complexity of doping in sport and guide future policy and practice.

Keywords: sport; coaching; athlete support personnel; doping; anti-doping; drugs

Introduction

Doping is a current issue that threatens the integrity of sport and the health and wellbeing of athletes (UK Anti-Doping; UKAD, 2019). It is defined as the occurrence of one or more of the anti-doping rule violations (ADRVs) set out in Article 2.1 to 2.10 of the World Anti-Doping Code (WADC; World Anti-Doping Agency [WADA], 2015). Previous research has suggested that coaches may have a significant influence on athletes' anti-doping attitudes and behaviours, implicating coaches as risk and protective agents towards athlete doping (e.g., Dimeo et al., 2013; Lentillon-Kaestner & Carstairs, 2010). In light of this influence, coaches are prescribed specific roles and responsibilities in the WADC (WADA, 2015) and are bound by the anti-doping rules. Failure to adhere to these rules can lead to an ADRV and subsequent sanctions, such as being ineligible from any competitive involvement in their sport for up to four years (WADA, 2015).

Empirical evidence points to the potential influence of coaches on athletes' doping beliefs and behaviours (e.g., Ntoumanis, Barkoukis, Gucciardi & Chan, 2017) and emphasises the need for coach-focussed anti-doping research. A previous review of empirical research addressing coaches' anti-doping knowledge, attitudes and beliefs (Backhouse & McKenna, 2012) highlighted only four, cross-sectional, self-report studies between 1990 and 2011, demonstrating a limited number of studies and range of research designs utilised within the coach anti-doping literature at this time. These studies investigated individual coach factors, including knowledge, attitudes and beliefs relating to doping in sport. Across 556 surveyed coaches, whilst the majority lacked knowledge related to doping in sport, they self-reported anti-doping attitudes and acknowledged their responsibility in undertaking a general anti-doping role (Laure et al., 2001; Fung, 2006; Fjeldheim, 1992; Scarpino et al., 1990). Although useful, these studies did not explore the specific nature of coaches' anti-doping roles. Consequently, Backhouse and McKenna (2012) called for future research to move beyond the limited investigation of individual factors, identifying a need to understand coaches' anti-doping roles situated within their wider situational and normative context.

Coach anti-doping policy has progressed since Backhouse & McKenna's (2012)

review, with the introduction of a new WADA Code in 2015 (WADA, 2015). Compared to the previous 2009 Code, Article 21 of the 2015 version expanded on athlete support personnel (ASP) roles and responsibilities, emphasising the importance of organisational collaboration in anti-doping efforts and disclosure of any previous ADRVs. In addition, Article 2 also introduced a new ADRV of prohibited association, making it a Code violation for an individual to associate in a professional or sport-related capacity with ASP who are currently ineligible through doping-related offenses. This increased focus on ASP ADRVs and doping prevention (WADA 2015) represented a shift from reactive, secondary prevention strategies that focused on doping detection and deterrence (Lucidi, Mallia & Zelli, 2015). The frequency and focus of coach anti-doping literature has also progressed to consider coaches' roles in doping prevention (e.g., Engelberg & Moston, 2015).

The influence of ASP continues to be acknowledged within the forthcoming 2021 WADC (WADA, 2019), and doping is increasingly recognised as a complex behaviour situated within a wider social context (Backhouse, Griffiths & McKenna, 2018; Backhouse, Whitaker, Patterson, Erickson & McKenna, 2016). Indeed, this greater acceptance of doping as a complex phenomenon could potentially influence how doping is conceptualised as a problem. Furthermore, in order to understand how coaches can be effectively mobilised to promote anti-doping behaviours, research must consider both individual coach characteristics and the environment coaches create for their athletes. Establishing how coaches can exhibit effective anti-doping behaviours is critical as existing policy does not specify the exact nature of coach engagement in anti-doping behaviours (Patterson & Backhouse, 2018). In addition, existing coach anti-doping programs such as CoachTrue (WADA, 2018) and Coach Clean (UKAD, 2018) are not obviously evidence-informed and buy-in from coaches and wider organisations has been limited (Patterson, Backhouse & Duffy, 2016). In order to develop evidence-based interventions that promote coaches' primary prevention of doping, a robust research base is required.

Consequently, this review aims to systematically and critically review the anti-doping coach literature from 1999 (year of WADA induction), until 2019. This 20-year time period

enables the evolution of coach-anti-doping research to be examined within the wider context of global anti-doping policy, considering studies conducted before the first WADC of 2004, through to after the introduction of the 2015 WADC (which emphasises the increased responsibility and liability of coaches as key ASP (WADA, 2015). This time period also covers the start of the review process for the next WADC, which began on November 2017, was finalised in November 2019 and will be introduced for January 2021 (WADA, 2019). Within this analysis of how the coach anti-doping landscape has changed over time, the review aims to synthesise key findings related to coaches' perspectives and behaviours associated with doping and anti-doping in sport.

In order to improve comprehension of this growing research field, and inform future research directions and policy development, it is timely to utilise a mixed studies systematic review design to examine existing coach anti-doping literature (Khan, Kunz, Kleijnen & Antes, 2003). In a mixed studies systematic review, narrative synthesis is used to combine such diverse designs, methodologies and findings (Pope, Mays & Popay, 2007; Whittemore & Knafl, 2005). Reviewing this literature through integrating methodologies will develop a deeper level of understanding of the specific coach anti-doping research landscape and explore how this landscape has changed over time (McEvoy & Richards 2006). To ensure methodological rigour, guidelines established by Popay et al., (2006) inform the development of narrative syntheses, which have been effectively employed by previous systematic reviews of coaching literature (e.g., Norris, Didymus & Kaiseler, 2017; Staff, Didymus & Backhouse, 2017). In addition, the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines should be adopted to ensure methodological rigor throughout all sections of a review (Moher et al., 2010, 2015).

Method

Search Strategy

In line with PRISMA guidelines the research team generated a clearly defined search strategy, including the databases searched, key search terms and search fields (Moher et al.,

2010, 2015). The research team collaboratively and iteratively generated a list of relevant search terms using keywords from previous published anti-doping literature and a priori knowledge. Search terms were generated across three levels representing doping as the phenomenon under study, cognitive-behavioural characteristics and the specific population of interest (see Table 1). Full-text searches were conducted at two stages (31st March 2019 and 31stth August 2019), using search fields of 'Title', 'Abstract' and 'Keyword'. Specifically, seven databases were used, including PubMed, PsycINFO, PsycARTICLES, SPORTdiscus, CINAHL, Scopus and ERIC. These databases represented disciplines of psychology, sport and health, and largely replicated those used in an earlier review of coach anti-doping literature (Backhouse & McKenna, 2012). Electronic database searches identified a total of 843 records. In addition, electronic journal searches and citation pearl growing identified a further 16 records. All 859 records were imported and stored in an electronic folder on Mendeley™ reference management software. Information stored included details of authors, year of publication, title, journal and abstract. Ahead of sifting, duplicates (n=315) were removed from the database through the Mendeley™ 'Check Duplicates' function, followed by manual duplicate checks conducted by the first author.

Criteria for Inclusion

PRISMA guidelines emphasise the need to state clearly defined inclusion criteria for literature searches (Moher et al., 2010, 2015). Inclusion criteria were generated ahead of sifting retrieved records to ensure the inclusion of papers that were relevant to the aims of the review. To be included, papers must have been published in peer-reviewed journals, available in full-text, available in English and explicitly state the research methodology used. Papers must have actively recruited coach participants and explicitly investigated their perspectives and/or behaviours related to doping and/or anti-doping in sport. The included publication date range represented a 20-year timeframe from WADA formation (1999) to the present day (2019) and allowed analysis of the changing coach anti-doping research landscape over time.

Sifting of Retrieved Records

Informed by PRISMA guidelines (Moher et al., 2010, 2015), sifting consisted of three stages, whereby the first author reviewed records at title, then by abstract and then full-text article (Jones et al., 2004). Inclusion criteria were systematically applied at each sifting stage and any records that did not satisfy these criteria were excluded (see Figure 1). In line with recent coaching systematic reviews (e.g., Norris et al., 2017; Staff et al., 2017), inter-rater reliability checks were conducted by the second named author, who reviewed a 10% minimum sub-sample of the retrieved abstracts (n=36) and full texts (n=13). There were one and five discrepancies across the sub-samples of abstracts and full texts respectively, which were documented in a Google Sheets™ document. Discussions between the first and second author resulted in a shared consensus based on the inclusion criteria. In addition, the first author emailed an outline of the purpose of the review and a list of the included papers to the lead author of each included paper. They were requested to review the sample and highlight any missing papers that may be relevant to the aims of the review. No additional signposted papers were added to the final sample.

Quality Assessment

The final sample of 38 papers was examined using research quality checklists to consider the validity, reliability and/or trustworthiness of the evidence base. Popay et al. (2006) outlines the need to explicitly state and justify the use of specific methods to appraise the research quality of studies. To establish research quality across both quantitative and/or qualitative designs, the first author re-read each full-text paper and used a combination of the Mixed-Methods Appraisal Tool (MMAT, Hong et al., 2018) and the Standard Quality Assessment Criteria (SQAC, Kmet, Lee & Cook, 2004). Evidence exists for the reliability and validity of both tools (MMAT, Hong et al., 2019; SQAC, Kmet et al., 2004). The SQAC focuses on the quality of reported information within empirical studies (Kmet et al., 2004). It uses a 14-item and 10-item checklist to score quantitative and qualitative designs respectively, which may both be used for mixed/multi-method studies. Responses were scored on a 3-point scale depending on the extent to which the criteria are met (2 = fully meets the criteria, 1 = partially meets the criteria, 0 = does not meet the criteria), or as not

applicable (N/A) if any of the items were not relevant to the study. As opposed to appraising information reporting quality alone, the MMAT focuses on ascertaining overall methodological quality, considering the appropriateness of research designs used and whether interpretation of results was adequately derived from and substantiated by underpinning data (Hong et al., 2018; Pace et al., 2011). The MMAT consists of two screening questions to check if the study is empirical, followed by five categories of study design (qualitative, quantitative randomised controlled trail, quantitative non-randomised, quantitative descriptive, and mixed methods). The reviewer completed the categories relevant to the design/methodology of the study on a 3-point response scale ('Yes', 'No' or 'Can't tell').

The first author completed both the SQAC and MMAT for all 38 studies, producing summary score percentages for the SQAC and percentage of 'Yes' responses for the MMAT, excluding any 'N/A' responses. Summary scores allowed comparison of SQAC and MMAT scores across included studies. A random 10% sub-sample (n=4) of studies were appraised independently by the second author to assess the trustworthiness of first author ratings (e.g., Norris et al., 2017). For SQAC scores, the two authors provided the same percentage rating for one paper and the three other paper ratings differed by no more than 15%. For MMAT scores, the two authors provided the same percentage rating for two papers and the two other paper ratings differed by no more than 18%. Discussions between the first and second author resulted in a shared consensus and agreement of final SQAC and MMAT summary scores (see Table 3). After first and second author sub-sample consensus was reached, the SQAC and MMAT scores of a further 6 papers were recalibrated.

Data Extraction and Synthesis

The first author conducted initial data extraction concurrently alongside quality assessment, documenting key information relating to underpinning philosophy, theoretical frameworks, design, methodology and key findings in tabulated format (Pope et al., 2007). Data extracted from a random 10% sub-sample of included studies was reviewed by the second author, who confirmed that information extracted was accurate and relevant to the study aims. Extracted tabulated information was subsequently refined by the first author and

reviewed by the research team (second and third authors) to inform the presentation of a publication timeline (see Table 2 and Figure 2). Figure 2 presents study publication statistics across four equal time periods, whereby the start of each time period largely coincides with key WADA milestones (e.g., WADA induction in 1999, WADC 2004, WADC 2009 and WADC 2015) illustrating differences in the number and type of studies published across these different time periods.

In addition to tabulation, narrative synthesis guidelines outlined by Popay et al. (2006) recommend the translation of all data, across methods into a common rubric, for example, using thematic analysis. Following tabulation, the first author conducted thematic analyses to identify key themes from included papers. Six stages of thematic analysis, outlined by Braun and Clarke (2006, 2019) were undertaken, which began with the first author immersing themselves in the data by reading and re-reading all included papers. The first author initially highlighted and annotated meaning units for each included paper, inductively generating codes across the included paper sample. In addition, the first author also reviewed initial tabulated data, generating overall higher order themes that characterised each study. The author utilised their psychology background and knowledge of general psychological constructs to inform the deductive generation of such higher order themes. Higher order themes were listed for each individual paper drawing on principles of Reciprocal Translational Synthesis (see Table 4; Dixon-Woods et al., 2006). Adopting both inductive and deductive methods allowed initial codes and higher order themes to inform both the ‘bottom-up’ and ‘top-down’ generation, refinement and definition of themes (Braun & Clarke, 2006, 2019). The process of theme generation was iterative, whereby themes were shared with the research team via in-person meetings and informal discussions. A working thematic model was generated in the form of a concept map, adjusted and refined through research team discussions to ensure themes addressed the aims of the review and informed the narrative synthesis (Popay et al., 2006).

Findings

Included Study Overview

The final sample consisted of 38 empirical studies (*N*=38, see Table 3; where possible the original wording from included studies is maintained in the table to protect the authenticity of extracted findings).

Methodological Characteristics. In line with the aims of the review, methodological characteristics across the 38 included studies are summarised in Table 3. The vast majority of studies (*n*= 37) adopted cross-sectional research designs, with only one study adopting a longitudinal design (*n*=1; Fagnani et al., 2018). Studies within the final sample included quantitative (*n*=16), qualitative (*n*=15) and mixed/multi-method (*n*=7) designs. The most frequently used method of data collection across quantitative and mixed/multi-method designs was questionnaires (*n*=21), whereas the most frequent qualitative method was semi-structured interviews (*n*=18). In terms of data analysis, quantitative studies most frequently reported using descriptive statistics (*n*=16) and parametric/non-parametric statistical tests of association and difference (*n*=17; including correlation analysis (n=8), t-tests (*n*=7), chi square (*n*=4) and ANOVA (*n*=4)). Qualitative studies most frequently reported using thematic analysis (*n*=7), content analysis (*n*=4), thematic content analysis (*n*=2) and grounded theory (*n*=2). The research timeline (see Figure 2) illustrates how a greater frequency of research emerged between 2014 and 2018 and this was accompanied by an increase in qualitative and mixed/multi-method designs.

Sample Characteristics. Regarding coach sample demographics, exact figures could not be calculated due to participant sample size information not being reported in one study (Bhagirathi, 2008). In addition, demographic sample details such as mean age were not reported in 14 studies. Data available showed that over 2500 coaches participated across the 38 included empirical studies. The mean age of participants was 40 years old (*SD* = 6.33) and the average proportion of females across the included samples was 17%, compared to 83% male (using information available). Further coach sample demographics documented a variety of team and individual sports coached, largely representing elite/performance athletes (e.g., Allen et al., 2017; Kegelaers et al., 2018) across both Junior and Senior athlete populations (e.g., Nicholls et al., 2015; Sajber et al., 2013); although precise data on athlete populations is

seldom specified. The reporting of demographics of coach samples therefore focus largely on the nature of the athletes they work with rather than individual characteristics of coaches. Only 9 studies referred to participants' level of coaching qualification and only a single study obtained information on average weekly coaching hours (Patterson & Backhouse, 2018).

There was greater diversity in terms of the geographical location of the studies, which were conducted across a total of 19 countries. Fifty percent of the studies recruited participants from European countries (*n*=19), 29% recruited from Oceania (Australia, *n*=11), 11% from Asia (Hong Kong, *n*=2; Iran, *n*=1; India, *n*=1) and 11% from North America (United States of America (USA), *n*=3; USA and Canada Collaboration, *n*=1). Two studies involved cross-continental collaborations, with one study recruiting participants from the United Kingdom, USA, Australia and Hong Kong (Nicholls et al., 2015) and another recruiting participants from Australia and Greece (Barkoukis, Brooke, Ntoumanis, Smith & Gucciardi, 2019).

Conceptual, Philosophical and Theoretical Underpinnings

The authors extracted data relating to the conceptual, philosophical and theoretical underpinnings of included studies to further ascertain the aims and purpose of studies, how doping was understood as an issue and how this may have impacted upon the selection and use of research design and methodology (Goodwin & Goodwin, 2016).

The vast majority of the included studies (*n*=29) did not explicitly state a definition of doping. Of those that did (*n*=9), the majority focussed predominantly on two ADRVs - individual *use* of prohibited substances (or performance enhancing drugs – PEDs – as commonly reported in the studies) and/or the *presence* of a substance established via a positive drugs test result. In addition to the limited conceptualisation of doping, the majority of studies (*n*=32) did not explicitly report any philosophical underpinning which informed the researchers' ontology, epistemology and subsequent methodological decisions. Only six studies explicitly documented their philosophical underpinning, with a diverse range of perspectives represented: social constructionist (Lentillon-Kaestner, 2014), positivist and interpretivist (Mazanov et al., 2014), interpretivist (Patterson & Backhouse, 2018), pluralist

and pragmatist (Patterson, Backhouse & Lara-Bercial, 2019), post-positivist (Boardley et al., 2019) and relativist (Barkoukis et al., 2019).

In addition, no theoretical underpinning was reported in the majority of studies (*n*=26). Twelve studies did use some form of theory to inform study design and/or analysis, whereby the Theory of Planned Behaviour (TPB; Ajzen & Fishbein, 1988) informed two studies (Fung, 2006; Judge et al., 2010). A choice model of decisions to use performance enhancing substances or methods (O'Donnell, Mazanov & Huybers, 2006) also informed two studies (Mazanov & Huybers, 2010; Mazanov, Huybers & Connor, 2010). All remaining theoretical frameworks used informed only one study each, for example, the Transtheoretical model (Prochaska & Velicer, 1997) informed a study by Fung and Yuan (2008).

Content of Included Studies

While inductively coding the findings from the 38 included studies, patterns in the data appeared to cluster around individual, contextual and behavioural factors, which the first author recognised as being aligned with the principles of Bandura's (1978, 1989) Social Cognitive Theory. Specifically, this theory claims that an individual's existence is characterised by individual/personal factors, behavioural factors and the social context/environment. Adopting an inductive and deductive approach led to the identification of three higher order themes displayed in Table 4. As part of the thematic analysis each higher order theme was defined (Braun & Clarke, 2006). Individual factors referred to internal psychological characteristics emanating from individual coach participants, (e.g., knowledge and beliefs). Contextual factors referred to the wider environmental factors which surrounded the coach, associated with doping in sport. Behavioural factors referred to specific anti-doping actions coaches reported they had carried out or claimed they would enact under hypothetical situations. All three higher order themes represented the key aspects of research findings relating to coaches' self-reported perspectives and behaviours in relation to doping and anti-doping in sport. It is important to note that themes often represent factors that overlap (Braun & Clarke, 2019); therefore, the individual, contextual and behavioural factors that the authors have identified may co-exist or interact with each other. However, no

evidence for the direction or causality of relationships was provided from included studies due to the predominance of cross-sectional research designs. Therefore, the authors are unable to draw conclusions on causality based on the current analysis.

Individual Factors. A total of 37 (97%) of the 38 included studies investigated internal individual factors, and content within these studies represented two themes: Coach anti-doping beliefs and coach knowledge.

Coach Anti-Doping Beliefs. The findings of 35 studies identified content related to coach beliefs about doping and anti-doping. Eighteen studies adopted quantitative methodologies, eleven studies adopted qualitative methodologies and six studies used mixed/multi-method designs. Beliefs are internally held views or opinions that link a physical or conceptual object to a specific attribute or quality (Fishbein & Ajzen, 1975). A total of 14 studies primarily addressed this theme, concentrating on the beliefs of coaches towards doping in sport (e.g., Dunn, Thomas, Swift, Burns & Mattick, 2011; Fung & Yaun, 2008; Kegelaers et al., 2018; Mazanov & Huybers, 2010; Mazanov, Huybers & Connor, 2010). Anti-doping beliefs primarily focussed on ADRVs of the use and presence of PEDs and/or banned substances, with studies also investigating coaches' beliefs of the factors influencing athletes' doping (Mazanov & Huybers, 2010; Mazanov, Huybers & Connor, 2010; Nicholls et al., 2015). A slight majority of studies utilised some form of quantitative data collection method (n=19) to investigate coach beliefs. All nineteen of these studies used questionnaires that measured coach opinions towards PEDs and banned substances, such as the Performance Enhancing Attitudes Scale (Petróczi & Aidman, 2009; used by Fagnani et al., 2018; Morente-Sanchez & Zabala, 2015) and the Questionnaire of Substance Use (Kondric et al., 2010; used by Rodek et al., 2013). Sixteen studies used qualitative methods to investigate coach beliefs, whereby 15 studies conducted semi-structured interviews with coach participants.

Quantitative questionnaire findings were unanimous in that coaches are supportive of anti-doping efforts (e.g., Blank et al., 2014; Pöppel & Büsch, 2019; Rodek, Sekulic & Kondric, 2012). These findings were largely underpinned by qualitative, interview-based studies whereby coaches justified such views through citing beliefs that using banned

substances was unethical or morally wrong (e.g., Engelberg & Moston; 2015; MacNamara & Collins, 2014; Nicholls et al., 2015). Coaches favoured sanctions for both athletes and coaches who violated anti-doping rules (Engelberg & Moston, 2015; Kegelaers et al., 2018; Mazanov et al., 2014; Moston et al., 2014a; Rodek et al., 2012; Sajber et al., 2013) and the majority of elite coach samples (e.g., Engelberg and Moston, 2015; Rodek et al., 2012; Sajber et al., 2013) were in favour of rigid sanctions such as lifetime bans for doping involvement. However, the specific nature or variations of 'doping rule violations' was not explored, in that studies did not consider whether perceived sanctions would vary across specific ADRVs.

Through the thematic analysis six studies were identified that explicitly explored coaches' beliefs of whether doping was a serious problem in sport or not (Allen et al., 2017; Fung 2006; Judge et al., 2010; Moston et al. 2014b; Pöppel & Büsch, 2019; USADA, 2011). Coaches generally agreed that doping was a problem in sport as a whole, however there was a divide between coaches as to whether doping was perceived as a problem in their specific sport (Allen et al., 2017). Pöppel & Büsch (2019) and Moston et al. (2014b) provided evidence for favourable underestimation of doping prevalence within individuals' own sport, whereby Moston et al. (2014b) reported average perceived PED use estimates ranging from 18.75% for all sports compared to 9.85% for a participant's own sport. Coaches who did not believe doping was a serious problem in their sport often used such beliefs of low prevalence in their sport to justify this stance (Morgan & Smith, 2018; Moston et al., 2014b). However, Moston et al. (2014b) was the only study to explore doping prevalence beliefs across a combined sample of coaches and elite athletes from a variety of sports, revealing that the top three sports in which PEDs were seen as being most commonly used included weightlifting, cycling and athletics; indicating that doping was perceived as a serious problem in these sports.

Within the sample of included papers, coaches generally perceived that they had an influence over their athletes' doping, with eight studies explicitly exploring coaches' anti-doping role perceptions (Allen et al., 2017; Barkoukis et al., 2019; Engelberg & Moston, 2015; Judge et al., 2010; Laure et al., 2001; MacNamara & Collins, 2014; Morgan & Smith,

2018; Patterson & Backhouse, 2018). While most coaches across these studies believed they have a role to play in anti-doping efforts, there were caveats to this acknowledgment. For instance, some coaches stated that anti-doping behaviour was not an essential part of their role because other areas, such as maximising athlete performance, were the priority (Patterson & Backhouse, 2018). In addition, coaches did not see anti-doping education as part of their role (Engelberg & Moston, 2015; Morgan & Smith, 2018), despite coaches acknowledging the positive influence anti-doping education may have on their athletes (Thomas et al., 2011), and demonstrating a preference for coaches to engage in further anti-doping education themselves (Blank et al., 2014; Fung & Yuan, 2008; Judge et al., 2010; Patterson et al., 2019; Pöppel & Büsch, 2019).

Three studies referred to coach beliefs about anti-doping policy (Mazanov et al., 2014; Moston et al., 2014a; Patterson & Backhouse, 2018). Across these samples, coaches felt little need to be familiar with the WADC and, even if they were familiar with it, they indicated that they felt policy would not impact on their actual practice (i.e., behaviour). Coaches called for greater clarity on policy and the use of simplified language and behavioural expectations to bridge the perceived gap between policy and practice (Patterson & Backhouse, 2018).

Six studies referred to coaches' perceived lack of confidence to deal with doping related issues, such as offering advice or initiating conversations with their athletes (Engelberg & Moston, 2015; Judge et al., 2010; Patterson & Backhouse, 2018; Patterson et al., 2019) or in confronting athletes they suspect to be doping (Boardley et al., 2019; Sullivan et al., 2014). Boardley et al. (2019), Patterson and Backhouse (2018) and Sullivan et al. (2014) drew on Bandura's (1977) concept of self-efficacy to describe this lack of confidence, referring to an individual's perceived capability to be able to achieve a specific goal/outcome in a specific situation. This low self-efficacy was characterised by a perceived lack of doping knowledge in comparison to other ASP (e.g., team doctors; Patterson & Backhouse, 2018). Study findings therefore demonstrate that coaches believe they have an influence over athlete

doping outcomes, yet do not actively engage in anti-doping efforts due to low self-efficacy and a lack of perceived knowledge.

Coach Knowledge. The findings of 18 studies related to coaches' actual anti-doping knowledge. Studies assessed knowledge regarding anti-doping systems, regulations and principles, while also considering how this knowledge was acquired and subsequently used by coaches. Nine studies adopted quantitative methodologies, six studies adopted qualitative methodologies and three studies used mixed or multiple methods designs. Coaches' knowledge of drug testing and doping control systems was the most frequently reported and was assessed across ten included studies via questionnaire (*n*=6; Bhagirathi et al., 2008; Mandic et al., 2013; Mazanov et al., 2013; Morente-Sanchez & Zabala, 2015; Pöppel & Büsch, 2019; Sajber et al., 2013) and interviews (*n*=4; Allen et al., 2017; Engelberg & Moston, 2015; Engelberg et al., 2017; Mazanov et al., 2014).

Coaches were typically most knowledgeable about general doping regulations and control procedures such as testing, but less knowledgeable about specific aspects of these control procedures, such as the biological passport and the whereabouts system (Engelberg et al., 2017). In addition, coaches had less knowledge of specific banned substances and their associated side effects (Sajber et al. 2013; Seif-Barghi et al., 2015). Aside from doping control processes and banned substances, only three studies assessed knowledge of ASP responsibilities outlined by the WADC, with coaches demonstrating limited awareness of consequences for non-compliance (Mazanov et al., 2013; Mazanov et al., 2014; Patterson & Backhouse, 2018). Also, only one included study considered all 10 ADRVs, whereby 12.8% of coach participants (total sample n= 136) were familiar with all 10 ADRVs (Seif-Barghi et al., 2015). Despite the lack of knowledge reported by coaches, it was important to note that many coaches still provided anti-doping advice without reading the WADC or undergoing any formal anti-doping education (Mandic et al., 2013; Mazanov et al., 2013). Furthermore, both coach and athlete samples identified the coach as a primary source of anti-doping and dietary supplementation knowledge, despite limitations in coaches' actual and perceived

knowledge (Barkoukis et al., 2019; Rodek et al., 2012; Sajber et al., 2013; Thomas et al., 2011).

Six studies explicitly examined methods and sources of coach anti-doping knowledge acquisition (Blank et al., 2014; Engelberg & Moston, 2015; Mandic et al., 2013; Patterson et al., 2019; Sajber et al., 2013; Thomas et al., 2011). The majority of coach participants had not engaged in any kind of formal anti-doping education (Patterson et al., 2019; Sajber et al., 2013). In the absence of formal education, findings revealed that coaches relied on self-education to acquire anti-doping knowledge, often largely dependent on the use of internet resources (Blank et al., 2014; Engelberg & Moston, 2015; Mandic et al., 2013; Patterson et al., 2019; Sajber et al., 2013). Despite this reliance on self-education through internet resources, coaches had no or very limited knowledge of existing internet-based WADA coach resources, such as CoachTrue, in order to increase their knowledge of anti-doping and their wider responsibilities under the WADC (Allen et al., 2017; Patterson & Backhouse, 2018; Patterson et al., 2019).

A total of seven studies compared coach knowledge with that of other ASP or athletes (Bhagirathi et al., 2008; Jurisic & Sattler, 2015; Mandic et al., 2013; Mazanov et al., 2013; Morente-Sanchez & Zabala, 2014; Sajber et al., 2013; Seif-Barghi et al., 2015). Coaches showed limitations in their assessed doping knowledge, scoring lower on doping questionnaire assessments than doctors/physicians and other ASP in two studies (Mazanov et al., 2013; Morente-Sanchez & Zabala, 2014). For example, Morente-Sanchez & Zabala (2014) found that coaches represented the lowest proportion of an ASP sample (n=237) to demonstrate knowledge about the prohibited list (6.1%) compared to physical trainers (19.7%) and other technical staff (23.9%). However, Morente-Sanchez & Zabala (2014) was the only study to find a statistically significant difference whereby coaches had worse (anti-) doping knowledge compared to other ASP. In contrast, Bhagirathi et al., (2008) found that coaches actually scored significantly higher than physiotherapists and medical doctors on a doping questionnaire assessment, though the specific components of assessed knowledge were not described.

The included studies suggest that coaches have a higher level of (anti-)doping knowledge compared to their athletes. Two studies found that coaches have scored significantly higher on knowledge of doping and sports nutrition than their athletes (Mandic et al., 2013; Sajber et al., 2013). Findings indicate that coaches scored highest on assessed items relating to general doping regulations and testing procedures measures compared to items assessing knowledge of specific substances, methods and side effects (Sajber et al., 2013). Interestingly, Blank et al. (2014) found that coaches scored significantly higher on questionnaire items relating to doping substances, methods and side effects compared to their self-rated levels of doping knowledge, demonstrating a clear difference between coaches' beliefs about their knowledge and their actual knowledge scores. Therefore, findings suggest that coaches may possess both knowledge of general doping control procedures and regulation as well as more specific substance related knowledge, that exceeds that of their athletes and their own beliefs (Blank et al., 2014; Mandic et al., 2013; Sajber et al., 2013).

Behavioural Factors. Sixteen (42%) of the 38 included studies considered coach anti-doping behaviour, which was the second higher order theme identified through the thematic analysis. This higher order theme consisted of two themes: self-reported anti-doping behaviour and hypothetical anti-doping behaviour.

Self-Reported Behaviour. Twelve studies referred to coach self-reported anti-doping behaviours in their findings. Six studies adopted qualitative methodologies, five studies adopted quantitative methodologies and one used a mixed/multi-method design. Taken together, findings showed that coach self-reported anti-doping actions are limited, whereby only 1 in 10 coaches reported carrying out doping prevention actions over the past 12 months (Laure et al., 2001), with coaches discussing doping issues with their athletes a maximum of two to three times a year (Engelberg et al., 2017). Indeed, the majority of coaches in a sample of 62 Austrian coaches reported that they did not prepare their athletes for doping controls or incorporate doping prevention as part of their training routines (Blank et al., 2014). This lack of coach anti-doping action was characterised by a perceived lack of clarity surrounding who was responsible for managing anti-doping efforts, as well as perceived lack of anti-doping

knowledge and expertise in two studies (Allen et al., 2017; Patterson & Backhouse, 2018). Anti-doping roles and responsibilities were often passed onto either authority figures or medical staff by default, who were perceived to have more anti-doping expertise, representing a diffusion of coach anti-doping responsibilities outlined by the WADC (Allen et al., 2017; Barkoukis et al., 2019; Engelberg & Moston, 2015; Patterson & Backhouse, 2018). Coaches' lack of anti-doping behaviours extended to their behaviour amongst other support staff. For example, coach participants within an ASP sample very rarely spoke to other support staff explicitly about doping and approximately a third of the sample reported ignoring unethical behaviour of other support staff (Mazanov et al., 2013).

Self-reported anti-doping actions largely consisted of monitoring, observation and providing advice to athletes around issues such as doping control procedures, inadvertent doping and risks to health (Allen et al., 2017; Laure et al., 2001; Patterson & Backhouse, 2018). However, these behaviours were typically reactive as coaches proposed engaging in these behaviours if a doping concern or change in an athlete had been noticed (Allen et al., 2017; Engelberg & Moston, 2015; Patterson & Backhouse, 2018), or in response to doping workshops or prominent media doping cases (Engelberg et al., 2017). Also, coach-reported anti-doping behaviours were largely indirect and passive, for example, through creating team environments or cultures that emphasised values and behaviours associated with fair play and health promotion (Kokko et al., 2015; Patterson & Backhouse, 2018). However, coaches found it difficult to articulate both how they create these general team cultures and subsequently how they prevent doping through these cultures.

Only a single study explored both self-reported coach anti-doping behaviours and subsequent reflections on such behaviours, considering whether coaches evaluated the effectiveness of these actions and revised these as part of their on-going coaching practice (Allen et al., 2017). Allen et al. (2017) found explicit coach examples of more pro-active behaviours, including the integration of athlete education programmes, engaging in pro-active discussions with athletes and actively researching supplements as part of their everyday

coaching practice (Allen et al., 2017). Yet, only a minority of the coach sample engaged in such actions and exhibited limited evidence of self-evaluation of these actions.

Hypothetical Behaviour. Eight studies referred to coach anti-doping behaviours in response to hypothetical doping scenarios. Five studies adopted qualitative methodologies, two studies adopted quantitative methodologies and one used a mixed/multi-method design. In terms of coach-athlete interactions, two studies revealed the majority of coaches would not endorse or suggest doping to their athletes (Fung, 2006; Sajber et al., 2013). However, contrasting findings demonstrated that a minority of coaches still reported a willingness to engage in doping-related behaviours, for example agreeing to assist their friends or relatives to obtain a banned substance or working with a medical team to produce banned substances (Fung, 2006).

Similar to self-reported coach behaviour, findings referring to hypothetical behaviour indicate an element of passivity – or lack of 'directness' – in coaches' actions taken in response to concerns around athlete banned substance use. Three qualitative studies showed that the vast majority of coaches would seek internal support within the team, for example, referral to a team doctor (Engelberg & Moston, 2015; Mazanov et al., 2014; Patterson & Backhouse, 2018) if faced with a hypothetical scenario of an athlete approaching them with a doping dilemma – rather than dealing with this 'head on' and alone. Furthermore, findings of these studies illustrated that coaches were often reluctant to report doping to external authorities. For instance, Mazanov et al. (2014) noted that if an athlete was known to be doping, 15/39 of the ASP sample would not report to the National Anti-Doping Agency (NADO) and instead preferred the option of counselling the individual athlete about the consequences and/or reporting the incident internally within their own organisation. Interestingly, some coaches were unaware that not reporting such doping incidents to the relevant anti-doping authorities would be in violation of the WADC (Mazanov et al., 2013; Patterson & Backhouse, 2018).

Contextual Factors. Only seven (18%) of the 38 included studies considered contextual factors surrounding coaches' anti-doping perspectives and behaviours, which was the third and final higher order theme identified through the thematic analysis. This higher order theme consisted of a single theme: psychosocial components surrounding coaches' anti-doping perspectives and behaviours. The term psychosocial acknowledges the complex interrelation of social and individual processes that characterise human experiences (Williams & Anderson, 1998). Therefore, this theme is representative of the social and physical environment that coaches experience, which may shape their perspectives and behaviours in relation to doping in sport.

Psychosocial Components. Providing an initial insight into cultures that surround doping in sport, seven studies considered psychosocial factors, where all of these studies adopted qualitative methodologies. In each paper, culture was highlighted as a key psychosocial factor that was associated with coaches' perspectives of doping, considering the specific team culture (Barkoukis et al., 2019; Patterson & Backhouse, 2018) national sporting culture (Allen et al., 2017), culture within a specific organisation (Ohl et al., 2013) as well as the more general high-performance sporting culture (Engelberg & Moston, 2015; Mazanov et al., 2014). Allen et al., (2017) suggested that set traditions, values and beliefs are attached to cultures, for example the anti-doping belief that 'doping is cheating' held in traditional Scottish and British sporting culture, as opposed to Mazanov et al. (2014) who highlighted the 'it is important to win at all costs' belief which exists in high-performance sport culture. Such a high-performance culture may serve to normalise or even encourage prohibited substance use amongst coaches and athletes (Mazanov et al., 2014). Therefore, findings suggest that some cultures that exist within sport may conflict with, and strongly oppose, the values, beliefs and expectations set out by global anti-doping policy; exacerbating the gap between policy and real-world coaching practice (Mazanov et al., 2014).

Two studies considered how the culture within the specific sport of cycling has changed over time, considering perceived decreased overt social pressures to dope within cycling teams, yet acknowledging that external doping pressures still exist (Lentillon-

Kaestner, 2014; Ohl et al., 2013). High profile doping scandals, such as the Festina scandal in 1998 and widespread media condemnation of these events was highlighted as a turning point in cycling culture, which influenced coaches' doping beliefs vicariously as opposed to through direct personal experience (Engelberg & Moston, 2015).

Research Quality

The scores of reporting and methodological quality (using the SQAC and MMAT respectively) were compared across the higher order themes, research timeline and research designs. Despite limited differences on SQAC scores, included studies that explored behavioural and contextual factors recorded mean MMAT scores of 82% and 88% in terms of methodological quality, which were considerably higher than for studies which predominantly focussed on individual factors (69%). These higher MMAT scores coincided with a greater number of qualitative studies that investigated behavioural and contextual factors within the included study sample, which scored noticeably higher on the SQAC (75%) and MMAT (81%) than studies that adopted quantitative designs (SQAC = 68%; MMAT = 66%). These qualitative studies were conducted from 2010 onwards (e.g., Mazanov & Huybers, 2010) and despite the dominance of quantitative research between 1999-2013, from 2014-2018 a slight majority of published studies within the included sample adopted qualitative designs (10/19 studies; 53%). The 2014-2018 publication time period recorded the highest average scores for research quality (SQAC = 71; MMAT= 77) compared to 2004-2008 (SQAC = 47; MMAT= 37) and 2009-2013 (SQAC = 68; MMAT= 61), demonstrating an overall increased level of academic rigor of published coach anti-doping empirical literature as time has progressed.

Discussion

The aim of the review was to systematically identify and synthesise published, empirical coach anti-doping literature over a 20-year period between WADA formation (1999) and the present day (2019). The findings of the review provide insights into the evolution of the coach anti-doping landscape through drawing on a wider knowledge base than was available to previous reviewers (e.g., Backhouse & McKenna, 2012). This

process has enabled the authors to demonstrate how this field has progressed, but also discuss gaps in understanding that still exist. In this vein, future research directions, including reference to theoretical, methodological and coach anti-doping content are explored.

Since 1999 the total number of coach-anti-doping publications has grown exponentially. Initial research was exclusively quantitative in design, however with this increasing number of publications over time, there has been a growing proportion of qualitative and mixed/multi-method designs. The greater diversity of methodologies and designs has coincided with increased research quality, as determined by the MMAT (Hong et al., 2018) and SQAC (Kmet, Lee & Cook, 2004). Notably, the greater proportion of higher quality, qualitative studies, has extended our understanding through in-depth explorations that acknowledge the complexity of coach anti-doping beyond that of individual coach factors; extending the scope of investigations to behavioural and wider contextual factors. Specifically, qualitative designs have accessed coaches' voices through interviews and focus groups to make sense of coaches' anti-doping beliefs and self-reported behaviours, acknowledging that their lived experiences of doping are situated within the complexity of wider, dynamic social systems (Sparkes & Smith, 2013).

Though some later (qualitative) studies began to investigate the wider contextual factors and complexity surrounding coaches' perspectives and behaviours related to doping, the majority of included studies primarily or only considered individual processes. Most studies largely addressed the beliefs and knowledge of coaches towards doping in sport. Coaches acknowledged their perceived influence over athletes' doping behaviours. However, coaches reported low self-efficacy to actively engage in anti-doping efforts and some coaches did not see anti-doping behaviours as part of their role. Within the existing evidence base, findings in relation to individual factors are often termed as 'attitudes and beliefs', which are both mentioned frequently and often interchangeably within the included study sample. However, attitudes and beliefs are distinct psychological concepts and are not well-defined within this existing coach anti-doping literature, resulting in confusion

over conceptualisation and their potential differential influences. An attitude may be defined as "a learned predisposition to respond in a consistently favourable or unfavourable manner with respect to a given object" holding an affective component (Fishbein & Ajzen, 1975, p.6). Conversely, beliefs are views or opinions that links an object to an attribute, often representing the perceived likelihood that the object has or is linked to the attribute in question (Fishbein & Ajzen, 1975). Future coach anti-doping research should be clear in the conceptualisation of such terms, by differentiating between attitudes and beliefs, to avoid further confusion and allow their potential influence on coaches' behaviour to be critically explored.

In addition to issues around the conceptualisation of attitudes and beliefs, a key deficit in the current evidence base is the conceptualisation of doping. Few studies defined doping as consisting of more than one ADRV (Bhagirathi, 2008; Boardley et al., 2019; Jurisic & Sattler, 2015; Lentillon-Kaestner, 2014; Mandic et al., 2013; Nicholls et al., 2015; Rodek et al., 2012; Sajber et al., 2013). Indeed, doping as a phenomenon was rarely defined and narrowly conceptualised to only reflect a limited number of WADC ADRVs, associated with athletes' *use* of banned substances/PEDs and/or the *presence* of positive drugs. ADRVs that may directly apply to coaches (e.g., tampering, possession, trafficking, administration, complicity and prohibited association; WADA, 2015) have been ignored in the literature and this situation should be addressed. How doping is conceptualised may influence how it is perceived as a problem and how coach anti-doping is subsequently studied, therefore it is important for future research to acknowledge and utilise the WADA definition of doping, in the form of all ten ADRVs, extending to eleven ADRVs from 2021 (WADA, 2019). Studies that encompass the exploration of all eleven ADRVs will allow appreciation of how doping may manifest itself in multiple ways, emphasising the coach's liability to global anti-doping policy and acknowledging doping as a complex issue that extends beyond athlete banned substance use alone (Backhouse et al., 2016).

Issues surrounding conceptualisation could be connected to the finding that the majority of studies did not report the use of an underpinning philosophy or theoretical

framework. Of the studies that did adopt theoretical frameworks to understand coach anti-doping, they largely used models that focus on individual processes, for example, the Theory of Planned Behaviour (TPB; Ajzen & Fishbein, 1988) and the Transtheoretical Model (TTM; Prochaska & Velicer 1997). Such theories focus on conscious cognitive processes and behavioural intentions as key predictors of behaviour change (Webb & Sheeran, 2006). These conscious cognitive processes align with the Rational Choice Perspective, which stipulates that a person's behaviour is determined through their own individual decisions, which are consciously and deliberately made (Cornish & Clarke, 2008). Understanding doping through the narrow lens of the Rational Choice Perspective fails to acknowledge the wider interaction of contextual factors surrounding coaches, such as the sporting or organisational culture and complex social processes that exist between multiple stakeholders (e.g., Allen et al., 2017; Mazanov et al., 2014; Ohl et al., 2013). Athlete-focussed doping research has acknowledged the influence of wider networks on behaviour, recognising the need to explore beyond the individual (e.g., Kirby, Moran & Guerin, 2011; Lentillon-Kaestner & Carstairs, 2010). Therefore, future coach research should consider the wider networks surrounding the coach, utilising more comprehensive theoretical frameworks that consider such contextual influences (Backhouse et al., 2016).

In this vein, Backhouse et al. (2016) called for the use of meta-theories that combine numerous concepts and theories. Meta-theories systematically and critically integrate numerous concepts and theories from different discipline areas to allow the investigation of multiple factors together, which can be coherently applied to a wide range of phenomena across various contexts (Fiske & Shweder, 1986). A meta-theory therefore brings together the cumulative benefits of combined theories under a single umbrella. Literature from other fields has integrated meta-theory as a guiding framework in the exploration of multiple behaviour change determinants across different health-related contexts (e.g., Medication adherence, Jackson, Eliasson, Barber & Weinman, 2014; Physical activity promotion, Howlett, Jones, Bain & Chater, 2017; Hearing aid use, Barker, Atkins & de Lusignan, 2016). Within sports settings meta-theory has been successfully used to explore coach beliefs

and behaviours, subsequently informing the design and implementation of coach interventions, for example, on transformational coaching (Turnnidge & Côté, 2017). Meta-theory may be used as a framework to extend future doping-related research that includes additional theoretical concepts or processes, such as the influences of unconscious and social processes on coaches' anti-doping perspectives and behaviours, which remain largely unaccounted for within the existing literature (Barkoukis, Lazuras, Tsorbatzoudis & Rodafinos, 2013). As no single theory has been deemed as valid for explaining the complexity of doping, using meta-theory to explore coach anti-doping would address both the current limited use of theory and lack of consideration for wider social influences that exist within the current literature.

In addition to the current lack of theory, another limitation of existing research is that investigations have not determined the potential differential influence of factors on actual coach behaviours. A sample of quantitative studies did consider coach anti-doping behaviours, but focussed largely on behavioural *intent*, as opposed to actual reported behaviour (e.g., Fung, 2006; Sajber, 2013), where behavioural intent may not predict actual behaviour (Sniehotta, Presseau & Araujo-Soares, 2014; West, 2005). In addition, the frequent use of descriptive and correlational designs cannot infer causal relationships with behaviour (Imbens & Rubin, 2015). Therefore, the existing evidence base is largely restricted by both limitations in research design and a narrow coverage of factors that do not fully account for coach anti-doping behaviours (Lazuras, Barkoukis, Rodafinos & Tsorbatzoudis, 2010). Given that less than half of included studies investigated coach behaviours, future research should explicitly explore *actual* coach behaviours more frequently, as well as investigating them in more detail.

Recent research has started to develop a more detailed investigation of coach-anti-doping behaviour through the use of qualitative designs. Indeed, findings from the narrative synthesis highlighted a significant rise of qualitative studies between 2014 and 2019 that have begun to consider more specific anti-doping behaviours within wider sporting contexts (e.g., Allen et al., 2017, Engelberg & Moston, 2015, Mazanov et al., 2014, Patterson

& Backhouse, 2018). These studies reported that despite coaches generally opposing doping in sport, some organisational and sporting cultures may normalise or encourage drug use amongst coaches and athletes (e.g., Allen et al., 2017; Mazanov et al., 2014; Ohl et al., 2013). Coaches resulting anti-doping behaviours were largely reactive to doping issues, or passive in attempting to create general positive team environments that did not directly address doping. Actions such as the organisation of athlete anti-doping education were often circumvented to other support personnel internally who were perceived as either more authoritative or to have more expertise in doping. Also, doping actions were rarely integrated into a coach's everyday practice. These behaviours were largely associated with coaches' lack of self-efficacy to conduct anti-doping actions, characterised by a perceived lack of doping knowledge, such as not being aware of their responsibilities under the WADC (WADA, 2015). Therefore, qualitative studies have begun to explicitly explore coach behaviours and associated factors of these behaviours, investigating *what* coaches do as well as potentially *why* they may do it.

Though the qualitative designs used to date (i.e., interviews, focus groups) have furthered our understanding of coach anti-doping behaviour, additional methodologies are needed to fully illuminate the '*what'* and *'why'* of actual coach behaviour. Such research may consider a wider range of emergent factors, whilst also considering *how* these different factors shape coach behaviour, identifying and explaining the influence of both explicit and implicit behavioural determinants such as habit formation and reinforcement (Austin & Sutton, 2014; Baumeister et al., 1994; Mook, 1996). As an example, longitudinal behavioural diaries could be used as a tool to prompt coaches to reflect on, and document, their thoughts, feelings and behaviours in their every-day coaching practice. This approach has the potential to capture a wide range of influencing factors as well as revealing specific habits/routines (Sparkes & Smith, 2013). Recognising the limited evidence base in relation to contextual and cultural factors for doping in sport, social network analysis may be employed. When adopting this approach, coaches could be asked to map the key stakeholders that are perceived to influence and act as a source of social reinforcement on their behaviour (Crossley, 2010). For

example, the production of coach-centred sociograms would allow greater exploration of how coach behaviours are potentially impacted by the culture within which the coach is situated and how coach behaviours may in turn contribute to the culture. Use of a more diverse range of methods facilitates a multi-faceted and comprehensive understanding of coaches' perspectives and behaviours in relation to doping and anti-doping in sport. This is necessary if we are to deepen our understanding of doping as a complex issue, and inform global anti-doping policy and practice (Michie & Abraham, 2004).

A fundamental step in designing anti-doping education interventions and policies is consulting those who are direct recipients and targets of the programmes/policies; in this case coaches themselves (Backhouse & McKenna, 2012). Very little research has placed the coach at the centre of the investigation. Furthermore, within the included studies there is limited reporting of coach sample demographics or, if reported, a lack of explicit comparison of coach beliefs and behaviours across these different coach demographics. Instead, the majority of studies largely recruited coach participants as a function of the athletes they worked with, for example, elite (e.g., Engelberg & Moston, 2015) and performance athletes (e.g., Allen et al., 2017). Only a single study in the included sample found that coaches who had a higher level of coaching qualification were associated with a greater self-reported coach discouragement of athlete PED use (Judge et al., 2010). Therefore, future research should pay greater attention to coach demographics, such as hours worked (full-time or part-time), level of pay (paid or voluntary) and different sports (Patterson & Backhouse, 2018). Although Patterson & Backhouse (2018) found no obvious connections between coach demographics and their anti-doping behaviours, their findings represented a coach sample from only two sports (football and rugby) within an elite setting. Future coach anti-doping research should therefore consider coach demographics across a range of sporting contexts, such as non-elite and elite sport as well as across both team and individual sports that are associated with different ADRV frequencies. Such research would build on the current limited evidence base, taking a coach-centred approach by considering first-hand experiences and actions of coaches across coaching contexts (Backhouse & McKenna, 2012; Patterson & Backhouse, 2018).

Conducting such future research would allow the development of tailored, coach-informed and evidence-based interventions, which aim to promote pro-active coach anti-doping behaviours, meeting coaches' responsibilities outlined by current and future anti-doping policies (WADA, 2015, 2019). Coach-informed interventions may promote greater coach engagement, encouraging the integration of anti-doping behaviours within everyday coaching practice, supporting the health and wellbeing of their athletes and protecting the wider integrity of sport (Patterson, Duffy & Backhouse, 2014).

Conclusions

The findings of this comprehensive and systematic review highlight how the coach anti-doping research landscape has expanded and advanced over time; from a largely homogenous group of quantitative studies, focused predominantly on individual coach beliefs and knowledge of doping, to an increasingly diverse range of research designs, exploring the behavioural and complex contextual factors associated with coaches' perspectives and behaviours regarding doping and anti-doping in sport. The synthesis across studies found that coaches generally report anti-doping beliefs, but can describe limited examples of anti-doping behaviours; if exhibited, actions were often reactive, did not directly address doping and anti-doping responsibilities were largely circumvented to other support personnel. Such limitations in coach behaviours were frequently associated with a lack of self-efficacy to engage in anti-doping actions. Yet, some coaches also did not see anti-doping behaviours as part of their role, and some organisational and sporting cultures may actually normalise or encourage drug use amongst coaches and athletes. Having said this, caution must be exerted in drawing conclusions given that the scope of most included studies is limited as many did not investigate behavioural or contextual factors in relation to coaches' anti-doping roles. Existing research therefore cannot account for how complex contextual factors are associated with or influence specific coach anti-doping beliefs and behaviour, nor how coaches' beliefs or behaviour may specifically contribute towards the maintenance or change of particular social environments or cultures.

Indeed, the current evidence base is largely constrained to the investigation of individual conscious processes, driven by limited theoretical underpinning and simple conceptualisations of doping as an individualised and athlete-centred phenomenon, consisting primarily of the *use* of and *presence* of banned substances in an athlete's body. Therefore, future research must explore the complex interrelated social dynamics and unconscious processes that are associated with (anti-)doping actions in sport, considering the influence of coaches as key stakeholders, acknowledging their anti-doping responsibilities and liability to sanctions through integrating all eleven ADRVs within the future investigation of doping (WADA, 2019). Meta-theory should be used to inform the development and interpretation of such future research, facilitating the integration of beliefs, attitudes, behaviours, unconscious processes and the wider social environment into the understanding of coach anti-doping perspectives and behaviours. Meta-theory will provide a framework to guide future coach anti-doping research, placing coach behaviour at the centre of the investigation. Conducting theory-informed and coach-centred anti-doping research across multiple coaching demographics and contexts is needed to facilitate the development of tailored, coach-informed and evidence-based interventions for the future.

Disclosure Statement

No potential conflict of interest was reported by the author(s).

References

Ajzen, I., & Fishbein, M. (1988). Theory of reasoned action - Theory of planned behavior. *University of South Florida*.

Allen, J. B., Morris, R., Dimeo, P., & Robinson, L. (2017). Precipitating or prohibiting factor: Coaches' perceptions of their role and actions in anti-doping. *International Journal of Sports Science & Coaching*, *12*, 577-587. doi: 10.1177/1747954117727653

Austin, Z., & Sutton, J. (2014). Qualitative research: Getting started. *The Canadian Journal of Hospital Pharmacy*, *67*, 436-440.

Backhouse, S. H., Griffiths, C., & McKenna, J. (2018). Tackling doping in sport: a call to take action on the dopogenic environment. *British Journal of Sports Medicine*, *52*, 1485-1486. doi: 10.1136/bjsports-2016-097169

Backhouse, S. H., & McKenna, J. (2012). Reviewing coaches' knowledge, attitudes and beliefs regarding doping in sport. *International Journal of Sports Science & Coaching*, *7*, 167-175. doi: 10.1260/1747-9541.7.1.167

Backhouse, S. H., Whitaker, L., Patterson, L., Erickson, K., & McKenna, J. (2016). Social psychology of doping in sport: A mixed studies narrative synthesis. *Commissioned Report for the World Anti-Doping Agency.*

Bandura, A. (1977). Self-efficacy: toward a unifying theory of behavioral change. *Psychological Review*, *84*, 191-215. Doi: 10.1037/0033-295X.84.2.191

Bandura, A. (1978). The self system in reciprocal determinism. *American Psychologist*, *33*, 344-358. doi: 10.1037/0003-066X.33.4.344

Bandura, A. (1989). Social cognitive theory. In R. Vasta (Ed.), *Annals of child development. Vol. 6. Six theories of child development* (pp. 1-60). Greenwich, CT: JAI Press.

Barker, F., Atkins, L., & de Lusignan, S. (2016). Applying the COM-B behaviour model and behaviour change wheel to develop an intervention to improve hearing-aid use in adult

auditory rehabilitation. *International Journal of Audiology*, *55*, S90-S98. doi: 10.3109/14992027.2015.1120894

Barkoukis, V., Brooke, L., Ntoumanis, N., Smith, B., & Gucciardi, D. F. (2019). The role of the athletes' entourage on attitudes to doping. *Journal of Sports Sciences*, *37*, 2483–2491. doi: 10.1080/02640414.2019.1643648

Barkoukis, V., Lazuras, L., Tsorbatzoudis, H., & Rodafinos, A. (2013). Motivational and social cognitive predictors of doping intentions in elite sports: An integrated approach. *Scandinavian Journal of Medicine and Science in Sports*, *23*, e330-340. doi: 10.1111/sms.12068

Baumeister, R. F., Heatherton, T. F. & Tice, D. (1994). *Losing Control: How and why people fail at self-regulation*. San Diego, CA: Academic Press.

Bhagirathi, S. (2008). Knowledge and awareness towards doping in sports: A survey study. *ICSSPE Bulletin,* (56), 31-31.

Blank, C., Leichtfried, V., Fürhapter, C., Müller, D., & Schobersberger, W. (2014). Doping in Sports: West-Austrian Sport Teachers' and Coaches' Knowledge, Attitude and Behavior. *German Journal of Sports Medicine*, *65*. 289-293. doi: 10.5960/dzsm.2014.133

Boardley, I. D., Grix, J., Ntoumanis, N., & Smith, A. L. (2019). A qualitative investigation of coaches' doping confrontation efficacy beliefs. *Psychology of Sport and Exercise*, 101576. doi: 10.1016/j.psychsport.2019.101576

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*, 77-101. doi: 10.1191/ 1478088706qp063oa

Braun, V., & Clarke, V. (2019). Reflecting on reflexive thematic analysis. *Qualitative Research in Sport, Exercise and Health*, *11*, 589-597. doi: 10.1080/2159676X.2019.1628806

Cornish , D., & Clarke , R. V. (2008). The rational choice perspective. In R. Wortley and L. Mazerolle (Eds.), *Environmental Criminology and Crime Analysis* (pp. 21–47). Cullompton, UK: Willan Publishing.

Crossley, N. (2010). The social world of the network. Combining qualitative and quantitative elements in social network analysis. *Sociologica*, *4*, 1-34. doi: 10.2383/32049

Dimeo, P., J. Allen, J. Tayler, S. Dixon, and L. Robinson. (2013). Team Dynamics and Doping in Sport: A Risk or a Protective Factor? *Commissioned Report for the World Anti-Doping Agency.*

Dixon-Woods, M., Cavers, D., Agarwal, S., Annandale, E., Arthur, A., Harvey, J., ... & Riley, R. (2006). Conducting a critical interpretive synthesis of the literature on access to healthcare by vulnerable groups. *BMC Medical Research Methodology*, *6*, 35. doi: 10.1186/1471-2288-6-35

Dunn, M., Thomas, J.O., Swift, W., Burns, L., & Mattick, R.P. (2010). Drug testing in sport: The attitudes and experiences of elite athletes. *International Journal of Drug Policy, 21*, 330-332. doi: 10.1016/j.drugpo.2009.12.005

Engelberg, T., & Moston, S. (2015). Inside the locker room: a qualitative study of coaches' anti-doping knowledge, beliefs and attitudes. *Sport in Society*, *19*, 942-956. doi: 10.1080/17430437.2015.1096244

Engelberg, T., Moston, S., & Blank, C. (2017). Coaches' awareness of doping practices and knowledge about anti-doping control systems in elite sport. *Drugs: Education, Prevention and Policy*, *2*, 1-7. doi: 10.1080/09687637.2017.1337724

Fagnani, F., Faiola, F., Tomassi, G., Di Cagno, A., Pigozzi, F., & Borrione, N. (2018). Dissemination of the" WADA's outreach model on antidoping" in youth sport. *Medicina Dello Sport*, *71*, 474-489. doi: 10.23736/S0025-7826.18.03397-5

Fiske, D. W., & Shweder, R. A. (Eds.). (1986). *Metatheory in social science: Pluralisms and subjectivities*. Chicago: University of Chicago Press.

Fjeldheim, T. B. (1992). Sports Instructors and Sports Leaders: Attitudes Toward Doping in Sports, *Collegium Anthropoligicum*, *16*, 343-348.

Fung, L. (2006). Performance Enhancement Drugs: Knowledge, Attitude and Intended Behavior Among Community Coaches in Hong Kong. *The Sport Journal*, *9*. Retrieved from http://thesportjournal.org/article/tag/volume_3_number_1/page/10/

Fung, L., & Yuan, Y. (2008). Compliance by Hong Kong's national sport organizations with the world anti-doping program. *The Sport Journal*, *11*. Retrieved from http://thesportjournal.org/article/compliance-by-hong-kongs-national-sport-organizations-with-the-world-anti-doping-program/

Goodwin, C. J., & Goodwin, K. A. (2016). *Research in psychology methods and design* (4th ed.). Hoboken, NJ: John Wiley & Sons.

Hong, Q. N., Pluye, P., Fàbregues, S., Bartlett, G., Boardman, F., Cargo, M., ... & Rousseau, M. C. (2018). Mixed methods appraisal tool (MMAT), version 2018. *IC Canadian Intellectual Property Office, Industry Canada*.

Hong, Q. N., Pluye, P., Fàbregues, S., Bartlett, G., Boardman, F., Cargo, M., ... & O'Cathain, A. (2019). Improving the content validity of the mixed methods appraisal tool: a modified e-Delphi study. *Journal of Clinical Epidemiology*, *111*, 49-59. doi: 10.1016/j.jclinepi.2019.03.008

Howlett, N., Jones, A., Bain, L., & Chater, A. (2017). How effective is community physical activity promotion in areas of deprivation for inactive adults with cardiovascular disease risk and/or mental health concerns? Study protocol for a pragmatic observational evaluation of the 'Active Herts' physical activity programme. *BMJ Open*, *7*, e017783. doi: 10.1136/bmjopen-2017-017783

Imbens, G. W., & Rubin, D. B. (2015). *Causal inference in statistics, social, and biomedical sciences*. Cambridge, UK: Cambridge University Press.

Jackson, C., Eliasson, L., Barber, N. & Weinman, J. (2014) Applying COM-B to medication adherence. A suggested framework for research and interventions. *The European Health Psychologist, 16*, 7-17.

Jones, M. L. (2004). Application of systematic review methods to qualitative research: Practical issues. *Journal of Advanced Nursing, 48*, 271-278. doi:10.1111/j.1365-2648.2004.03196.x

Judge, L., Bellar, D., Petersen, J., Gilreath, E. & Wanless, E. (2010) Taking strides toward prevention-based deterrence: USATF coaches' perceptions of PED use and drug testing. *Journal of Coaching Education*, *3*, 56-71. doi: 10.1123/jce.3.3.56

Jurisic, D., & Sattler, T. (2015). Knowledge on Doping: Construction and Validation of an Original Measurement Tool and its Applicability to Olympic Sailing. *Kinesiologia Slovenica*, *21*, 37-45.

Kegelaers, J., Wylleman, P., De Brandt, K., Van Rossem, N., & Rosier, N. (2018). Incentives and deterrents for drug-taking behaviour in elite sports: a holistic and developmental approach. *European Sport Management Quarterly*, *18*, 112-132. doi: 10.1080/16184742.2017.1384505

Khan, K. S., Kunz, R., Kleijnen, J., & Antes, G. (2003). Five steps to conducting a systematic review. *Journal of the Royal Society of Medicine*, *96*, 118-121. doi: 10.1258/jrsm.96.3.118

Kirby, K., Moran, A., & Guerin, S. (2011). A qualitative analysis of the experiences of elite athletes who have admitted to doping for performance enhancement. *International Journal of Sport Policy and Politics, 3,* 205–224. doi:10.1080/19406940. 2011.577081.

Kmet, L., Lee, R., & Cook, L. (2004). Standard quality assessment criteria for evaluating primary research papers from a variety of fields. *Alberta, Canada: Alberta Heritage Foundation for Medical Research*.

Kokko, S., Villberg, J., & Kannas, L. (2015). Health Promotion in Sport Coaching: Coaches and Young Male Athletes' Evaluations on the Health Promotion Activity of Coaches. *International Journal of Sports Science & Coaching*, *10*, 339-352. doi: 10.1260/1747-9541.10.2-3.339

Kondric, M., Sekulic, D., & Mandic, G. F. (2010). Substance use and misuse among Slovenian table tennis players. *Substance Use and Misuse*, *45*, 543-553. doi: 10.3109/10826080903452553

Laure, P., Thouvenin, F. & Lecerf, T. (2001). Attitudes of Coaches Toward Doping*, Journal of Sports Medicine and Physical Fitness*, *41*, 132-136.

Lazuras, L., Barkoukis, V., Rodafinos, A., & Tsorbatzoudis, H. (2010). Predictors of doping intentions in elite-level athletes: A social cognition approach. *Journal of Sport and Exercise Psychology, 32*, 694-710. doi: 10.1123/jsep.32.5.694

Lentillon-Kaestner, V. (2014). Doping use and deviance in Swiss national and international elite cycling. *Performance Enhancement & Health*, *3*, 167-174. doi; 10.1016/j.peh.2015.09.004

Lentillon-Kaestner, V., & Carstairs, C. (2010). Doping use among young elite cyclists: A qualitative psycho-sociological approach. *Scandinavian Journal of Medicine and Science in Sports*, *20*, 336–345. doi: 10.1111/j.1600-0838.2009.00885.x

Lucidi, F., Mallia, L., & Zelli, A. A. (2015). When the 'how' may at least matter as much as the 'what'. In V. Barkoukis, L. Lazuras, & H. Tsorbatzoudis (Eds.), *The psychology of doping in sport* (pp. 65–77). Oxford, UK: Routledge.

MacNamara, Á., & Collins, D. (2014). Why athletes say no to doping: A qualitative exploration of the reasons underpinning athletes' decision not to dope. *Performance Enhancement and Health*, *3*, 145-152. doi: 10.1016/j.peh.2015.09.001

Mandic, G. F., Peric, M., Krzelj, L., Stankovic, S., & Zenic, N. (2013). Sports nutrition and doping factors in synchronized swimming: Parallel analysis among athletes and coaches. *Journal of Sports Science and Medicine*, *12*, 753-760.

Mazanov, J., Backhouse, S.H., Connor, J., Hemphill, D., & Quirk, F. (2013). Athlete support personnel and anti-doping: Knowledge, attitudes, and ethical stance. *Scandinavian Journal of Medicine and Science in Sports*, *24*, 845-856. doi: 10.1111/sms.12084

Mazanov, J., Hemphill, D., Connor, J., Quirk, F., & Backhouse, S. H. (2014). Australian athlete support personnel lived experience of anti-doping. *Sport Management Review*, *18*, 218-230. doi: 10.1016/j.smr.2014.05.007

Mazanov, J., & Huybers, T. (2010). An empirical model of athlete decisions to use performance-enhancing drugs: qualitative evidence. *Qualitative Research in Sport and Exercise, 2*, 385-402. doi: 10.1080/19398441.2010.517046

Mazanov, J., Huybers, T., & Connor, J. (2010). Qualitative evidence of a primary intervention

point for elite athlete doping. *Journal of Science and Medicine in Sport, 14*, 106-110. doi: 10.1016/j.jsams.2010.06.003

McEvoy, P., & Richards, D. (2006). A critical realist rationale for using a combination of quantitative and qualitative methods. *Journal of Research in Nursing*, *11*, 66-78. doi: 10.1177/1744987106060192

Michie, S. & Abraham, C. (2004). Interventions to change health behaviours: evidence-based or evidence-inspired? *Psychology and Health, 19*, 29-49. Doi: 10.1080/0887044031000141199

Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., & Prisma Group. (2010). Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *International Journal of Surgery, 8*, 336–341. doi: 10.1016/j.ijsu.2010.02.007

Moher, D., Shamseer, L., Clarke, M., Ghersi, D., Liberati, A., Petticrew, M., Shekelle, P., Stewart, L. A., & Prisma Group (2015). Preferred reporting items for systematic reviews and meta-analyses protocols (PRISMA-P) 2015 statement. *BioMed Central, 4*, 1-9. doi:10.1186/2046-4053-4-1

Mook, D. G. (1996) *Motivation: the organization of action*. New York, NY: W. W. Norton.

Morente-Sanchez, J., & Zabala, M. (2015). Knowledge, attitudes and beliefs of technical staff towards doping in Spanish football. *Journal of Sports Sciences, 33*, 1267-1275. doi: 10.1080/02640414.2014.999699

Morgan, S. A., & Smith, J. (2018). Perceptions of Anti-Doping Policy among Collegiate Coaches. *Applied Research in Coaching & Athletics Annual*, *33*, 106–129.

Moston, S., Engelberg, T., & Skinner, J. (2014a). Athletes' and coaches' perceptions of deterrents to performance-enhancing drug use. *International Journal of Sport Policy and Politics*, *7*, 623-636. doi: 10.1080/19406940.2014.936960

Moston, S., Engelberg, T., & Skinner, J. (2014b). Perceived incidence of drug use in Australian sport: a survey of athletes and coaches. *Sport in Society, 18*, 91-105. doi: 10.1080/17430437.2014.927867

Nicholls, A. R., Perry, J. L., Levy, A. R., Meir, R., Jones, L., Baghurst, T., Sanctuary, C., & Thompson, M. A. (2015). Coach perceptions of performance enhancement in adolescence: The sport drug control model for adolescent athletes. *Performance Enhancement and Health*, *3*, 93–101. doi: 10.1016/j.peh.2015.07.001

Norris, L. A., Didymus, F. F., & Kaiseler, M. (2017). Stressors, coping, and well-being among sports coaches: A systematic review. *Psychology of Sport and Exercise*, *33*, 93-112. doi: 10.1016/j.psychsport.2017.08.005

Ntoumanis, N., Barkoukis, V., Gucciardi, D. F, Chan, D. (2017). Linking coach interpersonal style with athlete doping intentions and doping use: a prospective study. *Journal of Sport and Exercise Psychology*, *39*,188-198. doi: 10.1123/jsep.2016-0243

O'Donnell, T., Mazanov, J., Huybers, T. (2006). Towards a choice model of athletes' decision to use performance enhancing substances or methods: factors and covariates. Australia. In: *Proceedings from the ACSPRI Social Science Methodology Conference*. Retrieved from http://old.acspri.org.au/conference2006//proceedings/.

Ohl, F., Fincoeur, B., Lentillon-Kaestner, V., Defrance, J., & Brissonneau, C. (2015). The socialization of young cyclists and the culture of doping. *International Review for the Sociology of Sport*, *50*, 865-882. doi: 10.1177/1012690213495534

Pace, R., Pluye, P., Bartlett, G., Macaulay, A. C., Salsberg, J., Jagosh, J., & Seller, R. (2011). Testing the reliability and efficiency of the pilot Mixed Methods Appraisal Tool (MMAT) for systematic mixed studies review. *International Journal of Nursing Studies*, *49*, 47-53. doi: 10.1016/j.ijnurstu.2011.07.002

Patterson, L. B., & Backhouse, S. H. (2018). "An important cog in the wheel", but not the driver: Coaches' perceptions of their role in doping prevention. *Psychology of Sport and Exercise*, *37*, 117-127. doi: 10.1016/j.psychsport.2018.05.004

Patterson, L. B., Backhouse, S. H., & Duffy, P. J. (2016). Anti-doping education for coaches: Qualitative insights from national and international sporting and anti-doping organisations. *Sport Management Review*, *19*, 35-47. doi: 10.1016/j.smr.2015.12.002

Patterson, L. B., Backhouse, S. H., & Lara-Bercial, S. (2019). Examining coaches' experiences and opinions of anti-doping education. *International Sport Coaching Journal*, *6*, 145-159. doi: 10.1123/iscj.2018-0008

Patterson, L. B., Duffy, P. J., & Backhouse, S. H. (2014). Are coaches anti-doping? Exploring issues of engagement with education and research. *Substance Use and Misuse*, *49*, 1182-1185. doi: 10.3109/10826084.2014.912469

Petróczi, A., & Aidman, E. (2009). Measuring explicit attitude toward doping: Review of the psychometric properties of the Performance Enhancement Attitude Scale. *Psychology of Sport and Exercise*, *10*, 390-396. doi: 10.1016/j.psychsport.2008.11.001

Popay. J., Roberts, H., Sowden, A., Petticrew, M., Arai, L., Rodgers, M., Britten, N., Roen, K., & Duffy, S. (2006). *Guidance on the conduct of narrative synthesis in systematic reviews*. Swindon, UK: Economic and Social Research Council.

Pope, C., Mays, N., & Popay, J. (2007). *Synthesising qualitative and quantitative health evidence: A guide to methods.* Maidenhead, UK: McGraw-Hill.

Pöppel, K., & Büsch, D. (2019). The doping critical attitude of elite sports coaches in combat sports. *German Journal of Exercise and Sport Research*, *49*, 168-178. doi: 10.1007/s12662-019-00565-6

Prochaska, J. O. & Velicer, W. F. (1997) The transtheoretical model of health behavior change. *American Journal of Health Promotion*, *12*, 38–48.

Rittel, H. W., & Webber, M. M. (1973). Dilemmas in a general theory of planning. *Policy Sciences*, *4*, 155-169.

Rodek, J., Sekulic, D., & Kondric, M. (2012). Dietary supplementation and doping-related factors in high-level sailing. *Journal of the International Society of Sports Nutrition*, *9*, 51. doi: 10.1186/1550-2783-9-51

Sajber, D., Rodek, J., Escalante, Y., Olujić, D., & Sekulić, D. (2013). Sport nutrition and doping factors in swimming; parallel analysis among athletes and coaches. *Collegium Antropologicum*, *37*, 179-186.

Scarpino, V., Arrigo, A., Benzi, G., Garattini, S., La Vecchia, C., Bernadi, L.R., Silvestrni, G. & Tuccimei, G. (1990). Evaluation of prevalence of doping among italian athletes. *Lancet*, *336*, 1048-1050. doi: 10.1016/0140-6736(90)92502-9

Seif-Barghi, T. S., Halabchi, F., Dvorak, J., & Hosseinnejad, H. (2015). How the Iranian football coaches and players know about doping. *Asian Journal of Sports Medicine*, *6*, e24392. doi: 10.5812/asjsm.6(2)2015.24392

Sniehotta, F. F., Presseau, J., & Araújo-Soares, V. (2014). Time to retire the theory of planned behaviour. *Health Psychology Review*, *8*, 1-7. doi: 10.1080/17437199.2013.869710

Sparkes, A. C., & Smith, B. (2013). *Qualitative research methods in sport, exercise and health: from process to product*. London, UK: Routledge.

Staff, H. R., Didymus, F. F., & Backhouse, S. H. (2017). The antecedents and outcomes of dyadic coping in close personal relationships: a systematic review and narrative synthesis. *Anxiety, Stress, & Coping*, *30*, 498-520. doi: 10.1080/10615806.2017.1329931

Sullivan, P. J., Feltz, D. L., LaForge-MacKenzie, K., & Hwang, S. (2014). The preliminary development and validation of the Doping Confrontation Efficacy Scale. *Psychology of Sport and Exercise*, *16*, 182-190. doi: 10.1016/j.psychsport.2014.04.011

Thomas, J. O., Dunn, M., Swift, W., & Burns, L. (2011). Illicit drug knowledge and information-seeking behaviours among elite athletes. *Journal of Science and Medicine in Sport, 14*, 278-282. doi: 10.1016/j.jsams.2011.02.001

Turnnidge, J., & Côté, J. (2017). Transformational coaching workshop: Applying a person-centred approach to coach development programs. *International Sport Coaching Journal*, *4*, 314-325. doi: 10.1123/iscj.2017-0046

UKAD (2019). *About Doping in Sport.* United Kingdom: UK Anti-Doping. Retrieved from https://ukad.org.uk/our-organisation/what-we-do/about-doping/

UKAD (2018). *Coach Clean.* United Kingdom: UK Anti-Doping. Retrieved from https://ukad.org.uk/education/coaches/coach-clean/

USADA. (2011). What Sport Means in America: A Study of Sport's Role in Society. *Journal of Coaching Education*, *4*, 2–44. doi: 10.1123/jce.4.1.2

WADA (2015). *World Anti-Doping Code* (*WADC*). Canada: World Anti-Doping Agency. Retrieved from https://www.wada-ama.org/sites/default/files/resources/files/wada-2015-world-anti-doping-code.pdf

WADA (2018). *Coach True*. Canada: World Anti-Doping Agency. Retrieved from https://www.wada-ama.org/en/resources/education-and-prevention/coachtrue

WADA (2019). *2021 Code Review*. Canada: World Anti-Doping Agency. Retrived from https://www.wada-ama.org/en/what-we-do/the-code/2021-code-review

Webb, T. L., & Sheeran, P. (2006). Does changing behavioural intentions engender behavior change? A meta-analysis of the experimental evidence. *Psychological Bulletin*, *132*, 249–268. doi: 10.1037/0033-2909.132.2.249

West, R. (2005). Time for a change: putting the Transtheoretical (Stages of Change) Model to rest. *Addiction*, *100*, 1036-1039. doi: 10.1111/j.1360-0443.2005.01139.x

Whittemore, R., & Knafl, K. (2005). The integrative review: updated methodology. *Journal of Advanced Nursing*, *52*, 546-553. doi: 10.1111/j.1365-2648.2005.03621.x

Williams J. M., & Andersen M. B. (1998). Psychosocial antecedents of sport injury: Review and critique of the stress and injury model. *Journal of Applied Sport Psychology*, *10*, 5-25. doi: 10.1080/10413209808406375

Table 1

Final search terms used for electronic database searches.

Search Term Categories		
Phenomena:	Cognitive-Behavioural Characteristics:	Population:
	AND	**AND**
Doping OR dope OR doper OR dopers OR anti-dop* OR antidop* OR "anti doping" OR “performance enhancing drugs” OR “performance enhancing substances” OR “image and performance enhancing substances” OR “image and performance enhancing drugs” OR “image enhancing drugs” OR “image enhancing substances” OR “appearance and performance enhancing substances” OR “banned drugs” OR “banned substances” OR “prohibited drugs” OR “prohibited substances” OR “steroids” OR “anabolic steroids”	Attitude* OR belief* OR knowledge OR perspective* OR perception* OR opinion* OR behaviour* OR action* OR communicat* OR experience* OR educat* OR interven* OR human-cent* OR user-cent* OR design-cent*	Coach* OR manager* OR mentor* OR trainer* OR instructor* OR teacher* OR tutor* OR "athlete support personnel" OR entourage OR sportsnet

Table 2

Publication dates and breakdown of included studies

Year of Publication	Number of Studies included in final sample	Percentage of included studies
1999	0	0
2000	0	0
2001	1	2.6
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	1	2.6
2007	0	0
2008	2	5.3
2009	0	0
2010	4	10.5
2011	2	5.3
2012	1	2.6
2013	4	10.5
2014	7	18.4
2015	6	15.8
2016	0	0
2017	2	5.6
2018	4	10.5
2019	4	10.5
TOTAL	38	100

**n.b.* The searches were conducted up until 31stth August 2019.

Table 3

Tabulation of extracted data from included studies.

Author(s) and Year	Country	Aims	Sample	Design and Methods	Quality Scores	Themes	Key Findings
Allen et al. (2017)	Scotland (United Kingdom)	To examine coaches' perceptions of their role and actions in athletes' anti-doping behaviour.	23 Performance Coaches (17M/6F, M_{age} = 42.9, *SD* = 8.71, *CE* = 18.85). *Additional Coach Sample Details:* All coaches were currently/recently working at national or international level.	QL CS INT	SQAC= 80% MMAT= 100%	Coach beliefs Coach knowledge Self-reported behaviour Psychosocial components	- Coaches largely held clean sport beliefs based within wider context of strong anti-doping values of Scottish and British programmes and sporting culture. - Coaches acknowledged influence over athletes in terms of advice given and demonstration of values, which emphasised a focus on process over outcome. - *However,* coach self-reported anti-doping behaviours were reactive and not systematic/pro-active. Responsibility of anti-doping actions was left to other staff (e.g., anti-doping officers or doctors). - Among 17 coaches doping was not considered to be a problem in their sport with anti-doping being seen as low priority.
Barkoukis et al. (2019)	Australia and Greece	To investigate the role of the athletes' entourage in fostering or forestalling athletes' doping intentions and behaviours.	19 Coaches (9 Australian: 7M/2F, *Mage* = 44.5, *SD* = 14.3, *CE* = 20.25; 10 Greek: 10M/0F, *Mage* = 48.1, *SD* = 6.34; *CE* = 20.6). *Additional Populations Sampled:* 21 Athletes from	QL CS INT	SQAC= 85% MMAT= 86%	Coach beliefs Coach knowledge Self-reported behaviour Hypothetical behaviour Psychosocial	*Results from coaches are not always distinguished in the reported findings. Specific coach findings (where possible) and general findings from across the sample of participants are presented below:* - Coaches who had a close and trusting relationship with their athletes were considered most influential with respect to doping-related decisions. It appears that athletes are likely to internalise and display the morals and standards developed by their coach. - Coaches and athletes adopted a clear and straightforward anti-doping stance. However, this

			team and individual sports.			components	initial stance generally blurred when probed further. - The influence of doping stigma on doping-related perceptions and actions was exhibited through coaches' lack of doping knowledge, limited provision of doping education activities for athletes and a displacement of responsibility regarding doping education. - An anti-doping culture in the athletes' environment was considered central to adopting an anti-doping stance. This anti-doping culture was characterised by identified clear team morals, strong team leaders, strong moral values from upbringing, strong support systems and resources within the team.
Bhagirathi (2008)	India	To assess the knowledge and awareness of doping and drugs abuse in sports from coaches, physical education teachers, sports physiotherapists and medical doctors.	Coaches, physical education teachers *(N, M/F, M_{age}, SD and CE not stated).* *Additional Populations Sampled:* *S*ports physiotherapists and medical doctors *(N not stated).*	QT CS QUES	SQAC= 35% MMAT= 29%	Coach knowledge	- 60% of coaches were unaware of WADA doping testing methods. - 56% of coaches were aware of the WADA banned substance list. - 57% of coaches were aware of Therapeutic Use Exemptions (TUEs). - Reported significant statistical difference found among groups (coaches, physical education teachers and medical practitioners; *Direction and nature of this significant difference is difficult to decipher*).
Blank et al. (2014)	Austria	To evaluate the knowledge and attitudes of coaches and sport teachers regarding anti-doping.	20 Coaches, 32 Sport teachers and 10 fulfilled both roles (55M/7F, M_{age} = 37.9, *SD* = 11.7, *CE* = 13.3).	QT CS QUES	SQAC= 65% MMAT= 86%	Coach knowledge Coach beliefs Self-reported behaviour	- Significant statistical difference ($p < .05$) between participants' actual knowledge and perceived knowledge (actual knowledge was significantly higher than perceived knowledge). - 69.4% of the sample indicated that doping is not a relevant topic during everyday training despite 48.4% reporting high interest in the topic of performance enhancing substances.

							- Coaches' score on attitudes items was 86.8/100, outlining a positive anti-doping attitude. - Despite positive anti-doping attitudes coaches' scored very moderately (48.7/100) across 6 anti-doping behaviour items.
Boardley et al. (2019)	United Kingdom	To investigate the nature of doping confrontation efficacy (DCE) beliefs and examine possible antecedents and outcomes of these from the perspective of coaches.	11 Technical Coaches (7M/4F, M_{age} = 40.6, *SD* and *CE not stated*). *Additional Coach Sample Details:* 8 from rugby, 3 from athletics across regional, national and international levels). *Additional Populations Sampled:* 10 Strength and Conditioning Coaches.	QL CS INT	SQAC= 95% MMAT= 86%	Coach knowledge Coach beliefs Hypothetical behaviour	-Data analysis supported relevance of all five dimensions of DCE (Sullivan et al., 2015). - Initiation: Most coaches were generally confident they could clearly articulate the purpose/s they would outline when initiating confrontations (e.g., understanding why athletes may be considering doping and changing athletes' minds about choosing to dope). - Intimacy: Most coaches recognised and felt confident in the interpersonal skills that underpin intimacy beliefs. - Expected Outcomes: More variable than intimacy and initiation beliefs. A potential negative outcome that concerned several coaches was the potential for damaging trust within the coach-athlete relationship. - Deficits in coaches' anti- doping knowledge were also identified, for example many coaches were not aware of important resources for coaches and athletes (e.g., Informed Sport or Global DRO), supporting the need for improved anti-doping education for coaches.
Dunn et al. (2010)	Australia	To investigate the extent to which elite Australian athletes and key experts (KE)	24 'Key Experts' (*M/F, M_{age}, SD and CE not stated*) *Additional Coach Sample Details:* Included: 7 retired	MULTI-M (QL Arm) CS INT	SQAC= 60% MMAT= 47%	Coach beliefs	*Reported findings did not separate coach findings from those of 'Key Experts':* - Most Key Experts (KE; 21/24) believed that drug testing was an effective deterrent to illicit drug use. - Five KE felt that the current doping-related policies

		who come into contact with athletes support drug testing as a deterrent to drug use.	athletes, 5 academics, 3 team managers, 2 high performance managers, 2 player association managers, 2 head coaches, 2 welfare managers, 1 executive officer, 1 national sport coordinator, 1 team medical officer. *Additional Populations Sampled:* 974 Elite Athletes. *Same sample as Thomas, Dunn, Swift & Burns (2011) - See below.*				in their sport were not adequate and that penalties should be more severe. Eleven KE believed that punishment severity was sufficient in their sport and 2 felt the penalties for being caught with an illicit drug should be less severe. - Most KE believed that there should be separate policies for Illicit Drugs (ID) and Performance Enhancing Drugs (PED) and that penalties for ID use should be less severe than for using a PED.
Engelberg & Moston (2015)	Australia	To explore coaches' knowledge, beliefs and attitudes about their role in anti-doping.	14 Coaches (9M/5F; M_{age} = 37.3 , *SD* = 10.29, *CE not stated*). *Additional Coach Sample Details:* Coach participants represented numerous sports currently working with elite athletes across state level (*n* =12) and national/international	QL CS INT	SQAC= 70% MMAT= 100%	Coach beliefs Coach knowledge Self-reported behaviour Hypothetical behaviour Psychosocial components	- The coach sample were consistently opposed to doping in sport and expressed strong opposing attitudes towards other coaches who might be supplying such substances to their athletes. - All participants believed that coaches had a role to play in the prevention of doping (through general influence over athlete) but coaches generally did not see anti-doping education as part of their role. - About half of the coaches stated that they would refer their athletes to the team doctor or a pharmacist if they asked them if a drug or substance was permitted. - Coaches reported that their anti-doping role as

			level (n = 2).				coaches was largely reactive (responding to athlete initiated requests) rather than proactive. - Emphasis on athlete responsibility for the use of legal or illegal drugs, and that coaches only had a limited part to play in monitoring such conduct.
Engelberg, Moston & Blank (2017)	Australia	To garner: (a) a more in-depth picture of coaches' actual awareness of doping practices and of possible ways athletes may avoid detection, (b) knowledge about anti-doping control systems, as well as (c) views on the importance of discussing doping themes with athletes and other coaches.	19 Coaches (15M/4F, M_{age} =45.8, *SD* and *CE not stated*). *Additional Coach Sample Details:* Coach sample represented 9 sports. All coaches were working with national/international level athletes, some (*n not stated*) were also working with non-elite youth athletes.	QL CS INT	SQAC= 75% MMAT= 100%	Coach beliefs Coach knowledge Self-reported behaviour	- All coaches correctly described random testing and all but one coach described out of competition testing correctly. However, coaches were far less knowledgeable of the biological passport and the whereabouts system. - The majority of coaches reported that they discuss doping matters with athletes two to three times a year. Some coaches hold discussions less frequently. - Several coaches admitted to only discussing doping issues when there is a prominent case covered by the media or during a doping educational workshop. - Coaches doping discussions were perceived to not follow an organised schedule. - Coaches were more likely to discuss doping matters with other coaches than with their athletes.
Fagnani et al. (2018)	Italy	1.) Evaluate coaches' and athletes' knowledge of doping risks and their attitude towards illegal behaviour.	129 Coaches (*N, M/F, M_{age}, SD and CE not stated.)* *Additional Populations Sampled:* 702 athletes.	QT LG QUES	SQAC= 32% MMAT= 29%	Coach beliefs Coach knowledge	*From the paper, it is very difficult to decipher specific coach data, so data summarised is limited here. Results from coaches (staff) and athletes are not distinguished in the results section:* - Slight decrease in interactive quiz survey scores between 2016 and 2017 (*does not indicate what this means or whether statistically significant*).

		2.) Evaluate the effectiveness of an educational intervention. 3.) Promote awareness of "WADA's outreach model on anti-doping" programme.	*Additional Overall Sample Details:* (*N* =831, 391M/440F) Representing 5 different sports across 2 time points.				- 50% of participants claimed to be 'very well' informed about doping and 40% as 'adequately' informed. - 55% of participants claimed that this educational intervention was useful to them on their 'sporting journey'.
Fung (2006)	Hong Kong	To investigate the perceived knowledge, actual knowledge, attitude and intended behaviour of community coaches with respect to performance enhancing drugs (PEDs).	114 Community Coaches (93M/21F, M_{age} = 29.3, *SD* = 8.1, *CE not stated*).	QT CS QUES	SQAC= 65% MMAT= 57%	Coach beliefs Hypothetical behaviour	-There was a large difference and significant negative correlation between coaches' mean perceived knowledge score (23.7) and actual knowledge score (66.1; r = -.263; p < .05). -Behavioural intention was significantly correlated (p< .05) to the coaches' attitude (r = .335), perceived knowledge (r = -.270) and actual knowledge (r = .304). - 74% acknowledge doping as a serious problem in international sport but less than 20% agreed that it was a serious problem in Hong Kong. - 20% of the sample strongly agreed that scientific research should develop drugs that can pass doping control tests. - 14% of the sample agreed or highly agreed that they would work with a medical team to produce a 'high quality' banned substance. - 63% disagreed or highly disagreed that they would find ways to assist friends or relatives (significant others) to get hold of banned substances; 11% agreed they would find ways to assist their friends or relatives to get hold of a banned substance.
Fung & Yuan	Hong Kong	To assess	42 NSOs'	MULTI-M	SQAC=	Coach beliefs	- The majority of participants were at the

(2008)		current anti-doping efforts among Hong Kong's national sport organisations (NSOs), for example organisations' readiness to change and to initiate or strengthen anti-doping measures.	Representatives (*M/F, M_{age}, SD and CE not stated).* *Additional Coach Sample Details:* Included administrators, coaches, and committee members.	(Only QT findings reported) CS QUES + INT	40% MMAT= 24%		contemplation stage (of the Transtheoretical Model) in terms of the implementing anti-doping functions; 8 coaches were in the pre-contemplation stage (17.8%), 23 were in the contemplation stage (51.1%) and 14 were in the action stage (31.1%). - Coach respondents' rank ordering of importance of "pro" factors in anti-doping decisions: 'It will directly or indirectly improve professional knowledge of the NSO staff' (most important); 'It will help to maintain fair play' (least important). - Coach respondents' rank ordering of importance of "con" factors in anti-doping decisions: 'It will create unnecessary hassle for our athletes' (most important); 'There is a lack of manpower to implement such works' (least important).
Judge et al. (2010)	United States of America	To examine the perceived knowledge, attitudes, subjective norms, and behavioural intent of track and field coaches on PED use and drug testing.	254 track and field coaches (193M/61F, M_{age} = 33.4, *SD* = 9.7). *Additional Coach Sample Details:* Represented various levels from high school to the professional/elite level.	QT CS QUES	SQAC= 80% MMAT= 71%	Coach beliefs Self-reported behaviour	- Coaches who were USATF certified reported that they felt more knowledgeable about PED use (r = .168, p = .004) and that they had learned about PED use and testing through the USATF coaches' education program (r = .220, p < .001). - USATF certified coaches also reported a stronger perception that the coach plays a key role in PED deterrence (r = .158, p = .006). - Coaches with USATF certifications also reported spending time discussing and discouraging PED use with athletes (r = .121, p = .027; USATF certified 64.7% 'Agree' or 'Strongly Agree', uncertified 48.9% 'Agree' or 'Strongly Agree'). - More coaching hours was also associated with greater disagreement with legal supplements such as creatine use, considered cheating (r = -.135, p = .034).

Jurisic & Sattler (2015)	Croatia	To develop and validate a questionnaire designed to screen athletes' and coaches' knowledge and perspectives regarding doping issues in sport.	34 Sailing Coaches (34M/0F, M_{age} = 37.2, *SD* = 11.7, *CE not stated).* *Additional Coach Sample Details:* All participants coached at an elite level. *Additional Populations Sampled:* 39 Sailing Athletes.	QT CS QUES	SQAC= 70% MMAT= 57%	Coach knowledge	- Coaches achieved slightly higher scores than the athletes for doping knowledge (scores /18, higher score indicated better doping knowledge); 8.01 (±1.5) and 7.04 (±1.3) for the coaches and athletes, respectively, but the difference was not statistically significant (t = 0.26, p = .13). - Coaches who are currently involved in Olympic sailing (n = 8; 9.37±3.47) achieved statistically significant (p < .05) better results than their peers involved in non-Olympic sailing (n = 26; 6.95±2.39). - However, coach sample variables of age, number of years sailing experience and best competitive results were not significantly correlated with doping knowledge test performance.
Kegelaers et al. (2018)	Belgium	To provide a comprehensive and contextual overview of the incentives and deterrents for doping use in elite sports.	5 Coaches (5M/0F, M_{age} = 54.2, *SD* = 9.6, *CE not stated*). *Additional Coach Sample Details:* All full-time professionals, coaching at an international level in soccer, swimming, handball, track and field, or basketball. *Additional Populations Sampled:* 36 Former athletes, 4 doping 'experts'	QL CS FG	SQAC= 80% MMAT= 57%	Coach beliefs	*From the paper, it is very difficult to decipher specific coach data. Consequently, data summarised here is limited to general findings from across the whole sample of participants:* - Incentives (Push Factors): Participants reported push factors across a total of 5 levels which they believed could push athletes towards the use of doping: Athletic, Psychological, Psychosocial, Financial and Policy levels. - Incentives (Pull Factors): A total of 4 levels identified that could pull athletes towards the use of doping: Athletic, Psychological, Psychosocial and Financial levels. - Deterrents (Anti-push Factors): Participants reported factors across 4 levels that could deter athletes from using PEDs: Psychological Psychosocial, Financial, Policy levels. - Deterrents (Anti-pull factors): Participants

			and 3 self-admitted doping users.				identified anti-pull factors (perceived risks which might deter athletes from doping) across 4 levels: Athletic, Psychological, Psychosocial and Financial levels.
Kokko, Villberg & Kannas (2015)	Finland	To examine the extent to which youth sports coaches have taken health promotion into account as a part of coaching practice and to compare coaches and young (14 to 16 years old) male athletes' perceptions on coaches' health promotion activity.	240 Coaches (198M/29F, M_{age}, *SD and CE not stated*). *Additional Coach Sample Details:* Currently coaching 14 to 16 year old athletes. *Additional Populations Sampled:* 646 Athletes (14-16 years old). *Demographic data provided, but mean descriptive statistics not provided.*	QT CS QUES	SQAC= 90% MMAT= 100%	Coach beliefs Self-reported behaviour	*The paper is focussed on the general area of health promotion, which encompasses doping as a specific aspect. Results reported in this section of the table are limited and are summarised in relation to health promotion generally:* - There were significant differences ($p < .001$) between coaches' and young athletes' perceptions on the health promotion activity of the coaches, including 'doping' and 'drugs' as specific health topic domains. - Coaches self-reported a greater level of health promotion activity compared to athletes' perceptions of coach activity. - A statistically significant difference ($p < .001$) of higher self-reported scores of health promotion activity compared to athlete scores for coaches were reported for sports performance-related actions and health topics (but not non-performance-related actions). - 10-20% of coaches reported that they had never raised substance-related issues with their athletes before.
Laure, Thouvenin, & Lecerf (2001)	France	To give information about the attitudes of coaches toward	260 Coaches (183M/77F, M_{age} = 30.8, *SD* = 8.0 years, *CE not stated*).	QT CS QUES	SQAC= 70% MMAT= 71%	Coach beliefs Self-reported behaviour	- 80.7% consider that the current methods of preventing doping in sport are ineffective. - 80.3% of the sample rate themselves as 'badly trained' in the prevention of doping and 73.8% would like to have specific training on the subject of doping.

		doping and its prevention and to evaluate how they confronted it.	*Additional Coach Sample Details:* All were state-validated qualified coaches, representing a total of 32 different sports.				- 98.1% consider that they have a role to play in the prevention of doping. - Only 35.0% of coaches said that they had accessed the list of banned products. - Only 10.4% (1 coach out of 10) have organised a doping prevention action during the last 12 months. - 5.8% of coaches had used doping drugs in the last 12 months.
Lentillon-Kaestner (2014)[SEP]	Switzerland	To better understand doping norms in Swiss national and international elite cycling.	Two coaches (2M/0F, *M_{age}, SD and CE not stated*). *Additional Coach Sample Details:* All of the coaches, team or individual managers interviewed had previously been international elite cyclists. *Additional Populations Sampled:* Also 8 young active cyclists, 3 physicians, 2 cycling team managers, 2 individual cycling managers and 1 cycling journalist (all male) were recruited.	QL CS INT	SQAC= 65% MMAT= 86%	Coach beliefs Psychosocial components	*From the paper, it is very difficult to decipher specific coach data. Consequently, data summarised here is limited to general findings from across the whole sample of participants:* - In Switzerland doping was perceived by interviewees as deviant only for the national elite level, not at the international level. - Participants, including trainers, stated that the social pressure to dope made it very difficult for cyclists to refuse at the international, elite level. - Participants considered a shift of cycling doping culture before and after the Festina Scandal (1998): Before the Festina Scandal, clean professional cyclists were considered 'outsiders' and socially sanctioned (e.g., ostracised) because they did not want to follow the group's doping norms. Following the Festina Scandal, doping practices have become more hidden, but some social pressures still existed at the international level.

Mandic et al. (2013)	Croatia and Serbia	To determine and compare the knowledge of sports nutrition and doping between synchronised swimming athletes and their coaches and to clarify the factors related to knowledge of doping and sports nutrition.	28 Synchronised Swimming Coaches (M_{age} = 30, *SD* = 5.26, *M/F and CE not stated*). *Additional Coach Sample Details:* 19 and 9 coaches from Croatia and Serbia respectively. *Additional Populations Sampled:* 82 Junior and senior athletes.	QT CS QUES	SQAC= 75% MMAT= 57%	Coach beliefs Coach knowledge	- On average coaches scored significantly higher than athletes on Knowledge of Sports Nutrition (KSN; 8.14 and 5.56, respectively) and for Knowledge of Doping (KD; 6.57 and 4.59, respectively). - Approximately two-thirds of coaches and one-third of athletes declared self-education as the primary source of information on doping and KSN. - One third of coaches believed doping is present in synchronised swimming. The coaches who scored higher on the KD were also more convinced that there is doping in synchronised swimming. - The more experienced coaches had a better KD, and those with higher formal education are associated with a better KSN score.
Mazanov & Huybers (2010)	Australia	To generate a grounded model of athlete decision-making performance-enhancing substance and method (PESM) use.	4 Coaches (*M/F, M_{age}, SD and CE not stated).* *Additional Coach Sample Details:* Coaches were from Olympic, professional and state levels of competition. *Additional Populations Sampled:*	QL CS INT and FG	SQAC= 70% MMAT= 71%	Coach beliefs	- When discussing objectives of PESM use, one coach quote emphasised the importance of winning to athletes and that having a ‘win at all costs’ mentality means athletes are more likely to dope. - Two coaches also emphasised the consequences of winning citing 'the limelight', accolades and financial/contractual benefits to winning which may influence athlete decisions to dope. - When discussing the Deterrence System, one coach quote suggested that detectability of a substance impacts on athletes’ PESM decisions. In this coach’s opinion if a substance was not detectable this would make athletes more likely to dope.

			37 Athletes, 4 physiotherapists, 2 dieticians/sports nutritionists, 1 sports administrator and 1 sports scientist.				
Mazanov, Huybers & Connor (2010)	Australia	Further development of athlete PESM decision-making grounded theory from Mazanov and Huybers (2010; see above).	4 Coaches (3M/1F, *Mage, SD and CE not stated).* *Additional Coach Sample Details:* Coaches worked at Olympic, international professional, national professional and state levels. *Additional Populations Sampled:* 8 Athletes, 4 physiotherapists, 2 sports nutritionists/dietician, 1 sports administrator and 1 sports scientist.	QL CS INT	SQAC= 65% MMAT= 71%	Coach beliefs	*From the paper, it is very difficult to decipher specific coach data, so data summarised is limited here. Specific coach findings (where possible) and general findings from across the sample of participants are presented below:* - 'Sponsorship' (financial and non-financial) was identified as influencing the motivation of athletes to use PEDs. - A national coach participant suggested that sponsorship was a factor that may influence athlete motivation to use PEDs, especially if an athlete is on the cusp of "making it" for example, being selected for a team. The coach suggested that an athlete would be more likely to use PEDs if they thought it would give them an "extra edge" and if "sport's all they've got maybe". - Participants highlighted that doping prevention is likely to be more effective when timed to co-occur with an athlete being on the cusp of winning or losing sponsorship.

Mazanov et al. (2013)	Australia	To determine the knowledge, ethical stance, and attitudes of Athlete Support Personnel (ASP) in relation to their anti-doping obligations.	Approximately 62 coaches *(exact number not reported; M/F, M_{age}, SD and CE not stated*). *Additional Overall Sample Details:* 292 Australian Athlete Support Personnel (158M/134F, M_{age} = 40.2 years, *SD* = 13.5, *CE* = 16.8 years; 44% were former elite athletes).	QT CS QUES	SQAC= 80% MMAT= 71%	Coach beliefs Coach knowledge Self-reported behaviour	- Coaches' knowledge was similar to that of other ASP; 28 coaches obtained a mean score of 27.5/35 (*SD* = 2.3), which was marginally below the average ASP score of 27.7/35. - Coaches (32/62) were providing untrained dietary advice far more than other ASP, such as psychologists (2/8) and nutritionists (0/7). - 27.2% of ASP respondents had provided advice to their athletes about anti-doping without reading the WADC. - 77.3% of ASP respondents also reported 'never' talking about athlete doping with other ASP. - 31.5% of ASP reported ignoring unethical behaviour of other support staff.
Mazanov et al. (2014)	Australia	To investigate the relationship between anti-doping policy and practice as experienced and understood by Australian ASP.	18 Coaches (*M/F, M_{age}, SD and CE not stated).* *Additional Populations Sampled:* 5 administrators, 4 psychologists, 4 trainers, 3 medical practitioners, 2 sport scientists, 1 physiotherapist, 1 lawyer, and 1 parent.	QL CS INT	SQAC= 80% MMAT= 100%	Coach beliefs Coach knowledge Hypothetical behaviour Psychosocial components	- Perceptions of 'being knowledgeable' were associated with knowing how to access anti-doping information, if needed. - There was a dominant view that there was no/little urgency or need to be familiar with the WADC, as doping was perceived as so rare that it was unlikely that ASP would ever be in a situation where they needed to act. - If an athlete told ASP that they were using a banned PED: 21/39 ASP would 'report to a higher authority in sport', 15/39 would not report the athlete to ASADA and 4/39 would not report the athlete at all and would keep the information confidential. Furthermore, 12/39 ASP would remind the athlete about their obligations and counsel the athlete as to

							consequences to their sporting career and 9/39 would counsel athlete as to consequences to health. - Referral to ASP's own organisational hierarchy or other ASP for additional support was a common approach and engaging management of the sporting organisation for advice was the dominant response if an athlete admitted doping, as opposed to referring to the WADC or other WADA resources.
MacNamara & Collins (2014)	United Kingdom and Ireland	To examine the reasons athletes cite for not using PEDs. Also interested in exploring whether the reasons not to use PEDs might vary against a number of key factors including age, sport, and level of performance.	10 Coaches (10M/0F, *CE* = 15 years, M_{age} *and SD not stated*). *Additional Coach Sample Details:* Coaches were at the 'world-class' level, referring to coaches who have worked at World Championship, Olympic Games and/or international level. *Additional Populations Sampled:* 36 Elite Athletes.	QL CS INT	SQAC= 85% MMAT= 86%	Coach beliefs	*From the paper, it is very difficult to decipher specific coach data, so data summarised is limited here. Specific coach findings (where possible) and general findings from across the sample of participants are presented below:* -A minority of older athletes and coaches (previously as athletes) admitted to taking PEDs during their early career and recognised the temptation of this (conversely, the younger cohort of athletes strongly articulated their stance and stated how they would not take PEDs due to their personal ethical standards). - Despite the reporting of previous coach doping, coaches were highlighted as a protective influence on athletes' decision not to dope. - The participants described how doping was "culturally inevitable" in other countries and sport systems but was not part of their personal involvement in sport.
Morente-Sanchez & Zabala (2015)	Spain	To understand the phenomenon of doping	101 Football Coaches (*M/F,* M_{age}*, SD and CE not stated).*	MULTI-M (Only QT findings	SQAC= 55%	Coach beliefs Coach	- 84.9% of all respondents did not know the prohibited list, with coaches representing the lowest proportion holding this knowledge (6.1%) compared

		(attitudes, beliefs and knowledge) in Spanish Football teams' technical staff members.	*Additional Overall Sample Details:* Total of 237 Athlete Support Personnel from Spanish football, including 101 coaches, 68 physical trainers and 68 other technical staff (e.g., physiotherapists, doctors, and psychologists) (M_{age} = 34.5, *SD* = 8.6 years, *M/F and CE not stated*).	reported) CS QUES	MMAT= 47%	knowledge Self-reported behaviour	to physical trainers (19.7%) and other technical staff (23.9%). - For perceived anti-doping knowledge coaches scored themselves lowest across the three groups: coaches (3.1/10), physical trainers (4.1/10) and other technical staff (4.4/10; significant at $p < .05$). - Across the total sample, the three most common groups reported as responsible for doping were doctors (33%), players (11%), and coaches (10%). - Across the sample 39.2% of ASP had used/recommended supplements before. In addition, participants across the three categories had reported using banned substances before, coaches (8.1%), physical trainers (6%), and other technical staff (1.5%).
Morgan & Smith (2018)	United States of America	How do collegiate coaches perceive the currently adopted international doping policy? How is the education of this policy delivered to student-athletes attempting to compete at the Olympic level?	6 Coaches (*M/F, M_{age}, SD and CE not stated).* *Additional Coach Sample Details:* Participants coached student-athletes across NCAA summer sports from 3 different conferences.	QL CS INT	SQAC= 55% MMAT= 43%	Coach beliefs Psychosocial components	- Coaches emphasised the role of their medical staff/ trainers in anti-doping, citing that these staff were more educated and were perceived to be responsible for delivering anti-doping education. - Coaches reported that doping education was managed via an administrative service during the beginning and mid-point of the academic year, with coaches reporting that they took on very little/no other anti-doping policy education and prioritised other educational topics instead. - Coaches perceived a low pervasiveness of doping, reporting a lack of positive drugs tests within their own sport, so did not see anti-doping education as a priority. - A main coach concern was over prevalence of 'street drugs' and alcohol abuse at the collegiate level, which was differentiated to 'doping'.

Moston, Engelberg & Skinner (2014a)	Australia	To compare the perceptions of legal and material loss deterrents for banned performance-enhancing drug use of both athletes and coaches.	92 Coaches (70M/22F, M_{age} = 37.8 years, *SD* = 13.68, *CE not stated*). *Additional Coach Sample Details:* Participants were recruited from a range of sports. *Additional Populations Sampled:* 488 Elite Athletes.	QT CS QUES	SQAC= 65% MMAT= 71%	Coach beliefs	- Coaches consistently saw the deterrence value of both forms of sanction (legal sanctions and material loss) as less effective than perceived by athletes ($p < .05$). - Athletes and coaches largely agreed that the problem of performance-enhancing drug use in sport was serious: 76.6% of athletes and 73.9% of coaches 'Agreed' or 'Strongly Agreed'. - However, there was a significant difference between attitudes towards the effectiveness of the current anti-doping regime ($p < .05$); 62.9% of athletes and 47.8% of coaches 'Agreed' or 'Strongly Agreed' that the current anti-doping regime is effective. - Coaches assigned a greater degree of responsibility for performance enhancing drug use to clubs (51.9%) and governing bodies (57.1%) than athletes (31.8% and 33.5% respectively; $p < .05$). - Also coaches assigned more responsibility to themselves as coaches, than athletes did ($p < .05$). *However*, only 67.5% of coaches agreed that coaches are responsible for PED use.
Moston, Engelberg & Skinner (2014b)	Australia	To explore the perceptions of athletes and coaches about doping in sport. In particular, the paper focuses	92 Coaches (70M/22F, M_{age} = 37.8 years, *SD* = 13.68, *CE not stated*). *Additional Populations*	QT CS QUES	SQAC= 70% MMAT= 71%	Coach beliefs	- Coaches perceived a higher incidence of performance enhancing drug use across all sports in general (20.90%; *SD* = 20.02), compared to 9.97% (*SD* = 15.86) in their own sport. - Coaches' perceived incidence of illicit recreational drug use across all sports was 28.01% (*SD* = 19.16) and only 22.28 (*SD* = 19.75) in their own sport.

		on the perceived incidence of doping.	*Sampled:* 488 Elite Athletes. *Same sample as Moston et al (2014a; see above).*				- For all respondents combined, the top three sports in which performance-enhancing drugs were seen as being most commonly used included Weightlifting (29.2%), Cycling (28.1%), and Athletics (20.2%). - Sports in which recreational drugs were seen as being most commonly used included Rugby League (43.0%), Surfing (17.6%), and Australian Rules Football (16.1%). - No significant differences between the views of the athletes and coaches were found across all estimates of incidence.
Nicholls et al. (2015)	United Kingdom, Australia, United States of America and Hong Kong	To explore the suitability of the Sports Drug Control Model (Donovan et al., 2002) for adolescent athletes of different cultures and abilities.	11 Coaches (10M/1F, M_{age} = 47.45, *SD* = 12.33, *CE* = 19). *Additional Coach Sample Details:* Participants coached adolescent athletes and resided in the United Kingdom (n = 6), the United States (n = 2), Hong Kong (n = 2), or Australia (n = 1).	QL CS INT	SQAC= 80% MMAT= 86%	Coach beliefs	- Many of the coaches felt very strongly that the coach influences an adolescent athlete's susceptibility towards doping, given their perceived authority and trust in the athlete-coach relationship. - Data analysis of coach interviews highlighted 10 key factors that coaches felt influenced athlete doping: perceived threat, perceived benefit, low self-esteem, morality, legitimacy of doping, significant others, age and maturation, participation level, ethnicity and country of residence and stress. - Coach participants felt that availability and affordability were key factors in influencing behaviour and that PEDS were frequently both available and affordable to their athletes.
Ohl et al. (2013)	Belgium, France and Switzerland	To understand how interactions amongst different cycling team members	6 Coaches (*M/F, M_{age}, SD and CE not stated).* *Additional*	QL CS INT and	SQAC= 50% MMAT= 43%	Psychosocial components	*From the paper, it is very difficult to decipher specific coach data. Consequently, data summarised here is limited to general findings from across the whole sample of participants:*

		determined cyclists attitudes towards doping products and methods.	*Populations Sampled:* 5 Physicians, 10 team managers, 5 journalists or policy-maker, 22 recently professional cyclists and 22 retired cyclists.	OBS			- The three types of cycling teams identified were: the 'strongly supportive' teams; teams with 'affirmed values' that develop an anti-doping focus but have less support and follow-up with cyclists; and teams made up of individuals with relatively poor supervision. All the members of 'strongly supportive' and 'affirmed values' teams expressed anti-doping views. Some also expressed concerns about the possible long-term effects on their health. - Cyclists who are members of very structured (i.e., 'strongly supportive') teams often officially reject doping, explaining that they adopt clear anti-doping attitudes. - In less supervised teams, young cyclists' work groups were perceived as open to other actors including physicians, coaches or peers promoting doping products. - Doping was perceived as more of an individual choice by the young cyclists (compared to older/ retired cyclists of the past).
Patterson & Backhouse (2018)	United Kingdom	To give a voice to coaches and explore their roles in anti-doping, including what behaviours they undertake and what factors influence these behaviours.	12 Coaches (12M/0F, M_{age}, *SD and CE not stated).* *Additional Coach Sample Details:* The sample consisted of 6 Football coaches and 6 Rugby League coaches, all aged between 27 and 54 years. Coaches' experience ranged from being in their	QL CS INT	SQAC= 90% MMAT= 100%	Coach beliefs Coach knowledge Self-reported behaviour Hypothetical behaviour Psychosocial components	- The majority of coaches expressed anti-doping views, describing doping as 'bad', 'unfair' and/or 'wrong'. - Main coach actions were to observe, monitor and provide advice to athletes, but were largely reactive. Coaches' anti-doping behaviours are indirect and passive e.g., creating a club/team environment where behavioural expectations and values are clear. - 11/12 coaches reported that they would seek support from other individuals if they ever faced a doping-dilemma. Coaches turned to individuals whom they perceived as having more expertise/knowledge, e.g., doctors or superior colleagues internally.

			first season to 15 + years. All coaches held or were working towards coaching qualifications equivalent to UKCC Level 2 or above.				- Coaches had low self-efficacy to partake in (anti) doping conversations and called for greater clarity on policy outlined expectations and a simplified language. - Most coaches believed they have a part to play in anti-doping efforts, but some coaches stated that working purposefully on anti-doping was not an essential part of their remit and that maximising performance was the priority.
Patterson, Backhouse & Lara-Bercial (2019)	United Kingdom	To investigate coaches' experiences and opinions of anti-doping education, including how knowledgeable and well-equipped coaches feel to deal with doping-related matters currently.	292 Coaches (224M/64F out of 288 participants who reported gender, M_{age} = 43.45, *SD* = 13.82, *CE* = 12.58). *Additional Coach Sample Details:* All participants were currently coaching across a range of team and individual sports in the UK and had obtained various different levels of coaching certification/ qualification.	MIXED-M CS QUES	SQAC= 83% MMAT= 88%	Coach beliefs Coach knowledge	- Almost a quarter of the surveyed coaches reported never learning about anti-doping. - Only a third had engaged with a formal anti-doping education programme and coaches typically received information on detection-deterrence related topics (e.g., banned substances, testing procedures). - Many coaches perceived themselves as only having 'a little' knowledge about anti-doping and declared themselves as 'a little' equipped to work with their sportspeople on doping-related matters; 174/292 coaches rated themselves as 'a little' or 'not at all' equipped to work with their sportspeople on doping-related matters. - 96% of coaches were inclined to learn more about anti-doping in the future.
Pöppel & Büsch (2019)	Germany	To conduct a precise baseline analysis of the	69 Combat Sport Coaches (62M/7F, M_{age} =	MIXED-M CS	SQAC= 68%	Coach beliefs Coach	- The participating coaches in combat sports regard doping as an international problem. - Independent of their type of combat sport coached,

		coach's position to deduce recommen-dations for efficient and effective doping prevention.	46.58, *CE* = 15.55, *SD not stated*). *Additional Coach Sample Details:* Coach participants represented the sports of Boxing: n = 13, Fencing: *n*=35, Judo: *n*=4, Wrestling: *n*=17.	QUES	MMAT= 65%	knowledge Hypothetical behaviour	the coaches indicated a very critical position concerning doping and displayed satisfactory knowledge concerning doping substances. - In response to a question ascertaining familiarity with doping prevention programmes the majority of coaches (*n* = 49; 71%) either did not answer the question or indicated that they did not know about programmes. - Several coaches suggested the need for future doping prevention to be conducted on a regular basis that is embedded in their own coaching courses and tailored to their specific needs.
Rodek, Sekulic & Kondric (2012)	Croatia	To examine dietary supplements (DS) consumption and attitudes toward DS among athletes and their coaches. Also the study considered the associations between DS and doping-related factors in sailing.	34 Sailing Coaches (33M/1F, M_{age} = 37.01, *SD* = 11.70, *CE not stated*). *Additional Coach Sample Details:* All coaches were members of the Croatian National Sailing Team and coached at an elite level. *Additional Populations Sampled:* 44 Elite Sailing Athletes.	QT CS QUES	SQAC= 60% MMAT= 71%	Coach beliefs	- 13/34 (38.2%) coaches classed their self-rated doping knowledge as 'poor' with 1/34 (2.9% of coaches) rating themselves as 'having no knowledge'. - 24/34 (70.6%) coaches are either not familiar with doping in sailing or do not think doping is used/prevalent in their sport (Sailing). Only 2 (5.9%) coaches felt doping occurred often in Sailing. - Opinions about penalties for doping offences tend to favour rigid penalties, including lifetime suspension from competition, especially after a second doping offense (18 coaches; 52.9%). - Coaches were split in terms of what the main problem of doping was; 17 (50%) of coaches reported that doping mainly threatened health and 17 (50%) felt doping mainly went against fair-play values. No coaches rated that 'doping should be allowed'.
Sajber et al. (2013)	Croatia	To clarify the factors related	22 Swimming Coaches	QT	SQAC= 80%	Coach beliefs	- Coaches had greater knowledge scores for both KSN and KD when compared to athletes (statistically

		to knowledge of doping (KD) and sports nutrition (KSN) across coaches and athletes.	(18M/4F, M_{age} = 36.5, *SD* = 7.8, *CE not stated*). *Additional Populations Sampled:* 55 Junior and senior-level competitive athletes from swimming.	CS QUES	MMAT= 71%	Coach knowledge Hypothetical behaviour	significant $p < .05$). - Coaches' knowledge was strongest in relation to doping regulations and procedures, and weakest with regard to specific substances. - Coaches' main sources of information about doping and sport nutrition were formal education (50%) and self-education (41%). Notably, coaches who possess higher formal education scored better on KD. - 64% of coaches agreed with lifelong penalties for doping, 18% agreed with a milder punishment for a first time offence and lifelong suspension for second offence, and 18% believed there should be a financial punishment. - 91% of coaches said that they would 'not suggest doping usage' to their athletes.
Seif Barghi et al. (2015)	Iran	To determine Iranian football coaches' and players' knowledge and attitudes regarding the list of prohibited drugs and adverse effects of popular misused drugs.	136 Football Coaches (*M/F, M_{age}, SD and CE not stated).* *Additional Coach Sample Details:* Participants recruited from all 6 districts of Iran. *Additional Populations Sampled:* 239 Footballers (all competitive athletes).	QT CS QUES	SQAC= 65% MMAT= 57%	Coach beliefs Coach knowledge	- Among all participants (*N* = 375), only 48 participants (12.8%) were familiar with all 10 definitions of doping (doping definitions: 15% of coaches demonstrated poor knowledge (less than 40% correct), 29% moderate knowledge (40-70% correct) and 56% good knowledge (>70% correct)). - Coaches' level of actual doping knowledge varied across different doping topics: It was higher for 'doping definitions' (55.9% scored 'good knowledge'), compared to 'name of prohibited drugs' (11.8% of coaches scored 'good') and 'side effects of anabolic steroids' (Only 2.2% 'good knowledge' scores). - Athlete and coach attitude responses were combined (*N* = 375). Overall, more than 82% of participants disagreed to allow free use of all drugs. - Over 90% of the combined sample either 'Agreed' or 'Completely Agreed' to educating coaches about harms and side effects of PEDs.

Sullivan et al. (2014)	United States of America and Canada	To design and validate a measure of coaches' efficacy in confronting athletes whom they suspect of doping.	560 High School Coaches (498M/62F, M_{age} = 43 years, *SD* = 10.93, *CE* = 18.85). *Additional Coach Sample Details:* 439 from USA and 121 from Canada, representing a range of sports, but predominantly American Football (*n* = 336).	QT CS QUES	SQAC= 85% MMAT= 86%	Coach beliefs	- A 21-item version of the Doping Confrontation Efficacy Scale (DCES) showed acceptable psychometric properties, including a good fit of the data to the proposed five-factor model of the construct (comparative fit index = .967; Tucker-Lewis index = .962; root mean square residual = .040, standardised root mean square residual =.037). - Structural equation modelling revealed that coaches' confrontational efficacy is significantly predicted by coaches' perceptions of motivational climate; specifically, that it is positively related to task-involving climate and negatively related to ego-involving climate. This result implies that coaches who are more prone towards task-involving climates tend to have higher efficacy/confidence in confronting athletes about drug use.
Thomas et al. (2011)	Australia	To investigate knowledge of illicit drugs and explore information-seeking behaviours and opinions regarding illicit drug education among elite Australian athletes.	24 'Key Experts' (*M/F, M_{age}, SD and CE not stated*). *Additional Coach Sample Details:* Included: 7 retired athletes, 5 academics, 3 team managers, 2 high performance managers, 2 player association managers, 2 head coaches, 2 welfare managers, 1 executive officer, 1 national sport	MULTI-M (QL Arm) CS INT	SQAC= 63% MMAT= 35%	Coach beliefs	- Key Experts (KEs) believed that elite athletes were generally knowledgeable about illicit drugs, however 15 KEs commented that this knowledge may be limited to illicit drug types and athletes may not be aware of the effects or side effects of such drugs. - KE perceived illicit drug knowledge to be influenced by factors such as age (younger athletes perceived to not know as much as the older athletes). - Family members and coaches were identified as a source of information for athletes by 13.5% and 9.9% of the athlete respondents, respectively. The internet was the most common source (64% of athletes). - 10 KEs believed that some athletes would not feel comfortable seeking information/advice about doping within their club/sporting organisation. Notably, no KE felt that an athlete would feel comfortable

			coordinator, 1 team medical officer. *Additional Populations Sampled:* 974 Elite Athletes. *Same sample as Dunn et al. (2010) – see above*				approaching a coach or team manager for information on illicit drugs.
USADA (2011)	United States of America	The study looked at, among other things: beliefs about issues/problems facing sport today, what drives the pressure to cheat and the impact of the emphasis on winning, the responsibility sport figures have as role models.	213 Coaches (Quantitative Arm: *N* =193, 124M/69F; Qualitative Arm: *N* =20*, M_{age}, SD and CE not stated*). *Additional Coach Sample Details:* Participants were coaches for National Governing Bodies (NGBs). *Additional Populations Sampled:* Participants represented five different audience segments (including: general population, coaches, NGB adults, children, teachers).	MIXED-M CS QUES and INT	SQAC= 60% MMAT= 59%	Coach beliefs	*From the paper, it is very difficult to decipher specific coach and doping data, so data summarised is limited here. Specific coach findings (where possible) and general findings from across the sample of participants are presented below:* - 79% of surveyed NGB coaches were aware of other coaches who have cheated. - The collective sample ranked the use of performance-enhancing drugs as the most serious problem facing sport today (closely followed by issues such as the focus on money, and the criminal behaviour of well-known athletes). - A majority of adult participants (75%) agreed that athletes' use of performance-enhancing substances is a violation of ethics in sport. - Although sport can positively impact ethics, 66% of the NGB coach sample also believed that some sports accept unethical behaviour (e.g., doping). - Coaches ranked as the number one positive influence on today's youth involved in sport.

Notes: *SD* = Standard Deviation, *CE* = Mean number of years coaching experience, M_{age} = Mean age, QT = Quantitative, QL = Qualitative, MIXED-M = Mixed Methods, MULTI-M = Multiple Methods, CS = Cross-Sectional Design, LT = Longitudinal Design, QUES = Questionnaire Measure, INT = Interviews, OBS = Observations, FG = Focus Groups, SQAC = Standard Quality Assessment Criteria Score (Kmet at al., 2004), MMAT = Mixed Methods Appraisal Tool Score (Hong et al., 2018).

Table 4

Higher order themes, themes and codes generated from the thematic analysis representing the clustering of findings from the existing coach doping prevention literature.

Higher Order Themes	Themes	Codes
Individual factors	Coach beliefs	Beliefs about others' use of PEDs/Banned substances Beliefs about testing Beliefs about doping consequences Doping as a problem in sport Perceived doping prevalence Perceived influence over athlete doping Coach role beliefs Anti-doping self-efficacy Beliefs about anti-doping policy Athlete doping determinants Morality of doping Beliefs about anti-doping education Beliefs about anti-doping knowledge
	Coach knowledge	Knowledge of doping control procedures Knowledge of banned substances/methods Knowledge of doping side-effects Knowledge about anti-doping policy Discrepancies between perceived and actual knowledge Sources of knowledge Knowledge comparison between groups Known incidents of doping
Behavioural factors	Self-reported behaviour	Integration of anti-doping into coaching practice Reactivity of anti-doping actions Passivity of anti-doping actions Diffusion/sharing of anti-doping behaviours Athlete discussions
	Hypothetical behaviour	Behavioural intent Hypothetical athlete scenarios Proposed anti-doping responses Reporting doping
Contextual factors	Psychosocial components	Sporting culture Organisational culture National culture Culture change Media influence Significant others Complex social processes

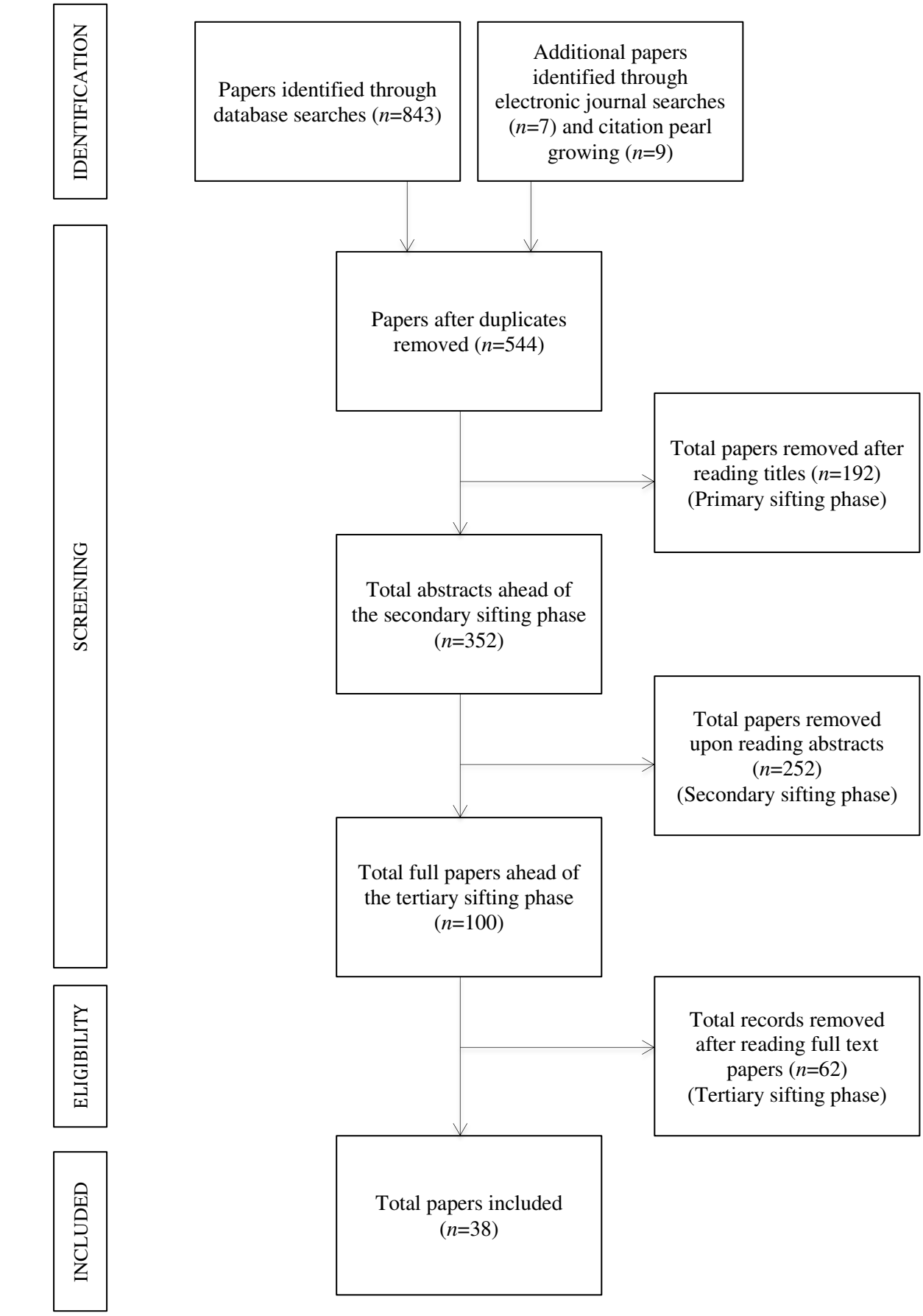

Figure 1. PRISMA flow diagram documenting the study selection criteria

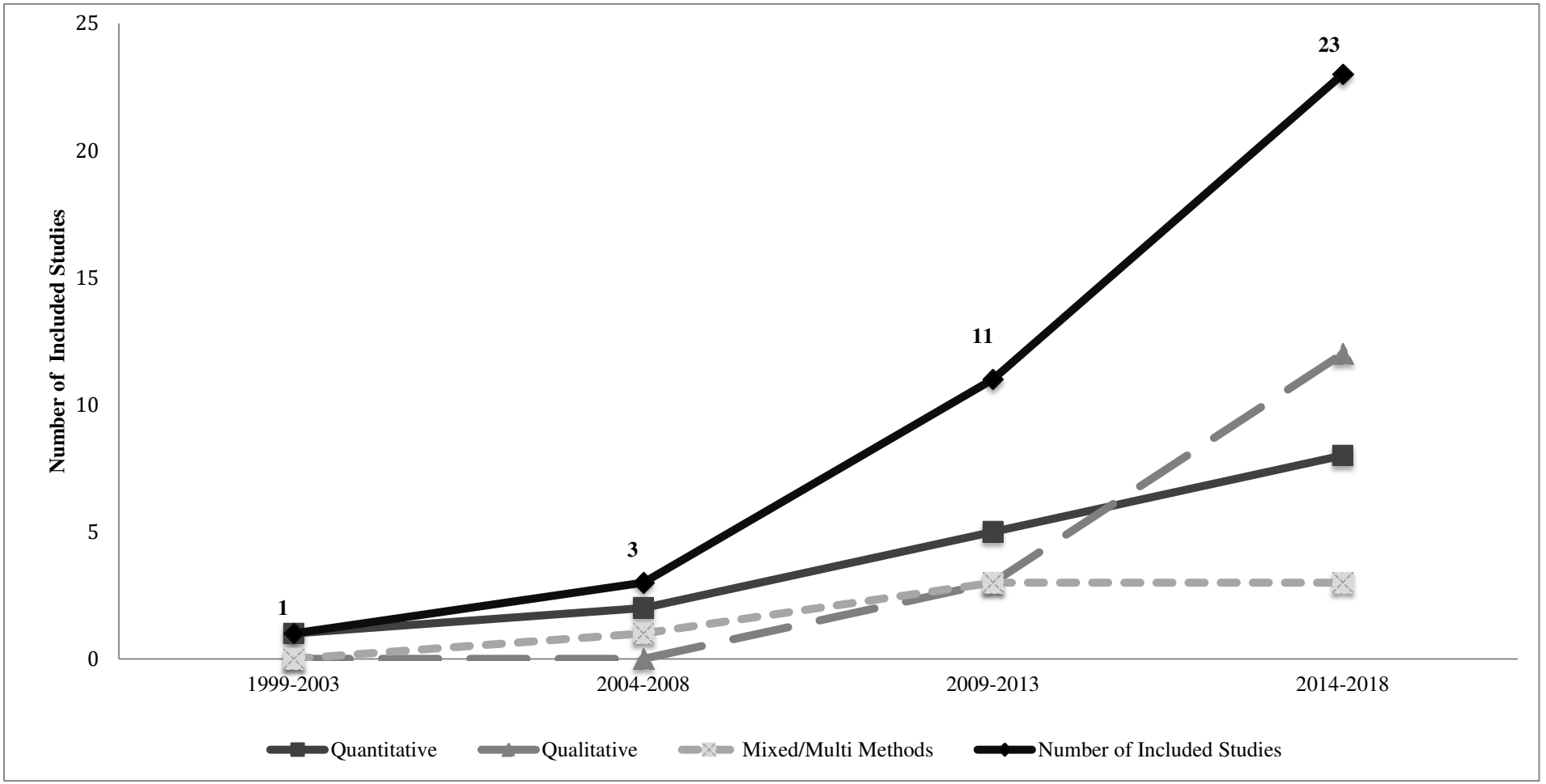

Figure 2. Publication timeline documenting the number of included studies published across four equal time periods between 1999 and 2018.

Highlights

- The current evidence base has a limited theoretical underpinning.
- The majority of studies focused on individual coach beliefs and knowledge.
- Recent studies explored behavioural and contextual factors surrounding coach (anti-) doping perspectives and behaviours.
- Despite holding anti-doping attitudes coaches' report limited anti-doping behaviours.
- Meta-theory should inform future research, recognising the complexity of doping.

Disclosure Statement

No potential conflict of interest was reported by the author(s).