



INVESTIGATING THE DOPING-RELATED KNOWLEDGE AND ATTITUDES OF SPORTS COACHES

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Introduction

Recent years have witnessed an upsurge of research interest in the psychosocial factors associated with competitive athletes' propensity to use prohibited "performance enhancing drugs" (PEDs; e.g., see Erickson, Backhouse, & Carless, 2017; Kirby, Guerin, Moran, & Matthews, 2016; Moston, Engelberg, & Skinner, 2015), a practice that is commonly known as "doping". Within psychology, the term doping refers to athletes' proclivity to use "illegitimate performance enhancement substances and methods" (Lazuras, Barkoukis, Rodafinos & Tzorbatzoudis, 2010, p. 694). In the past, anti-doping legislation tended to ascribe responsibility for engaging in doping to the individual athlete concerned (WADA, 2009). This legislation largely reflected the assumption that an athlete's decision to engage in doping was shaped by *individual* characteristics (Ntoumanis et al., 2014) such as their level of moral disengagement (Kavussanu, 2016). Over time, however, it has become clear that as athletes do not live, train or compete in isolation, their decision to engage in doping is likely to be affected significantly by their multifaceted social and technical network (Engelberg & Moston, 2016). In recognising the importance of this network, WADA (2015) used the term "athlete support personnel" (ASP) to designate "any coach, trainer, manager, agent, team staff, official, medical, paramedical personnel, parent or any other Person working with, treating or assisting an Athlete participating in or preparing for sport Competition" (p. 132). Significantly, the revised WADA Code (WADA, 2015) stipulates increased punishment for ASP associated with doping activity.

Of the various individuals involved in ASPs, perhaps the most important are coaches. After all, as Backhouse and McKenna (2012) observed, these people are usually present "from an athlete's first forays into sport through to the pursuit of the highest goals" (p. 167). Due to such direct and sustained contact with athletes, coaches play a crucial role in shaping their beliefs, decision-making and behaviour (e.g., see Becker, 2009; Coatsworth & Conroy, 2009; Dieffenbach, Gould & Moffett, 2002). For example, in extreme cases, coaches may instruct athletes to use banned PEDs (Pitsch, Emrich, & Klein, 2007). Indeed, Athletics Canada banned a coach for life when he admitted to the Dubin inquiry (Dubin, 1990) that he had introduced Ben Johnson, the Canadian sprinter, to anabolic steroids. Despite such well-documented cases, relatively little research has been conducted on the attitudes, beliefs, and knowledge of coaches about doping in sport (Backhouse & McKenna, 2012). This neglect is disappointing in view of the discovery by Scarpino et al. (1990) that *almost two-thirds* of

athletes who had admitted to doping reported that they had done so under pressure from coaches and managers.

Against this background, the purpose of the present report is to describe the results of a study designed to investigate the doping-related knowledge and attitudes of sports coaches. More precisely, we shall attempt to investigate questions concerning: coaches' confidence in their doping knowledge and their sources of doping information; the extent to which coaches receive requests for doping information from athletes; coaches' beliefs about the efficacy of anti-doping efforts; and the degree to which certain socio-demographic variables (e.g., educational certification) have an influence on coaches' attitudes to doping. In relation to this last question, we shall explore the possibility that strength and conditioning coaches (who work mainly with athletes' bodily efficiency) may have more positive or tolerant attitudes to doping than skill-based coaches, who focus more on technical aspects of athletes' performances.

Before we outline our precise research objectives, however, let us summarise what we have learned from the limited research base of studies on coaches' knowledge of, and attitudes to, doping in sport.

Coaches and doping: some key findings

In a recent systematic review, Backhouse and McKenna (2012) identified only four studies (Fjeldheim, 1992; Fung & Yuan, 2006; Laure, Thouvenin, & Lecerf, 2001; Scarpino et al., 1990) that had investigated coaches' knowledge of, and attitudes to, doping in sport. The samples of coaches in these studies were drawn from Norway, Hong Kong, France and Italy. In one of these studies, Laure et al. (2001) conducted anonymous surveys with 260 professional coaches in France to determine how frequently they were faced with doping queries from athletes. They found that 1 in 6 of the participants had been confronted with requests for information about doping in the previous 12 months. Overall, although these studies differed considerably in scope and methodology - thereby rendering generalization difficult - Backhouse and McKenna (2012) concluded that "sports coaches ... are regularly faced with doping issues ... (and) they routinely self-reported holding negative attitudes towards doping in sport" (p. 171). Unfortunately, these authors also acknowledged that many gaps remain in our understanding of coaches' attitudes to doping.

Only a few studies to date have attempted to compare the doping knowledge and attitudes of coaches and athletes simultaneously. For example, Peters et al. (2009) examined the opinions of 620 coaches and 1757 competitive athletes in Germany and found that for 25% of athletes, the coach is their first point of contact in relation to doping. Overall, 34% of coaches felt “rather badly” informed about doping, particularly at lower competitive levels and over two thirds of coaches wanted more detailed information on the subject. Clearly, coach education initiatives were not fulfilling the coaches’ needs in this respect. Unfortunately, Peters et al.’s (2009) analysis did not go any deeper than describing the participants’ doping-specific knowledge and behaviours. No attempt was made to determine the factors that shaped the coaches’ attitudes to doping. In an interesting earlier study, Scarponi et al. (1990) attempted to investigate the prevalence of doping among Italian adolescents by surveying 1015 athletes and 114 coaches and managers and 102 doctors. This study was the first of those mentioned here that specifically defined categories of performance enhancement substances and methods for participants. Of particular interest to the present research is the finding that *62% of athletes who acknowledged doping reported that pressure to do so came from coaches and managers*. The suggestion remains that although most coaches maintain a strong anti-doping stance and recognise their role in promoting anti-doping, a subset of this population is contributing to the problem of doping by pressurising their athletes to engage in doping (Laure et al., 2001; Scarponi et al., 1990), providing doping substances to their athletes (Fjeldheim, 1992) or acting as a poor role model by doping themselves (Laure et al., 2001).

Since publication of the review of Backhouse and McKenna (2012), several studies have attempted to fill gaps in the relevant literature. For example, Moston, Engelberg, and Skinner (2015) explored the perceived incidence of doping among 609 Australian elite athletes and coaches. Results showed that the perceived incidence of performance-enhancing drug usage was approximately 19%. Furthermore, this study also found that the majority of athletes and coaches perceived drug use to be more common in sports *other* than their own. Most recently, Engelberg and Moston (2016) conducted a qualitative study among 14 elite-level coaches in an effort to understand how coaches perceive their role in directly and indirectly influencing the doping attitudes and behaviours of the athletes with whom they work. A key finding of this study was the discovery that although coaches supported the revised WADA Code, they also acknowledged how they could occasionally, albeit indirectly and inadvertently, condone doping behaviour. Such a phenomenon could occur through the tacit endorsement of pro-doping expectancies when communicating with athletes.

Summary of research objectives

1. To provide a descriptive account of coaches' confidence both in their doping knowledge and in their sources of doping information.
2. To assess coaches' level of contact with doping, regularity of requests for doping information from athletes and beliefs about the efficacy of anti-doping efforts.
3. To measure the attitudes to performance enhancement of coaches and to determine if socio-demographic variables like certification have an influence on such attitudes.

Method

Participants

Participants for the study consisted of 266 sports coaches and strength and conditioning trainers (79.3% male), with an age range of 17-80 years ($n = 265$, $M = 41.6$, $SD = 11.81$). Of these, 198 were certified as sports coaches, 13 were certified as strength and conditioning trainers, and 55 were certified as both. The sample included coaches and trainers of several nationalities (American ($n = 1$), Belgian ($n = 1$), British ($n = 26$), British-Irish ($n = 3$), Canadian ($n = 1$), Dutch ($n = 3$), Ecuadorian ($n = 1$), English ($n = 2$), French ($n = 1$), Irish ($n = 212$), Northern-Irish ($n = 1$), Romanian ($n = 1$), Singaporean ($n = 2$), South African ($n = 1$), Spanish ($n = 2$), Swedish ($n = 2$), and Turkish ($n = 1$)) and from four different competitive levels – Club/School ($n = 46$); County/Interprovincial ($n = 53$); National ($n = 49$); and International ($n = 118$). The participants' years of experience as a coach and/or trainer ranged from 1 to 60 years, with a mean of 16.99 years ($n = 253$, $SD = 10.8$).

Measures

The methodology of the study was designed around a quantitative survey. For the purpose of this report, the questionnaire consisted of 3 parts (see Appendix 1 for supporting documents).

Part 1: Demographic information (including knowledge of, and contact with, doping)

Demographic items elicited such information as nationality, coaching experience and type of coaching certification held. This section also sought to determine whether coaches had received anti-doping information and what the source of that information was. Coaches' level of contact with requests for doping information from athletes and the nature of those requests were also examined.

Part 2: Evaluating the perceived effectiveness of anti-doping programmes

This part of the questionnaire was devised simply to gather descriptive information from coaches on how they view recent changes to anti-doping measures (e.g., punishing the athlete support network as well as the individual athlete for involvement in doping). Some elements of the questionnaire involved closed-ended questions, and responses were measured on a scale 1 (strongly disagree) to 6 (strongly agree).

Part 3: Measuring coaches' attitudes to doping

A published 17-item questionnaire measuring performance enhancement attitudes (PEAS; Petroczi & Aidman, 2009) was utilised as the attitudinal scale, the reliability and validity of which have previously been reported by the authors (Petroczi, 2006; Petroczi & Aidman, 2009). The Cronbach alpha value for the present study was 0.813. The scale is unidimensional and is measured using a Likert scale from 1 (strongly disagree) to 6 (strongly agree). Maximum and minimum scores range from 102 to 17, with a high score indicating more tolerant attitudes to doping e.g. *"Doping is not cheating since everyone does it"*.

Our initial research proposal to WADA also included a plan to use the Theory of Planned Behaviour (TPB; Ajzen, 1988) to measure coaches' attitudes, subjective norms, perceived personal control and behavioural intent in relation to doping and anti-doping in sport. Subscale questions to examine these variables were developed in accordance with guidelines for constructing TPB questionnaires (Ajzen, 2006; Francis et al., 2004). However, our first pilot study revealed that this scale displayed low levels of internal consistency, which necessitated their removal from the original research plan.

Procedure

The questionnaire was initially drafted in hardcopy and was then posted on the University College Dublin server by IT staff using Qualtrics software. Responses were recorded in a database, with the participants' IP address being the only identifying feature. All responses to the questionnaire were anonymous. A brief pilot study was run using an experienced athletics coach as a participant, who also had a doctorate in psychology. The aim of this pilot was to determine the relevance of the instructions and questions, to assess the suitability of the language used, to get an accurate estimate of total time required to complete the questionnaire and to make sure that the electronic version of the survey was functioning correctly. The participant was satisfied with most survey items but made two suggestions for simplifying the

wording of questions e.g., he recommended that we should change “pertain to” to “relate to”. The questionnaire took nine minutes to complete. There was one slight technical problem with completing textboxes, which was resolved by the IT expert.

As soon as the questionnaire was finalised (see Appendix 1), Irish sporting bodies were contacted by email to request help with the distribution of the questionnaire. The Irish Institute of Sport (IIS), Olympic Council of Ireland (OCI), Coaching Ireland and Setanta College (Strength & Conditioning training college) agreed to distribute a link to the online questionnaire to coaches in their databases. Contacts in the UK Strength and Conditioning Associations (UKSCA) and National Strength and Conditioning Association (NSCA) also promoted the link through their own considerable networks in the Strength and Conditioning industry. Some of the larger national governing bodies such as Athletics Ireland, Tennis Ireland, Irish Hockey Association and Football Association of Ireland publicised the study among their international-level coaches. Finally, since members of the research team were active themselves in certain sports and had applied sport psychology experience across a variety of sporting disciplines, personal coaching contacts were also invited to take part in the study.

The questionnaire opened with an information sheet outlining the purpose of the research, highlighting the anonymity of responses and explaining where the findings would be disseminated. The voluntary nature of participation was specified in a ‘statement of informed consent’, with which participants had to indicate agreement with by clicking a link. This link then brought them to the start of the survey. In light of the purposive sampling methods employed, it is difficult to determine an accurate response rate.

Results

1. Knowledge of, and experiences relating to, doping in sport

All 266 coaches and trainers provided information on their knowledge of and experiences relating to doping in sport. 175 (65.8%) reported that they had received information about banned substances in sport. 64 (24.1%) reported that they were confident in their knowledge about banned substances, while 133 (50%) were somewhat confident and a further 69 (25.9%) were not confident. The sources of anti-doping received by coaches is displayed in Table 1.

Table 1. Sources of anti-doping information reported by coaches

Source of information	n (%) ^a
National governing bodies	127 (72.6)
Anti-doping agencies	92 (52.6)
International governing bodies	19 (10.9)
Personal research (internet, journals, newspapers)	17 (9.7)
Science & medical staff (doctor, physiotherapist, pharmacist, physiologist)	14 (8)
Formal education (college, workshops, conferences)	13 (7.4)
Personal contacts (other coaches & athletes)	9 (5.1)
Team/club	5 (2.9)

^a% of participants who had received information about banned substances in sport ($n = 175$)

Regarding coaches' and trainers' experiences relating to doping in sport, 76 (28.6%) participants had been asked for information about doping by an athlete during their coaching career (see Table 2). Additionally, 51 coaches (19.2%) personally knew athletes who were taking, or had previously taken, banned performance enhancing substances.

Table 2. Frequency and types of requests for information on doping made by athletes

Request	n (%) ^a
Anti-doping rules & regulations (incl. products on WADA list)	62 (81.6)
Advice on nutritional supplements	59 (77.6)
The performance effects of doping substances	31 (40.8)
Coach's/trainer's opinion on the use of PEDs	31 (40.8)
The health hazards associated with doping	23 (30.3)
The appropriate dosage of doping substances	2 (2.6)
Other	11 (14.5)
Medication use (e.g. cold medication, inhalers) and TUE ^b	4 (5.3)
Doping test procedures	2 (2.6)
Consumption other substances (i.e. creatine, caffeine)	1 (1.3)
Treatment times for drugs	1 (1.3)

^a% of participants who had received a request for information ($n = 76$)

^b Therapeutic use exemption

The breakdown of sports in which the doping athletes were engaged is displayed in Table 3, with athletics (n=15) and cycling (n=14) showing the highest representation, followed by football (n=8) and rugby (n=7).

Table 3. Sport engaged in by athlete who was taking, or had previously taken, banned performance enhancing substances

Sport	n (%) ^a
Athletics (including running, triathlon and track & field)	15 (29.4)
Cycling	14 (27.5)
Football	8 (15.7)
Rugby	7 (13.7)
Bodybuilding	4 (7.8)
Weightlifting	4 (7.8)
GAA	3 (5.9)
Swimming	2 (3.9)
Basketball	1 (2)
Boxing	1 (2)
Equestrian show jumping	1 (2)
Kayaking	1 (2)
Judo	1 (2)
MMA	1 (2)
Motorsport	1 (2)
Recreational fitness	1 (2)
Tennis	1 (2)

^a % of participants who reported knowing an athlete who was taking, or had previously taken, banned performance enhancing substances (n = 51)

2. Effectiveness of anti-doping programmes

256 participants responded to the survey items assessing coaches' and trainers' perceptions of the effectiveness of anti-doping programmes (see Figure 1). Most participants (n=216; 84.4%) agreed with the statement that "*doping is a serious problem in elite sport in general*", though 163 (63.75%) participants disagreed that it was a serious issue in their sport. Regarding the current drug-testing procedures, 173 (67.6%) believed that the current system was effective in catching dopers in-competition. However, 147 participants (57.4%) believed that the current system was not effective in catching dopers out of competition. In terms of punishments for doping, 134 participants (52.3%) did not believe that the current sanction (at the time of data collection) of a 2-year ban for the first offence and a lifetime ban for the second was sufficient, while 122 (47.7%) agreed that the sanctions were strict enough to deter athletes from doping. Additionally, 221 participants (86.3%) believed that the punishments should be extended beyond the athlete to sports medics, managers, coaches and others, while

75 (29.3%) agreed that athletes that use performance enhancing substances should serve jail time. Finally, 146 participants (57%) agreed that anti-doping education programmes were effective methods of deterring performance enhancement doping.

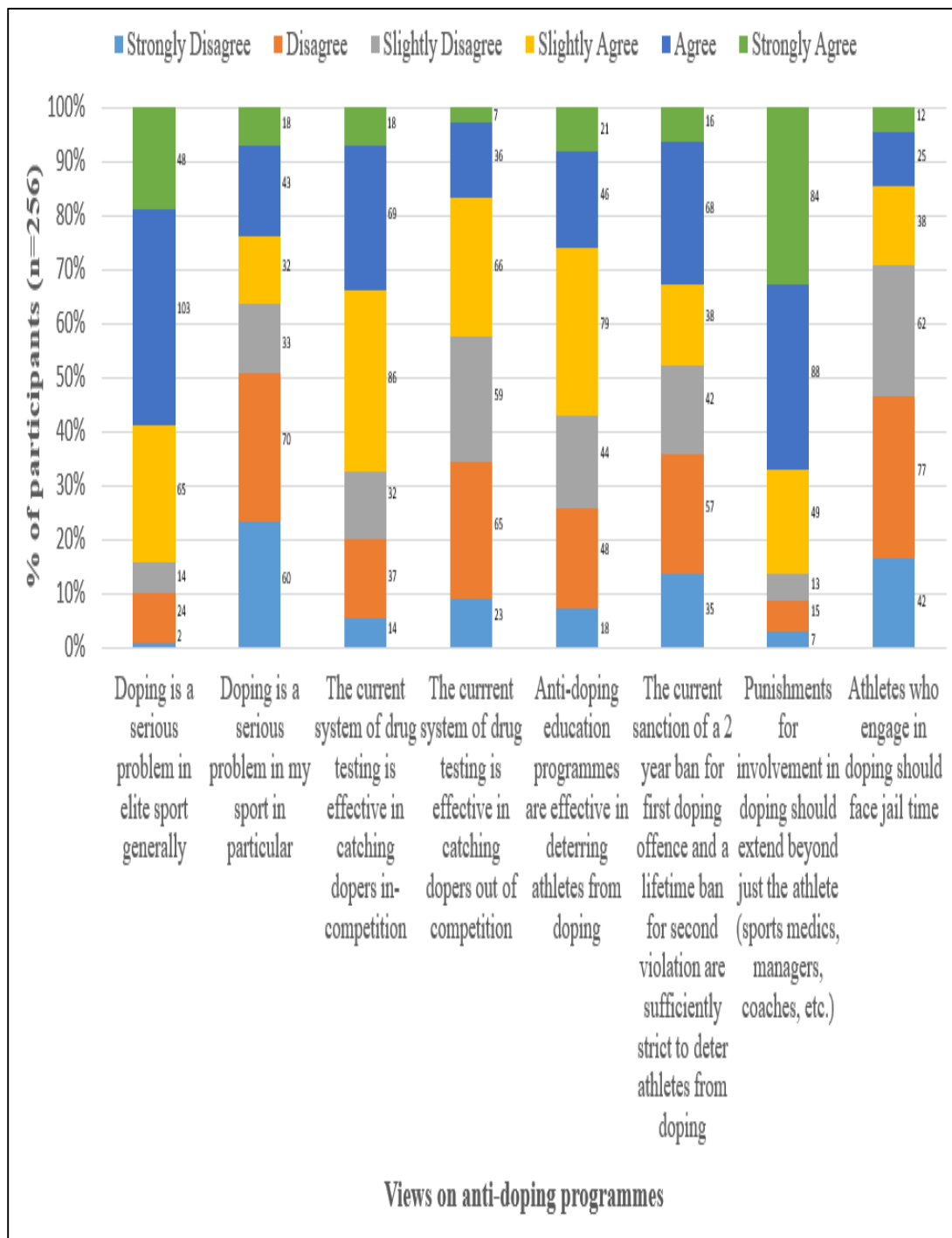


Figure 1. Coaches' and trainers' perceptions of the effectiveness of anti-doping programmes.

3. Attitudes towards performance enhancing doping

All 266 coaches and trainers completed the 17-item Performance Enhancement Attitude Scale (PEAS). Descriptive statistics were calculated for the full sample, the different certification types (strength & conditioning and non-strength & conditioning) and the different levels of competition (club/school, county/interprovincial, national, and international) and are provided in Table 4. The mean PEAS score for the full sample fell below the theoretical mid-point (59.5 using the 6-point version of the scale), indicating that the coaches and trainers in general held less favourable attitudes towards performance enhancing doping. Regarding the distribution of scores, both the skewness and kurtosis values for the full sample fell within acceptable limits of ± 2 for normality (Gravetter & Wallnau, 2014; Trochim & Donnelly, 2006). However, a significant result was observed on the Shapiro-Wilk test for normality, $W(266) = .934, p < .001$, suggesting a non-normal distribution for the PEAS scores. Further visual inspection of the histogram (see Figure 2) indicated that the data were positively skewed and thus differed from normal.

Table 4. Descriptive statistics for the PEAS for full sample, by certification type, and by coaching level

Coach type/level	Min	Max	Mean	Median	Mode	SD	Skew.	Kurtosis
All coaches (<i>n</i> = 266)	17	67	30.545	29	24	9.225	1.078	1.957
Non-S&C (<i>n</i> = 198)	17	67	29.732	28	24	8.827	1.045	1.656
S&C (<i>n</i> = 68)	17	67	32.912	32	36	9.991	1.103	2.430
Club/School (<i>n</i> = 46)	17	50	31.283	30.5	17	9.660	.296	-.887
County/ Interprovincial (<i>n</i> = 53)	17	52	31.207	31	26	8.270	.510	.145
National (<i>n</i> = 49)	17	67	31.531	30	28	9.723	1.166	2.479
International (<i>n</i> = 118)	17	67	29.551	28	24	9.265	1.613	4.135

3.1. Reliability of PEAS

Cronbach's alpha for the PEAS was calculated and the scale was observed to have good internal consistency ($\alpha = .813$). Removal of the items "Athletes are pressured to take performance-enhancing drugs" and "Athletes who take recreational drugs, use them because they help them in sport situations" would have resulted in Cronbach's alpha values of .817 and .820 respectively. However, given the marginal improvements associated with the deletion of these items, the decision was made to retain both items to allow for cross-study comparisons.

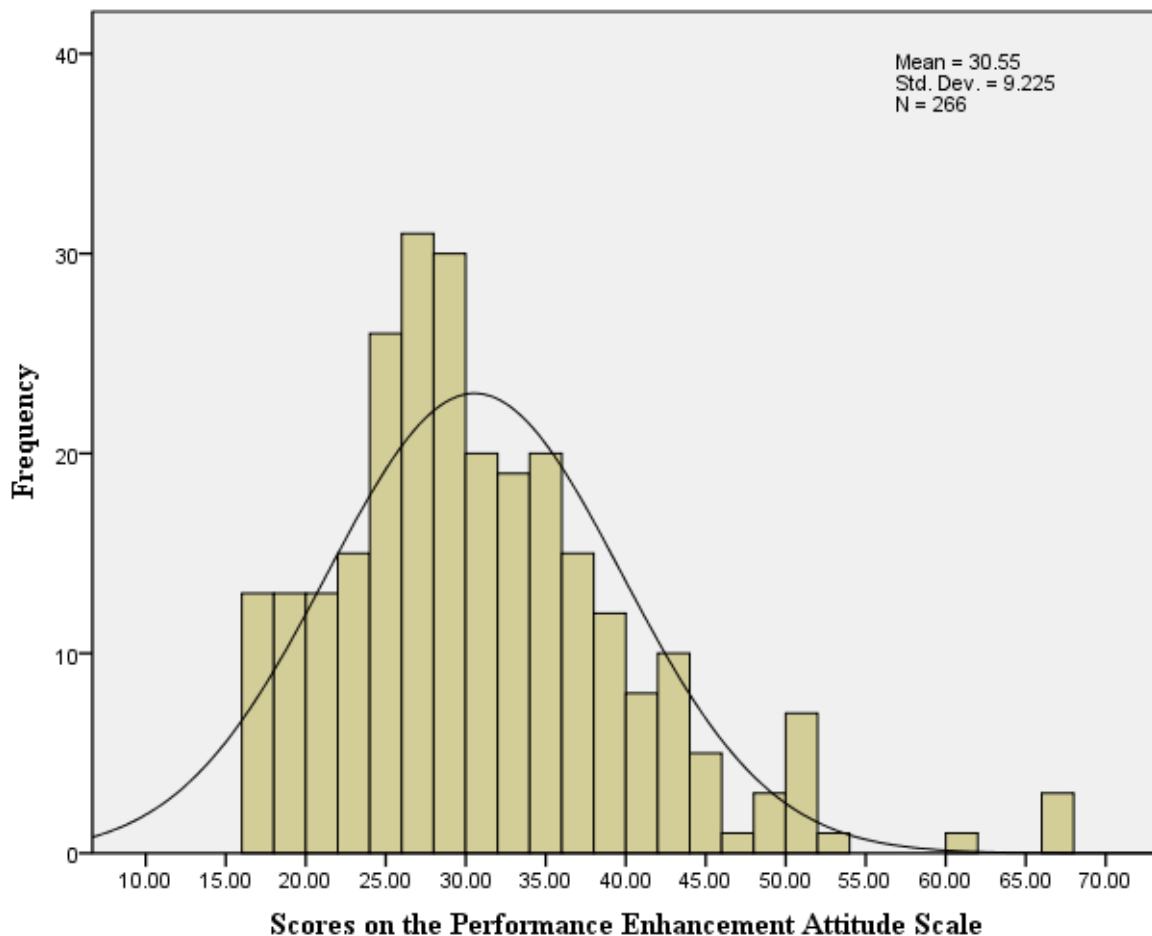


Figure 2. Distribution of scores on the Performance Enhancement Attitude Scale for full sample of coaches and trainers ($n = 266$).

3.2. Effect of coach type and level of competition on attitudes towards performance enhancing doping

To examine whether attitudes towards performance enhancing doping, as measured by the PEAS, differed across coach types and level of competition, participants were grouped according to their certification type (strength & conditioning vs non-strength & conditioning)

and competitive level (club/school, county/interprovincial, national, and international) (see Table 5). A χ^2 test of independence was then conducted to determine whether the two certification groups differed with respect to competitive level. Results from this test were not significant, $\chi^2(3) = 5.741, p = .125$, suggesting that the two groups did not differ in terms of competitive level.

A 2 x 4 non-repeated ANOVA was then conducted on the data to examine the effect of certification type and competitive level on attitudes towards performance enhancing doping. Descriptive statistics, normality tests and homogeneity tests were initially carried out on the PEAS for each group (see Table 6). Levene's test of equality of variances was not significant, $F(7, 258) = 1.569, p = .145$, and, as such, homogeneity of variance was observed. However, normality tests for four of the groups were significant, indicating that the distribution of scores on the PEAS differed from normal. While caution is thus advised in the interpretation of the results, ANOVAs have been demonstrated to be robust against violations of normality (Glass et al., 1972).

Table 5. Total number of strength & conditioning and non-strength & conditioning coaches across each competitive level

Certification type	Club/School	County/Interprovincial	National	International
S&C coach (<i>n</i> = 68)	9 (13.2%)	20 (29.4%)	10 (14.7%)	29 (42.6%)
Non-S&C coach (<i>n</i> = 198)	37 (18.7%)	33 (16.7%)	39 (19.7%)	89 (44.9%)

A significant interaction between certification type and competitive level was not observed, $F(3, 258) = .363, p = .780, \eta^2 = .004$. A significant main effect for competitive level was also not observed, $F(3, 258) = .618, p = .604, \eta^2 = .007$. However, there was a main effect for certification type, $F(1, 258) = 4.929, p = .027, \eta^2 = .019$, with those in the non-strength & conditioning group ($M = 29.732, SD = 8.827$) scoring significantly lower on the PEAS than those in the strength & conditioning group ($M = 32.912, SD = 9.991$).

Table 6. Descriptive statistics and Shapiro-Wilk test results for the PEAS grouped according to certification type and competitive level

Group	Mean	SD	Skew.	Kurtosis	Shapiro-Wilk
<u>S&C</u>					
Club/School	34.111	8.462	.390	-1.063	.926 ^a
County/Interprovincial	34.500	7.330	.128	.096	.975 ^a
National	32.500	8.303	1.133	.930	.906 ^a
International	31.586	12.474	1.496	2.866	.850
<u>Non-S&C</u>					
Club/School	30.595	9.912	.370	-.857	.945 ^a
County/Interprovincial	29.212	8.268	.949	1.307	.932
National	31.282	10.138	1.218	2.747	.923
International	28.888	7.925	1.309	2.805	.910

^a Scores on the PEAS are normally distributed

Given the issues with normality for some of the groups and the non-normal distribution of PEAS scores for the full sample, further non-parametric analyses were conducted on the PEAS data. Differences in PEAS scores for the strength & conditioning and non-strength & conditioning groups were analysed using a Kruskal-Wallis one-way ANOVA, a Mann-Whitney U test, and a Median test. Results from the Kruskal-Wallis one-way ANOVA indicated a significant difference in PEAS scores between the two groups, $\chi^2(1) = 6.667, p = .010$. Similarly, a Mann-Whitney test indicated that PEAS scores were significantly higher for the strength and conditioning group ($Mdn = 32$) than for the non-strength and conditioning group ($Mdn = 28$), $U = 8,144, p = .010, r = -.16$. Finally, a Median test indicated a significant difference between the two groups on PEAS scores, $\chi^2(1) = 6.489, p = .016$.

Additionally, differences in PEAS scores across the four competitive levels were analysed using a Kruskal-Wallis one-way ANOVA and a Median test. Results from the Kruskal-Wallis one-way ANOVA were not significant, $\chi^2(3) = 3.729, p = .292$, indicating that the four groups did not differ on PEAS scores. Similarly, results from the Median test were also not

significant, $\chi^2(3) = 2.640$, $p = .451$, again indicating that attitudes towards performance enhancing doping did not differ across the four competitive levels.

Discussion

The role of coaches in influencing the drug-related decisions of their athletes has been documented in high profile doping cases such as those of Ben Johnson, Marion Jones and Genevieve Jeanson. Indeed, since 2015 when WADA reserved the right to impose sanctions on athlete support personnel, a number of coaches including Tyson Gay's coach Jon Drummond and Russian track and field coach Vladimir Mokhnev, have been sanctioned with the imposition of lengthy doping bans. Unfortunately, very little research has been conducted to date to help us understand the doping knowledge, attitudes and behaviours of sports coaches. The aims of this study were threefold:

- 1) To understand coaches' knowledge of, and confidence in, anti-doping rules and regulations.
- 2) To assess the level of contact coaches have had with doping, their opinions about the worldwide system of anti-doping and the type of drug-related information their athletes seek from them.
- 3) To better understand factors that may influence coaches' attitudes towards doping.

Summary of findings and implications for anti-doping practice

Part 1: Although almost two thirds of participants had received information on banned substances, less than one quarter of them were confident in their subject knowledge. This echoes the findings of Peters et al. (2009) who found that 34% of coaches they surveyed felt "rather badly" informed about doping. Coaches seem to rely heavily on national governing bodies as a source of anti-doping information, followed by national and international anti-doping agencies. It is reassuring that a majority of coaches are turning to "official" sources to gather information on banned substances. However, such a low proportion of coaches reporting feeling confident in their knowledge is a cause for concern. Likewise, is reassuring that so few respondents relied on personal contacts ($n=9$; 3.3%) and internet research ($n=8$; 2.9%) for their anti-doping information, since the validity or accuracy of such information is not guaranteed. Interestingly, only 14 participants (5.2%) of coaches reported accessing information directly from WADA. Such a low number suggests that despite being the world's leading agency in developing and delivering anti-doping information and education

programmes, WADA is not reaching a majority of coaches with their material. A more detailed assessment of why this is the case would be well advised.

A total of 76 coaches (28.6%) had been asked by athletes for information relating to doping in sport. This finding is similar to Laure et al. (2001), who reported that 1 in 6 coaches they surveyed had been asked by athletes for doping-related information in the preceding 12 months. Many of the coaches in the present study reported multiple categories of requests from athletes, the most common being advice around the anti-doping rules and regulations (n=62), followed by the use of nutritional supplements (n=59). These categories of request would imply that athletes are, on the whole, seeking information from coaches to better inform themselves and reduce the likelihood of inadvertently ingesting banned substances. However, 31 coaches reported being asked about their opinion on the use of PEDs as well as the performance enhancing effects of certain doping substances. In the absence of further information, the intent of such requests is difficult to accurately interpret, but the suggestion could certainly be made that athletes are, on occasion, seeking information from their coaches to assist them in making decisions about their own use of PEDs.

Part 2: The epidemiology of PED use continues to be a contentious issue in the field of anti-doping. Although conventional drug testing indicates prevalence rates of around 2% (Petróczi et al., 2008), self-report studies report numbers between 0% (Alaranta et al., 2006) and 57.1% (Ulrich et al., 2017), and anecdotal reports estimate usage as high as 95% (Petróczi et al., 2008). A sample of Australian coaches surveyed by Moston et al. (2015) reported the perceived incidence of PED use at 20.9%. In the current sample, almost one in five coaches (19.2%) reported personally knowing an athlete who was deliberately engaging in doping for performance enhancement. Although this general figure does not allow us to calculate the real or perceived incidence of doping in sport, it does give a clear indication that coaches come into regular contact with athletes who are doping. This in turn means that they have an important role to play in doping prevention, and/or the reporting of doping behaviours to the relevant authorities. As one might expect, the sports with the highest incidence of doping reported by the present population of coaches were cycling and athletics. However, a number of coaches of team sports like rugby and football had also come into contact with athletes taking PEDs. These sports historically do not have particularly strong associations with doping culture, so the results may signpost to where future education and detection efforts should be directed. Interestingly, both the current study and studies by Engleberg and Moston

(2015) and Moston et al. (2015) found that coaches estimated the prevalence of doping to be higher in sport generally than in their own sport. If coaches do see PED use as relatively more prevalent or problematic in other sports than in their own, then anti-doping campaigns may be seen as personally irrelevant and may attract only limited support from them. Therefore, in order to maximise coach “buy-in” and engagement, anti-doping campaigns will need to directly address these misconceptions.

More than two thirds (67.%) of the coaches surveyed had confidence in the current in-competition testing systems. However, there was far less support for the efficacy of out of competition tests, with over half of coaches (57.4%) stating that it was ineffective in detecting athletes who were cheating. An additional point worth noting in the results pertaining to coaches’ beliefs about the efficacy of anti-doping efforts is that 110 coaches (41.4%) disagreed that anti-doping education campaigns were effective in deterring athletes from doping. Backhouse and McKenna (2012) report inconsistent findings between studies examining coaches’ opinions on the effectiveness of doping prevention methods. Given the significant resources WADA and other anti-doping agencies spend on designing and delivering such programmes, perhaps an audit of the efficacy of such efforts is required. A large majority of coaches (86.3%) supported WADA’s move to make athlete support personnel accountable for their actions, should they be proven to be engaging in doping activities. This is a promising finding, one which is supported by Engleberg and Moston (2015), and indicates a high level of willingness on the part of coaches to take responsibility for decisions they make around doping practices.

Part 3: Few studies to date have examined coaches’ attitudes to doping, or tested the factors that may contribute to such attitudes. The current study sought to determine whether the level of sport in which they were working, and the type of certification they held would influence our coaches’ attitudes to doping. Our study found no overall interaction effect between certification type and competitive level of coaches’ on their attitudes to doping. Competitive level was not found to significantly influence the Performance Enhancement Attitude Scale (PEAS; Petroczi & Aidman, 2009) scores of our coaches. However, it was revealed that coaches with strength and conditioning (S&C) certification (M=32.91) displayed significantly more permissive attitudes to doping than those without S&C certification (M=29.73). An obvious explanation for this is the fact that S&C coaches are concerned with the physical optimisation of athletes’ bodies, which has the potential to be greatly improved

by engaging in certain types of PED use. In contrast, sports coaches are more concerned with athletes' skill development and technical execution, aspects of performance which are less likely to directly benefit from doping practices. Indeed, according to Engleberg and Moston (2015), the views of (technical) coaches of elite-level athletes were that "doping does not aid in the development or implementation of sporting skills" (p.942). This finding has important implications for directing more targeted anti-doping efforts towards coaches studying and working in the area of S&C. The completion of anti-doping education modules as a requirement for S&C certification or professional membership would be a helpful starting point for addressing the findings reported here.

Only one published study to date has used the PEAS to measure the attitudes to doping of athlete service personnel (Morente-Sanchez & Zabala, 2015). This Spanish study tested 237 technical staff members of football teams and found an overall mean PEAS score of 31.63, slightly higher (i.e. more lenient) than the population of the current report (M=30.55). The football study did not examine differences in competitive level, but did extract scores for the different subgroups amongst the teams' technical staff. They found no significant differences in PEAS scores between coaches (M=31.91) and physical trainers (M=31.28). One likely explanation for this is that our study contained a much broader range of coaches working internationally in both team and individual sports, with widely varying physical and technical requirements compared to this more homogenous Spanish football group.

Limitations of the present study and implications for further research

This study revealed some interesting insights into where coaches are accessing their anti-doping information, and the confidence they have in their doping-related knowledge. It provided us with a greater understanding of the types of requests for information coaches receive, and the level of contact they have with athletes engaging in doping. We also examined coaches' attitudes to doping, and the anti-doping system and learned that S&C coaches have significantly more permissive attitudes to PED use than their technical coach counterparts. However, there are likely to be a multitude of other socio-demographic variables that are predictive of coaches' attitudes to doping, and these warrant further investigation, preferably using regression analysis.

Many gaps still remain in the literature relating to coaches and doping in sport. For example, as yet, we do not understand how coaches' attitudes to doping may influence their behaviours

with respect to promoting anti-doping (or indeed doping) practices amongst their athletes. Unfortunately, the lack of internal consistency in the first draft of our questionnaire (which was based on the Theory of Planned behaviour) precluded us from examining this question empirically in the present study. Interestingly, only one published study has attempted to understand the predictors of coaches' doping-related behaviours utilising the Theory of Planned Behaviour (Ajzen, 2006). Fung and Yuan (2006) tested the relationships between *perceived knowledge, actual knowledge, subjective norms, attitudes* and *behavioural intent* of 114 'community coaches' in Hong Kong. However, the validity of Fung and Yuan's subjective norm subscale has been criticised by Backhouse et al. (2007), and the basic correlation statistics employed in the study also preclude any inferences about predictors of coaches' behavioural intent. Further research that is guided by a sound theoretical framework and that helps to make specific predictions regarding *coaches' intentions to promote anti-doping* among the athletes they work with would be welcome in the literature. Empirical evidence on whether coaches' stated attitudes and behavioural intentions translate to actual behaviour is also still lacking. The determination of the strength of the attitude-intention-behaviour relationship in the doping context is an area that remains ripe for further study (Lazuras et al., 2010; Webb & Sheeran, 2006).

In a similar oversight, few studies have examined how coaches' attitudes to doping impact the attitudes and behavioural intentions of their athletes. Focus groups with fourteen elite level coaches revealed that coaches may inadvertently condone doping through inaction or apparent endorsement of pro-doping expectancies with their athletes (Engleberg & Moston, 2016). However, this assumption and the mechanisms by which coaches may be indirectly influencing their athletes' in relation to doping requires further empirical investigation among a much larger and more diverse sample size.

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Appendix 1

Doping Attitudes and Behaviour Scale - Coaches

Q1 Statement of Informed Consent: I agree to participate in the study outlined. I understand the nature of the study and I have had the opportunity to raise any queries. I understand that consent is voluntary and that by returning the survey I am agreeing to its content being included in the study. I also understand that any information collected during the course of this study may be published in reports and scientific journals, and may be presented at relevant conferences.

- I CONSENT to take part in this study (1)
- I DO NOT consent to take part in this study (2)

Q2 Part 1 of 5: Demographic Information Age:

Q3 Gender:

- Male (1)
- Female (2)

Q4 Nationality:

Q23 Are you certified as a:

- Sports coach (1)
- Strength and conditioning trainer (2)
- Both (3)

Q25 Sports you have worked with:

Q5 No. of years working with sportspeople:

Q6 Highest level of team/athlete you have worked with:

- Club / School (1)
- County / Interprovincial (2)
- National (3)
- International (4)

Q7 Have you received information about banned substances in sport?

- Yes (1)
- No (2)

Display This Question:

If Have you received information about banned substances in ... Yes Is Selected

Q8 From whom have you received information about banned substances in sport?

Q9 Are you confident in your knowledge about banned substances in sport?

- Yes (1)
- Somewhat confident (2)
- No (3)

Q11 During your coaching career have you ever been asked by an athlete for information about doping?

- Yes (1)
- No (2)

Display This Question:

If During your coaching career have you ever been asked by a... Yes Is Selected

Q12 What did the requests relate to? (Please tick more than 1 if applicable)

- Your opinion on the use of performance enhancing drugs (1)
- Anti-doping rules & regulations (incl. products on WADA list) (2)
- The performance effects of doping substances (3)
- The appropriate dosage of doping substances (4)
- The health hazards associated with doping (5)
- Advice on nutritional supplements (6)
- Other (please specify) (7) _____

Q16 Do you personally know any athletes who are taking, or have previously taken, banned performance enhancing substances?

- Yes (1)
- No (2)

Display This Question:

If Do you personally know any athletes who are taking, or ha... Yes Is Selected

Q17 What sport was the athlete engaged in?

Q20 Part 2 of 5: Attitudes to doping in sport For the purpose of this study, the following are categorized as:

1. Performance- enhancing drugs/methods: Stimulants (i.e., amphetamine, ephedrine etc.) – used to overcome tiredness Beta-blockers – used to calm nerves and steady hands Diuretics – used to reduce weight and mask presence of drug in urine Steroids (i.e., testosterone) – used to accelerate muscle growth and allow longer, more intense training Human growth hormone (HGH) - builds muscle size and strength Erythropoietin (EPO) – used to increase production of red blood cells, which improves endurance Blood doping - reinjected blood increases oxygen supply to muscles, thereby improving endurance

2. Recreational drugs: tranquilizers, barbiturates (sedatives), cannabis (i.e., marijuana), heroin, cocaine/crack, “speed” (i.e., amphetamines), hallucinogens (LSD, PCP), and inhalants (glue, etc.).

Below are statements showing what many people think and feel about sport and performance enhancing drugs. Please read each item carefully and indicate how strongly you agree or disagree.

	Strongly Disagree (1)	Disagree (2)	Slightly Disagree (3)	Slightly Agree (4)	Agree (5)	Strongly Agree (6)
Doping is necessary to be competitive. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Doping is not cheating since everyone does it. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Athletes often lose time due to injuries and drugs can help to make up the lost time. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Only the quality of performance should matter, not the way athletes achieve it. (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Athletes are pressured to take performance-enhancing drugs. (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Athletes who take recreational drugs, use	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

<p>them because they help them in sport situations. (6)</p> <p>Athletes should not feel guilty about breaking the rules and taking performance-enhancing drugs. (7)</p> <p>The risks related to doping are exaggerated. (8)</p> <p>Athletes have no alternative career choices, but sport. (9)</p> <p>Recreational drugs assist in motivating athletes to train and compete at the highest level (10)</p> <p>Doping is an unavoidable part of competitive sport. (11)</p> <p>Recreational drugs help to overcome boredom outside of competition (12)</p> <p>There is no difference between drugs and the technical</p>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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<p>equipment that can be used to enhance performance (e.g. hypoxic altitude simulating environments) (13)</p>						
<p>The media should talk less about doping. (14)</p>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<p>The media blows the doping issue out of proportion. (15)</p>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<p>Health problems related to rigorous training and injuries are just as bad as doping side effects. (16)</p>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<p>Legalizing performance enhancements would be beneficial for sports. (17)</p>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<p>It is expected of me that I deter the athletes I work with from doping (18)</p>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<p>I intend to source doping products for athletes I work with (19)</p>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<p>I am confident that I could</p>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

influence the doping attitudes of my athletes, if I wanted to (20)						
I feel under pressure in my role as a coach to promote anti-doping (21)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I plan to provide anti-doping information to athletes I work with (22)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Athletes' opinions about doping are beyond my control (23)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would provide information to an athlete on how to plan and execute a doping programme (24)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I expect that I would take disciplinary action against an athlete who I discovered was engaging in doping (25)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q21 Part 3 of 5: Coaching Behaviours It has been proposed in previous research, that coaches can have an indirect effect on the doping attitudes of the athletes they work with. Do you agree or disagree that the following coach behaviours could contribute to athletes being positively disposed toward doping?

	Strongly Disagree (1)	Disagree (2)	Slightly Disagree (3)	Slightly Agree (4)	Agree (5)	Strongly Agree (6)
Setting unattainably high performance expectations (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Failing to reward effort/improvement by athletes (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Punishing mistakes by shouting at or dropping the athlete in question (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Showing favouritism towards the best athletes in the group (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Actively encouraging rivalry between team-mates/training partners (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q23 Part 4 of 5: Perceived motivations of doping athletes The following factors have been cited as some of the possible reasons behind athletes' decisions to get involved in performance enhancing doping. Based on your experience as a coach, please indicate how strongly you agree or disagree with each factor as a potential influence in athletes' doping decisions.

	Strongly Disagree (1)	Disagree (2)	Slightly Disagree (3)	Slightly Agree (4)	Agree (5)	Strongly Agree (6)
For economic/monetary reasons (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To speed up recovery from injury (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To improve their performance (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To prolong their career in sport (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
For weight management/physical appearance reasons (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Due to peer pressure (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q24 Are there any other likely reasons you can think of?

Q30 Part 5 of 5: Effectiveness of anti-doping programmes Please indicate the extent to which you agree or disagree with the following statements:

	Strongly Disagree (1)	Disagree (2)	Slightly Disagree (3)	Slightly Agree (4)	Agree (5)	Strongly Agree (6)
Doping is a serious problem in elite sport generally (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Doping is a serious problem in my sport in particular (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The current system of drug testing is effective in catching dopers in-competition (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The current system of drug testing is effective in catching dopers out of competition (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Anti-doping education programmes are effective in deterring athletes from doping (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The current sanction of a 2 year ban for a first doping offence and a lifetime ban for a second violation are	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

<p>sufficiently strict to deter athletes from doping (6)</p> <p>Punishments for involvement in doping should extend beyond just the athlete (sports medics, managers, coaches etc.) (7)</p> <p>Athletes who engage in doping should serve jail time (8)</p>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q31 Do you have any suggestions for how the current drug testing and sanctions system could be improved?

Q32 Do you have any suggestions for how the content or delivery of anti-doping education could be improved?