ATTITUDES, INTENTIONS AND BEHAVIOR TOWARD DOPING AMONG ATHLETICS IN SPAIN: A COMBINATION OF QUANTITATIVE AND EXPERIMENTAL STUDIES

Final report to the World Anti-doping Agency
Social Research Grants Project 2019-A2 (2020, 2022)
March 2022

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Introduction

Social science research in doping in sport attempts to understand why athletes dope and how they do it; hence it helps to improve educational and interventional anti-doping programs. Whereas investigation on biomedical and legislative aspects of doping began in the 1960s (Beckett and Cowan, 1978), research on psychosocial doping factors was initiated in the 1990s (García- Grimau et al., 2020). Understanding the psychology of doping remains a challenge for social researchers due to the complex nature of the different variables influencing doping behavior (Blank et al., 2016). Researchers in this field have explored through different theoretical models all the possible factors that influence intentions and attitudes toward doping behavior (Donovan et al., 2002; Strelan and Boeckmann, 2003; Petróczi and Aidman, 2008).

The Sport Drug Control Model as a theoretical framework to study the psychology of doping in sport

To date, regarding quantitative studies there is no standard model and multiple scales of measurement and multiple questions items exist. The World Anti-doping Agency (WADA) provides a Social Science Research Package with a useful guideline for measuring athletes' responses in each of the Sport Drug Control Model's (SDCM) domains that influence doping attitudes and behavior (Social Science Research Package, WADA, 2015). Specifically the SDCM analyzes the following factors: morality, legitimacy, benefits and threat appraisals, motivational profiles, beliefs about reference groups' endorsement of doping methods/substances, use of legal supplements, beliefs about the availability of performance-enhancing substances (PES) and relevant authorities' control over trafficking of doping methods/substances, beliefs about the affordability of doping methods/substances, attitudes toward doping, susceptibility to doping, and self-reported use of banned substances (PES) or methods (PESM).

The SDCM incorporates different frameworks from the behavioral sciences (Nicholls et al., 2014) and considers the particularities of competitive sport, such as the existence of legal methods to improve performance and the influence of environmental and cultural beliefs (Lazuras, 2016). The SDCM has been quantitatively examined twice in Australian elite athletes and the items used have shown validity and reliability (Gucciardi et al., 2010; Jalleh et al., 2013). However, it is necessary to analyze the model in different populations and cultures to further develop it (Jalleh et al., 2013).

Doping prevalence measurements: how to improve quality and reliability?

Due to the intrinsic nature of doping in sport, a banned and socially rejected practice, the measurement of the prevalence of doping remains difficult and unclear, especially in competitive level, therefore data prevalence is potentially underestimated. The prevalence of doping in elite sports is likely to be between 14 and 39 % (De Hon et al., 2015). A recent meta-analysis study shows a disparate range between 0% and 73% (Gleaves et al., 2021) where authors suggest best practice recommendations and guidelines to improve the evidence quality in this field. However, the estimation of the prevalence of doping based on self-report survey provide a higher rate of dopers than the official laboratory statistics, which reflects better what is happening in "the real

world" of competitive sport. Also, prevalence figures provide a tool for evaluating the effectiveness of anti-doping policies.

For all those reasons, there is a need to empirically test de SDCM in other countries and beyond the athlete population. In addition, studies on attitudes and behavior toward doping in Spanish athletes are scarce and mainly focused on cycling (Morente-Sánchez et al., 2013a,b), soccer (Horcajo and de la Vega, 2014, 2016; Morente-Sánchez and Zabala, 2015; Horcajo and Luttrell, 2016) and triathlon (Morente-Sánchez et al., 2013a; Maestre, 2015), and the prevalence of doping is unknow. This project research will analyze for the first-time attitudes towards doping and prevalence of doping in competitive Spanish track and field athletes and coaches.

OBJECTIVES

Phase 1:
1. To assess via structural equation modelling, the extent to which the variables in the SDCM together predict attitude and susceptibility towards the use of PES in competitive Spanish track and field athletes.
2. To assess the relative importance of the various concepts in the model.
3. To measure self-reported doping prevalence in athletes

Phase 2:
1. To adapt and apply for the first time the SDCM in coaches.
2. To determine the factors in the SDCM that most influence coaches' attitudes and susceptibility toward doping.
3. To measure self-reported doping prevalence in coaches.

Phase 1: Testing the Sport Drug Control Model in competitive Spanish track and field athlete.

In this first phase, all the aforementioned objectives were accomplished. We empirically tested the SDCM while analyzing for the first time the intentions and attitudes toward doping in competitive Spanish track and field athletes. In order to do so we had to sworn translate the SDCM questionnaire into Spanish. This translated questionnaire was sent to WADA for their consideration as also previously stated in the research project. The manuscript was published in the journal 'Frontiers in Psychology', which is a Q2 Citation Reports (JCR) journal.

Methods

Participants and design

We conducted a cross-sectional online survey to examine Spanish track and field (athletics) athletes in 2020. Participants were 281 Spanish elite and national standard track and field athletes from whom 80.1% were 18-28 years old and 49.5% were females. Descriptive statistics of athletes' characteristics are presented in Table 1 below.

Table 1. Characteristics of the participants: athletes		
n		281
Gender	Male	50.5%
	Female	49.5%
Age range (years)	18-20	26%
	21-24	34.5%
	25-28	19.6%
	29-32	8.2%
	≥ 33	11.7%
Competition level	Olympic Games	5.6%
	World Athletics Championships	18%
	European Athletics Championships	14.7%
	Other International events with the national team	10.1%
	National Athletics Championships	44.8%
	Regional Championships	6.8%
Athletic discipline	Middle- long-distance	61.6%
	Race walking	4.3%
	Sprinting/hurdle	17.1%
	Jumping/throwing	13.9%
	Combined events	3.2%
Sport income	< 5000 €	73.3%
	5000-9.999 €	11.4%
	10.000-19.999 €	8.9%
	20.000-39.999 €	4.6%
	> 40.000 €	1.8%

Participants completed the SDCM questionnaire measuring the following constructs (1) morality, (2) legitimacy; (3) benefits appraisal; (4) threat appraisal; (5) personality traits; (6) beliefs about reference groups' endorsement of doping methods/substances; (7) use of legal supplements; (8) beliefs about the availability of PES and relevant authorities' control over trafficking of doping methods/substances; (9) beliefs about the affordability of doping methods/substances; (10) attitudes toward doping, (11) susceptibility to doping and (12) self-reported use of banned performance-enhancing substances or methods. Description of the questionnaire constructs and measures are presented in table 2 below.

Table 2. Description of the questionnaire

Modules/constructs from WADA guidelines	Construct measures[*]	Question number[**]
Morality	Moral decision-making, moral stance, moral affect, moral disengagement (6-items scale, Kavussanu et. al, 2016).	Q1, Q2, Q3, Q4
Legitimacy	Distributive justice.	Q5, Q6, Q7
Benefit appraisal	Perceived performance-enhancing effects of banned substances and methods, Likelihood of potential positive outcomes.	Q8, Q9, Q10, Q11
Threat appraisal	Threats of enforcement, threats relating to ill-health effects.	Q12, Q13, Q14, Q15
Personality traits	Self-efficacy to refrain from doping, goal orientations.	Q16, Q17
Reference Groups' Endorsement of Doping Methods/Substances	Subjective norms.	Q18, Q19, Q20
Availability of PESM and relevant authorities' control over trafficking of doping methods/substances	Perceived availability of PES, access to banned PES, perceived access to medical advice on use of PES, perceived efforts of relevant authorities in enforcing laws against trafficking of PESM.	Q21, Q22, Q23, Q24, Q25
Affordability of PESM	Perceived affordability of PESM.	Q26
Beliefs about Other Athletes' Attitudes towards and use of doping	Descriptive norms.	Q27
Belief about societal influences on doping	Belief about societal influences on doping.	Q28, Q29, Q30
Use of nutritional supplements and other technologies	Use of nutritional supplements, use of other technologies	Q21, Q32
Performance-Enhancing Drug use	Frequency of use of PESM in the past 12 months.	Q33. Q34
Demographic and sporting background	Athletics discipline, competition level, income from sport, age group, and gender.	Q35, Q36, Q37, Q38, Q39
Overall Susceptibility to doping	Susceptibility, attitudes, and intention to doping.	Q40, Q41, Q42, Q43, Q44

[*]See section 5 of WADA's social science research package for full descriptions of measures and items.
[**]See Appendix A. WADA: World Anti-doping Agency; NADO: National Anti-doping Organization; PES: performance-enhancing substances; PESM: performance-enhancing substances and methods.

The final SDCM 44-items questionnaire can be found in Appendix A. All the items in the questionnaire belong to the Social Science Research Package (WADA, 2015) with the exception of the morality construct which was measured using the 6-items from Moral Disengagement in Doping Scale (Kavussanu et al., 2016). Moreover, the factor 'susceptibility to doping' has been included as a dependent variable in our analysis, along with doping attitudes and behavior.

Protocol

Prior to starting the data collection, Ethics committees from Isabel I de Castilla International University (UI1-PI016) and World Anti-Doping Agency (2019- A2) provided ethical approval for the completion of the study. Before filling out the online survey, all the participants signed a consent form to participate in the study which was conducted in accordance with the Declaration of Helsinki. Athletes were informed about the aims and purposes of the study, that the project was funded by WADA, and reassured about their anonymity and confidentiality of their data. Participants were selected according to their performance level. The inclusion criterion was having achieved a qualification standard for participation in either a senior or age category (under 20 years [U-20] or under 23 years [U-23]) national athletics championship.

Coaches of twenty-four training groups nationwide were contacted via e mail or telephone and asked to allow their athletes to take part in a short survey. WhatsApp 2.18.52 (Mountain View, California, USA) groups were created, and athletes were invited to participate in the online survey (via link). Although the main contact was done via the coaches, who facilitated participation of their athletes, some athletes were recruited directly via telephone.

Results

Missing values were checked before statistical analysis. Missing data for each variable was low (i.e., 0.4-3.1%) and replaced through the expectation maximization method (Graham, 2009). Descriptive statistics, reliability and internal consistency analysis of the study variables were performed through the Statistical Package for the Social Sciences (SPSS) version 24.0 (IBM, Armonk, 234 NY, USA). MacDonalds's Omega (ω) and Composite Reliability values were >0.7 and Average Variance Extracted values were >0.5 which indicates a good reliability and internal consistency of the questionnaire suitable for uctural equation modelling (SEM) analysis. SEM supported a good fitness of the SDCM and confirmed that positive attitudes towards doping predicted high susceptibility to doping (β=0.55, p<0.001), which is in turn associated with the use of prohibited substances and methods (β=0.12, p<0.05). The factors that have most influence on attitudes towards doping are morality (β=0.46, p<0.001) and reference group opinion (β=0.62, p<0.001) (see figure 1). Self-reported doping use was 9.6%.
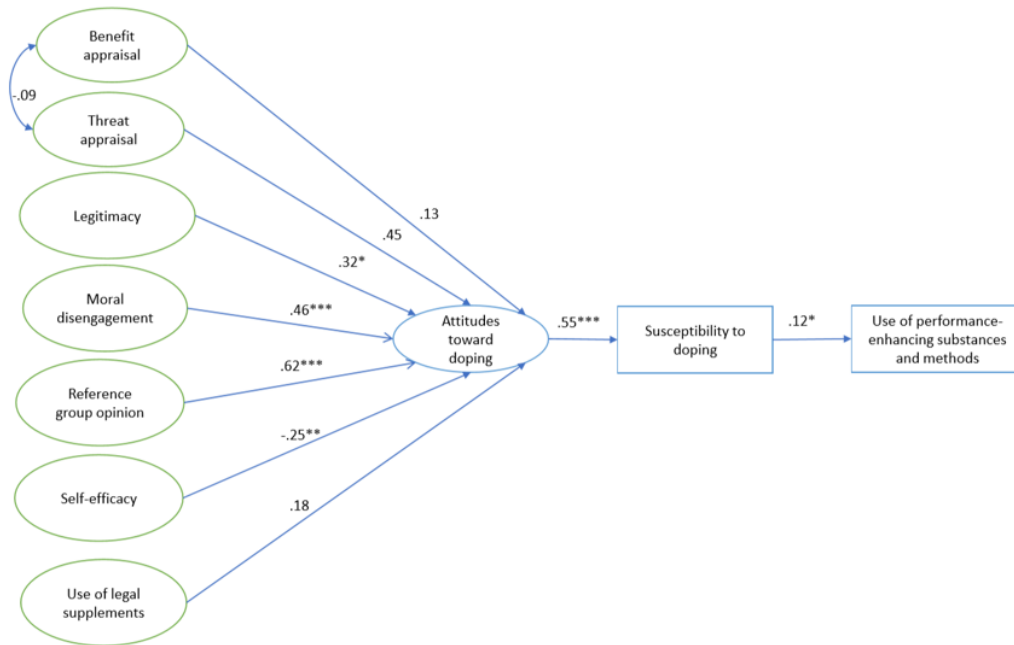
Figure 1. Overview of results of structural equation model analysis with standardized parameter estimates. Different levels of significance according to *p* value: *p<.05, **p<.01, and ***p<.001.

Phase 2: Testing the Sport Drug Control Model in Spanish track and field coaches.

Coaches strongly influence athletes' attitudes toward doping and can shape athlete's beliefs, behaviors, and decisions to be for or against doping (Barkoukis et al., 2019). The impact of the athlete's entourage on attitudes toward doping has been reported in different studies (Backhouse and McKenna, 2012; Mazanov et al., 2014; Engelberg and Moston, 2016). In this second phase of the project, we applied for the first time the SDCM in coaches with the aim of assessing the reproducibility of the model in athletes' support personnel. We determined the factors in the SDCM that most influence coaches' attitudes and susceptibility toward doping, and their doping prevalence. In this way, we achieved the objectives of phase two of the project. In order to apply the SDCM in coaches, the questionnaire was adapted for this population (see appendix B).

Researcher Elena García Grimau received an invitation from Dr. Andrea Petroczi to publish the manuscript in a new research topic entitled 'Women in Anti-doping Science 2021' and hosted by Frontiers in Sport and Active Living journal. The manuscript has been approved for production and accepted for publication in Frontiers in Sports and Active Living, section Anti-doping Sciences.

Methods

Participants and design

Athletics is the third summer Olympic sport most affected by doping, reporting 15% of the total anti-doping rules violations worldwide in 2018 (World Anti-doping Agency, 2020). However, to the best of the authors' knowledge no study analyzing attitudes and behavior toward doping in Spanish athletics coaches has been conducted previously. Thus, athletics coaches were recruited between February and March 2021 to participate

in a cross-sectional online survey via e-mail from the database of the National School of Coaches of the Royal Spanish Athletics Federation. The questionnaire was sent to 1432 coaches of whom 201 completed the survey. Descriptive statistics of coaches' characteristics are presented in Table 3 below.

Table 3. Characteristics of the participants: coaches

n		201
Gender	Male	88.6%
	Female	11.4%
Age range (years)	< 25	23.4%
	25-29	4 %
	30-39	12.4%
	40-29	21.9%
	50-59	27.9 %
	≥ 60	10.4 %
Competition level achieved by their athletes	Olympic Games	9.5%
	World Athletics Championships	11.9%
	European Athletics Championships	10%
	Other International events with the national team	15.4%
	National Athletics Championships	45.8%
	Regional Championships	7.5%
Athletic discipline expertise	Middle- long-distance	38.8%
	Race walking	4.5 %
	Sprinting/hurdle	26.9%
	Jumping/throwing	19.9%
	Combined events	10%
Sport income	< 5000 €	61.2%
	5000-9.999 €	21.4%
	10.000-19.999 €	11.9%
	20.000-39.999 €	4.0%
	> 40.000 €	1.5%

Participants completed the SDCM questionnaire measuring the following constructs: (1) moral disengagement; (2) benefits appraisal; (3) threat appraisal; (4) self-efficacy to refrain from doping; (5) goal orientations; (6) subjective norms: reference groups' endorsement of doping methods/substances; (7) descriptive norms: belief of doping use in others; (8) attitudes toward doping, and (9) susceptibility to doping. All measures used in this study can be found in Appendix B.

Protocol

Ethics committees from Isabel I de Castilla International University (UI1-PI016) and World Anti-Doping Agency (2019-A2) provided ethical approval for the completion of the present study. All the participants signed a consent form to participate in this study which was conducted in accordance with the Declaration of Helsinki. Coaches were informed about the aims and purposes of the study, that the project was funded by WADA, and reassured about their anonymity and confidentiality of their data.

Results

Descriptive statistics, reliability and internal consistency analysis of the study variables were performed through the Statistical Package for the Social Sciences (SPSS) version 24.0 (IBM, Armonk, 234 NY, USA). Missing values were checked before statistical analysis. Missing data for each variable was low (i.e., 0.0-4.4%) and replaced through the expectation maximization method (Graham, 2009). Means (95% confident intervals [CI]), standard deviations (SDs), McDonald's Omega (ω), average variance extracted (AVE) and composite reliability (CR) were calculated as a measure of reliability and internal consistency. SEM was carried out to test the SDCM in coaches through AMOS package for SPSS version 24.0. An examination of the measurement portion of the model and setting constraints was made to avoid identification issues.

Descriptive statistics for the different variables analyzed (see Table 4) indicate that coaches reported on average negative attitudes towards doping and low levels of susceptibility to doping and moral disengagement. With respect to psychological factors, coaches stated on average a high self-efficacy to refrain from doping and moderate ego-oriented goals. Regarding social norms, they reported a high subjective norm. They believed that, on average, reference groups would disapprove doping behaviors. With respect to descriptive norms, coaches perceived an average doping prevalence of 19.5% (1.95 ± 1.74 [mean ± SD]).

Table 4. Descriptive statistics, reliability and internal consistency estimates for the variables measuring the sport drug control model through structural equation modeling.

Variables	Range	Mean (CI)	SD	ω	AVE	CR
Susceptibility to doping	(1) not at all to (4) a lot of consideration	1.08 (1.04,1.13)	0.32	--	--	--
Attitudes toward doping	(1) definitely don't have to use to (5) definitely have to use	1.67 (1.52,1.81)	1.05	--	--	--
Moral disengagement	(1) Strongly disagree to (7) strongly agree	1.37 (1.28,1.46)	0.66	0.68	0.48	0.77
Benefit Appraisal	Performance enhancing effect: (1) would not to (5) definitely would	3.21 (3.06,3.36)	1.07	0.89	0.59	0.89
	Positive outcomes: (1) a lot to (3) not at all	1.50 (1.45,1.55)	0.34	0.72	0.48	0.82
Threat appraisal	Testing likelihood: (1) Very likely to (5) Not at all likely	3.57	1.27	--	--	--
	Evading detection: (1) Very likely to (5) Not at all likely	2.83	1.20	--	--	--
	Ill-health effect: (1) A lot of harm to (5) no harm	2.07 (1.9,2.24)	1.10	0.94	0.73	0.94
Motivational profiles: Self-efficacy to refrain from doping	(1) completely capable to (7) Not at all capable	1.59 (1.37,1.80)	1.54	0.98	0.84	0.98
Motivational profiles: ego-oriented goals	(1) strongly disagree to (5) strongly agree.	2.14 (2.03,2.26)	0.83	0.82	0.53	0.87
Subjective norms: Reference Groups' Endorsement of Doping	(1) would definitely approve to (5) would definitely disapprove	4.14 (4.04,4.24)	0.74	0.88	0.61	0.95
Descriptive norms: perception of others' use of doping		19.5* (17.1,22.0)	17.4	0.93	0.76	0.94

CI: confident intervals; SD: standard deviation; ω: McDonald's ω; AVE: average variance extracted; CR: composite 569 reliability * Average percentage of perceived doping

Measures showed good internal consistency and reliability, with ω values > 0.6, AVE values > 0.4 and CR values > 0.7. Self-reported doping prevalence among coaches was 4.5%, and 3% acknowledged having had an athlete who has tested positive for a prohibited substance. The SEM analysis of the SDCM in coaches (see Figure 2) revealed a good fit of the data: χ^2/df = 1.76, p < 0.001, CFI = 0.93, TLI = 0.96, RMSEA = 0.062 (90% CI = 0.054, 0.070), SRMR = 0.09. Covariance between moral disengagement and subjective norms, and between subjective norms and descriptive norms did not change the model fitness and improved the standardized parameter estimates and significance. Positive attitudes toward doping predicted high susceptibility to doping (β = 0.39, p < 0.001). Moral

disengagement (β = 0.58, p < 0.001), descriptive norms (β = 0.42, p = 0.001), ego-oriented goals (β = 0.34, p < 0.05), and self-efficacy to refrain from doping (β = 0.26, p < 0.05) displayed a significant influence on attitudes toward doping. These variables should be considered when designing anti-doping research projects and educational programs aiming at modifying coaches' attitudes towards doping.
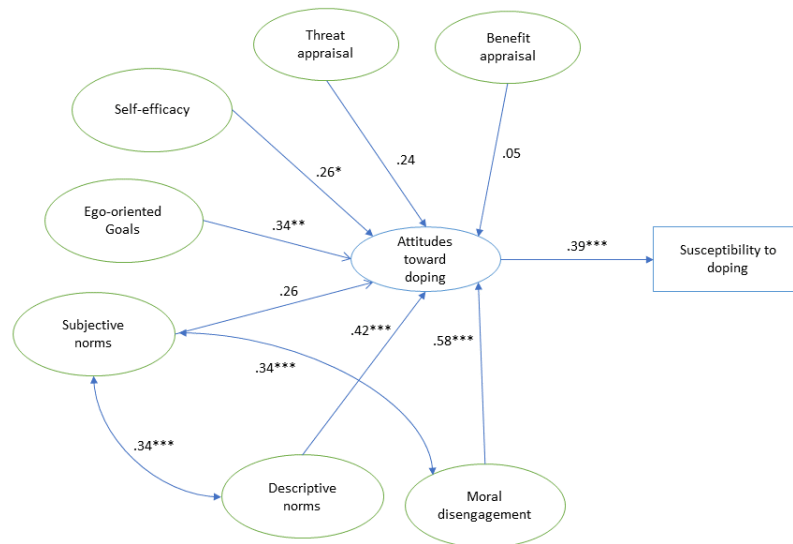
Figure 2. Overview of results of structural equation model analysis with standardized parameter estimates. Different levels of significance according to p-value: *p ≤ 0.05, **p ≤ 0.01, and ***p ≤ 0.001.

Discussion

The Sport Drug Control Model is likely to be the model which most explicitly represents the theoretical paradigm of the psychological study of the use of doping in sport (Kirby et al., 2016). This model can be further developed through its analysis in different populations and cultures. To our knowledge, published study has test the SDCM in Australia (Gucciardi et al., 2010; Jalleh et al., 2013) and adolescent athletes from United Kingdom, Australia, United States, and Hong Kong (Nicholls et al., 2020), and has not yet been applied either in Spain or in athletes' support personnel (ASP). The main objectives of this research project were to empirically test the SDCM while analyzing for the first time the intentions and attitudes toward doping in Spanish track and field athletes and coaches. Secondary project purpose was to determine the factors in the SDCM that most influence athletes and coaches' attitudes and susceptibility toward doping, and their doping prevalence.

Primary outcomes from phase 1 displayed that positives attitudes toward doping predicted high susceptibility to doping, which is in turn associated with the use of prohibited substances and methods. The observed strength of the relationship between attitudes toward doping and doping susceptibility are in agreement with results from other studies (Gucciardi et al., 2010; Barkoukis et al., 2013; Blank et al., 2016; Nicholls et al., 2020).

The factors that were found to have the greatest influence on attitudes toward doping in athletes are morality and reference group opinion. Preliminary evidence showed that moral variables are strong predictors of doping attitudes and behaviors (Ntoumanis et al., 2014; Backhouse et al., 2015, Kavussanu et al., 2019). An important change in our study is the measurement of the morality construct under the concept of moral disengagement, using the scale of Moral Disengagement of Doping in Sport (MDDS, Kavussanu et al., 2016). In recent studies sampling competitive athletes from different countries, moral disengagement was found to be a strong predictor of positive attitudes toward the use of PES (Hodge et al., 2013; Kavussanu et al., 2019; Ring and Hurst, 2019). Our findings emphasize the potential effectiveness of introducing the concept of morality into antidoping educational programs through practical interventions in order to acquire a strong moral stance against doping and avoid morality disengagement in athletes who are highly susceptible to dope. Intervention programs oriented toward changes in the moral aspect of doping have displayed the greatest effectiveness in antidoping prevention and they are scarcely implemented unfortunately (Gatterer et al., 2020).

Reference group opinion was found to be a significant and positive predictor of attitudes toward the use of doping, which means that the greater endorsement of doping by athletes' reference groups (i.e., coach, teammates, and family) the more prone were attitudes toward doping. This finding is consistent with that from Jalleh et al. (2013). In addition, these results are also in agreement with those from Lazuras et al. (2010) regarding subjective norms, which is a variable that derives from the TPB. The role played by significant others is a crucial contextual variable in understanding attitudes toward doping in athletes. If athletes' closest entourage rejects doping, this would be a protective factor to prevent athletes from being tempted to use banned substances or methods. For this reason, we have focused on analyzing the athlete's support personnel in phase 2 of the research project, specifically its most relevant reference group which is the figure of the coach.

The examination of the SDCM in Spanish elite- and national-standard track and field athletes is a strength of our study because this is the first analysis to date of attitudes toward the use of doping and doping-related behaviors in Spanish track and field competitive athletes. Our findings confirm SDCM reproducibility and variability (as it accounts for several variables).

As previously mentioned, in phase 2 of the study we analyzed attitudes and behaviors toward doping in coaches. Coaches could engage on doping behavior, act as social facilitators in doping in sport (Vakhitova and Bell, 2018) and incite their athletes to commit anti-doping rule violations (ADRVs) (i.e., those displayed in articles ranging from 2.5 to 2.11 of the World Anti-doping Code). Donovan et al. (2002) observed that the SDCM could be adapted for application to ASP but has not yet been applied to coaches. In this study, the SDCM is applied for the first time in coaches with the aim of assessing the reproducibility of the model in ASP. Its application in a new population is an added value to this research.

The most important findings regarding the relationship between the variables were that attitudes toward doping predicted high susceptibility to doping and were significantly influenced by moral disengagement, descriptive norms, ego-oriented goals, and self-efficacy to refrain from doping in athletics coaches. Our results emphasize once

again the relevance of moral variables to be considered in educational programs, whether targeting athletes or coaches. These results are in line with other studies in coaches (Patterson and Backhouse, 2018; Barkoukis et al., 2019) in which moral disengagement displayed a strong influence on doping likelihood acting as a direct predictor or mediator (Ring and Kavussanu, 2018b).

Descriptive norms were a significant and positive predictor of attitudes toward the use of doping in coaches, which reflects that the perception of high prevalence of doping in others could enhance their attitudes toward doping, as they tend to normalize this behavior. Normative beliefs can be considered determinants of attitudes and behavior toward doping in the sport society, therefore its inclusion in anti-doping educational programs should be addressed.

Regarding motivational profiles, self-efficacy, and ego-oriented goals were significant predictors of coaches' doping attitudes in the present study. Coaches with ego-oriented goals and less ability to resist temptations may be more prone to doping. Hence, those motivational factors are strong predictors of attitudes and susceptibility to doping in both coaches and athletes.

Overall, adaptation and application of the SDCM in ASP proves its reproducibility in other population. Our results show that moral disengagement, social norms, and motivational profiles are the strongest predictors of attitudes toward doping among coaches. We truly believe that is necessary to address these psychological-, attitude-, and behavior-related issues through educational programs targeting coaches. The results of the present study alongside those from others reveal that coaches tend to morally disengage through a lack of commitment and a diffusion of their responsibilities as educators in doping prevention (Barkoukis et al., 2019), and consider that they do not have adequate tools to prevent their athletes from doping use, while being aware of their role as antidoping educators though (Engelbert et al., 2019; Patterson et al., 2019). All this scientific evidence paints a worrying picture, as coaches could rather represent a doping risk. In the complex context of elite sport in which the influences of sport environment and reference group on athletes are crucial, the absence of doping prevention may involve the presence of risk of its use. Perhaps it is time to focus more efforts on coaches, without putting aside the athletes, and therefore turn coaches into reliable doping prevention factors.

During phase 1 and phase 2 we measured self-reported doping prevalence in athletes (9.6%) and coaches (4.5%). Only one (i.e., use of performance-enhancing substances and methods) from the 11 WADA current doping-related infractions was evaluated. Moreover, doping in sport is a prohibited and socially rejected practice, methods for assessing doping prevalence remain unclear and therefore data prevalence is potentially underestimated due to the sensitivity of the question. The use of multiple measures to triangulate doping prevalence data, and indirect measures like randomized response technique (RRT) may provide more reliable measurements (Gleaves et al., 2021).

Conclusion

This is the first questionnaire written in Spanish analyzing the influence of several factors on doping attitudes and behaviors in athletes and coaches. The development of this questionnaire represents an important step forward for the antidoping community to be able to analyze and evaluate the attitudes and behaviors toward doping in a much

wider population given the great number of Spanish speaking athletes worldwide. The SDCM has been applied for the first time in coaches and displayed reproducibility in ASP. Our research project provides unique and valuable information for application in educational programs in the Spanish anti-doping agency.

It is recommended to enhance anti-doping intervention programs which allow athletes to acquire a strong moral stance against doping. We recommend further research coach-centered to provide more assistance to sport coaches and establish effective and mandatory anti-doping education in them.

Finally, we successfully reached all project objectives within the agreed timeline despite the difficulties encountered due to the Covid-19 pandemic.

Dissemination of findings

Publications:

1. García-Grimau E, De la Vega R, De Arce R and Casado A (2021). *Attitudes Toward and Susceptibility to Doping in Spanish Elite and National-Standard Track and Field Athletes: An Examination of the Sport Drug Control Model*. Front. Psychol. 12:679001. doi: 10.3389/fpsyg.2021.679001

2. García-Grimau E, De la Vega R and Casado A (2022). *Moral Disengagement, Social Norms, and Motivational Profiles Influence Attitudes Toward Doping Among Spanish Athletics Coaches*. Front. Sports Act. Living 4:842959. doi: 10.3389/fspor.2022.842959 Accepted for publication

Planned publications:

One article discussing potential improvements in the Sport Drug Control Model, e.g., describing results based on logistic regression analysis, which will be submitted to *Frontiers in Psychology* (or another relevant journal).

One article comparing attitudes toward and susceptibility to doping between track and field competitive athletes and coaches will be submitted to *Journal of Sport and Health Science* (or another relevant journal).

Presentations at International Congress:

1. García-Grimau E. (2021). *Attitudes Toward and Susceptibility to Doping in Spanish Elite and National-Standard Track and Field Athletes: An Examination of the Sport Drug Control Model*. Virtual Poster Session, Partnership for Clean Competition Congress, 19 May.
2. An abstract entitled "*Moral Disengagement, Social Norms, and Motivational Profiles Influence Attitudes Toward Doping Among Spanish Athletics Coaches*"

will be sent to an International Congress (e.g., Conference of the European College of Sport Science or another one) during 2022.

References

Backhouse, S. H., and McKenna, J. (2012). Reviewing coaches' knowledge attitudes and Beliefs regarding Doping in Sport. Int. J. Sports Sci. Coach. 7, 167–175. doi: 10.1260/1747-9541.7.1.167

Backhouse, S., Whitaker, L., Patterson, L., Erickson, K., and McKenna, J. (2015). Social Psychology of Doping in Sport: A Mixed-Studies Narrative Synthesis. Available online at: https:// www.wada ama.org/sites/default/files/resources/files/literature_review_update_-_final_2016.pdf (accessed January 15, 2019).

Bamberger, M., and Yaeger, D. (1997). Over the edge. Sports Illustr. 14:62–70.

Barkoukis, V., Lazuras, L., Tsorbatzoudis, H., and Rodafinos, A. (2013). Motivational and social cognitive predictors of doping intentions in elite sports: an integrated approach. Scand. J. Med. Sci. Sports 23, e330–e340. doi: 10.1111/sms.12068

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

Blank, C., Kopp, M., Niedermeier, M., Schnitzer, M., and Schobersberger, W. (2016). Predictors of doping intentions, susceptibility, and behavior of elite athletes: a meta-analytic review. SpringerPlus 5:1333. doi: 10.1186/s40064-016-3000-0

Beckett, A. H., and Cowan, D. A. (1978). Misuse of drugs in sport. Br. J. Sports Med. 12, 185–194. doi: 10.1136/bjsm.12.4.185

De Hon, O., Kuipers, H., and van Bottenburg, M. (2015). Prevalence of doping use in elite sports: a review of numbers and methods. Sports Med. 45, 57–69. doi: 10.1007/s40279-014-0247-x

Donovan, R. J., Egger, G., Kapernick, V., and Mendoza, J. (2002). A conceptual framework for achieving performance enhancing drug compliance in sport. Sports Med. 32, 269–284. doi: 10.2165/00007256-200232040-00005

Engelberg, T., and Moston, S. (2016). Inside the locker room: a qualitative study of coaches' anti-doping knowledge, beliefs and attitudes. Sport Soc. 19, 942–956. doi: 10.1080/17430437.2015.1096244

Engelberg, T., Moston, S., and Blank, C. (2019). Coaches' awareness of doping practices and knowledge about anti-doping control systems in elite sport. Drugs Educ. Prev. Policy 26, 97–103. doi: 10.1080/09687637.2017.1337724

García-Grimau, E., Casado, A., and de la Vega, R. (2020). Evolución de la investigación psicosocial del dopaje en el deporte de competición: una revisión narrativa (Evolution of doping in elite sport from the perspective of social sciences: a narrative review). Retos 39, 973–980. doi: 10.47197/retos.v0i39.80834

Garc a-Grimau, E., De la Vega, R., De Arce, R., and Casado, A. (2021). Attitudes toward and susceptibility to doping in Spanish elite and national-standard track and field athletes: an examination of the sport drug control model. Front. Psychol. 12:679001. doi: 10.3389/fpsyg.2021.679001

Gatterer, K., Gumpenberger, M., Overbye, M., Streicher, B., Schobersberger, W., and Blank, C. (2020). An evaluation of prevention initiatives by 53 national anti-doping organizations: achievements and limitations. J. Sport Health Sci. 9, 228–239. doi: 10.1016/j.jshs.2019.12.002

Gleaves, J., Petr czi, A., Folkerts, D., De Hon, O., Macedo, E., Saugy, M., et al. (2021). Doping prevalence in competitive sport: evidence synthesis with "best practice" recommendations and reporting guidelines from the WADA Working Group on Doping Prevalence. Sports Med. 51:1909–1934. doi: 10.1007/s40279-021-01477-y

Gucciardi, D. F., Jalleh, G., and Donovan, R. J. (2010). Does social desirability influence the relationship between doping attitudes and doping susceptibility in athletes? Psychol. Sport Exerc. 11, 479–486. doi: 10.1016/j.psychsport.2010.06.002

Hodge, K., Hargreaves, E. A., Gerrard, D., and Lonsdale, C. (2013). Psychological mechanisms underlying doping attitudes in sport: motivation and moral disengagement. J. Sport Exerc. Psychol. 35, 419–432. doi: 10.1123/jsep.35.4.419

Horcajo, J., and de la Vega, R. (2014). Changing doping-related attitudes in soccer players: how can we get stable and persistent changes? Eur. J. Sport Sci. 14, 839–846. doi: 10.1080/17461391.2014.905988

Horcajo, J., and de la Vega, R. (2016). The conviction in attitudes related to doping: an experimental study with football coaches. Revista de Psicologia Del Deporte. 25, 57–64.

Horcajo, J., and Luttrell, A. (2016). The effects of elaboration on the strength of doping-related attitudes: resistance to change and behavioral intentions. J. Sport Exerc. Psychol. 38, 236–246. doi: 10.1123/jsep.2015-0316

Jalleh, G., Donovan, R. J., and Jobling, I. (2013). Predicting attitude toward performance enhancing substance use: a comprehensive test of the Sport Drug Control Model with elite Australian athletes. J. Sci. Med. Sport 17, 574–579. doi: 10.1016/j.jsams.2013.10.249

Kavussanu, M., Hatzigeorgiadis, A., Elbe, A.-M., and Ring, C. (2016). The moral disengagement in doping, scale. Psychol. Sport. Exer. 24, 188–198. doi: 10.1037/t58979-000

Kavussanu, M., Yukhymenko, M., Elbe, A.M., & Hatzigeorgiadis, A. (2019). Integrating moral and achievement variables to predict doping likelihood in football: A cross cultural investigation. Psychology of Sport & Exercise. https://doi.org/10.1016/j.psychsport.2019.04.008

Kirby, K., Guerin, S., Moran, A., and Matthews, J. (2016). "Doping in elite sport. Linking behavior, attitudes, and psychological theory," in Psychology of Doping in Sport, eds V. Barkoukis, L. Lazuras, and V. Tsorbatzoudis (Abingdon, OX: Routledge), 3–17.

Lazuras, L., Barkoukis, V., Rodafinos, A., and Tzorbatzoudis, H. (2010). Predictors of doping intentions in elite-level athletes: a social cognition approach. J. Sport Exerc. Psychol. 32, 694–710. doi: 10.1123/jsep.32.5.694

Lucidi, F., Zelli, A., Mallia, L., Grano, C., Russo, P. M., and Violani, C. (2008). The social-cognitive mechanisms regulating adolescents' use of doping substances, J. Sports Sci. 26, 447–456. doi: 10.1080/02640410701579370

Mazanov, J., Backhouse, S., Connor, J., Hemphill, D., and Quirk, F. (2014). Athlete support personnel and anti-doping. Scand. J. Med. Sci. Sports 24, 846–856. doi: 10.1111/sms.12084

Morente-Sánchez, J., Leruite, M., Mateo-March, M., and Zabala, M. (2013a). Attitudes toward doping in Spanish competitive female cyclists vs. triathletes. J. Sci. Cycling 2, 40–48. Available online at: https://jsc-journal.com/index.php/ JSC/article/view/49

Morente-Sánchez, J., Mateo-March, M., and Zabala, M. (2013b). Attitudes toward doping and related experience in Spanish National Cycling Teams according to different Olympic disciplines. PLoS ONE 8:e70999. doi: 10.1371/j.pone.0070999

Morente-S nchez, J., and Zabala, M. (2015). Knowledge, attitudes and beliefs of technical staff toward doping in Spanish football. J. Sports Sci. 33, 1267–1275. doi: 10.1080/02640414.2014.999699

Lazuras, L. (2016). "Social-cognitive predictors of doping use. An integrative approach," in Psychology of Doping in Sport, eds V. Barkoukis, L. Lazuras, and V. Tsorbatzoudis (Abingdon, OX: Routledge), 44-61.

Nicholls, A., Perry, J., Levy, A., Meir, R., Jones, L., Baghurst, T., et al. (2014). Coach perceptions of performance enhancement in adolescence: the sport drug control model for adolescent athletes. Perform. Enhancement Health 3, 93–101. doi: 10.1016/j.peh.2015.07.001

Nicholls, A. R., Levy, A. R., Meir, R., Sanctuary, C., Jones, L., Baghurst, T., et al. (2020). The susceptibles, chancers, pragmatists, and fair players: an examination of the Sport Drug Control Model for adolescent athletes, cluster effects, and norm values among adolescent athletes. Front. Psychol. 11:1564. doi: 10.3389/fpsyg.2020.01564

Ntoumanis, N., Ng, J. Y. Y, Barkoukis, V., and Backhouse, S. (2014). Personal and psychosocial predictors of doping use in physical activity settings: a meta-analysis. Sports Med. 44, 1603-1624. doi: 10.1007/s40279-014-0 240-4

Patterson, L. B., and Backhouse, S. (2018). "An important cog in the wheel", but not the driver: coaches' perceptions of their role in doping prevention. Psychol. Sport Exerc. 37, 117–127. doi: 10.1016/j.psychsport.2018.05.004

Patterson, L. B., Backhouse, S. H., and Lara-Bercial, S. (2019). Examining coaches' experiences and opinions of anti-doping education. Int. Sport Coach. J. 6, Q11 145–159. doi: 10.1123/iscj.2018-0008

Petroczi, A. (2002). Exploring the Doping Dilemma in Elite Sport: Can Athletes' Attitudes Be Responsible for Doping? Published Doctor of Philosophy Dissertation, University of Northern Colorado, USA.

Petroczi, A., and Aidman, E. (2008). Psychological drivers in doping: the life-cycle model of performance enhancement. Substance Abuse Treat. Preven. Policy 3:7. doi: 10.1186/1747-597X-3-7

Ring, C., and Hurst, P. (2019). The effects of moral disengagement mechanisms on doping likelihood are mediated by guilt and moderated by moral traits. Psychol. Sport Exerc. 40, 33–41. doi: 10.1016/j.psychsport.2018.09.001

Ring, C., and Kavussanu, M. (2018b). The role of self-regulatory efficacy, moral disengagement and guilt on doping likelihood: a social cognitive theory perspective. J Sports Sci. (2018) 36, 578–584. doi: 10.1080/02640414.2017.1324206

Strelan, P., and Boeckmann, R. (2003). A new model for understanding performance-enhancing drug use by Elite Athletes. J. Appl. Sport Psychol. 15, 176–183. doi: 10.1080/10413200390213795

Vakhitova, Z. I., and Bell, P. J. (2018). A script analysis of the role of athletes' support networks as social facilitators in doping in sport. Crime Prev. Community Saf. 20, 168–188. doi: 10.1057/s41300-018-0045-8

World Anti-Doping Agency (2015). Social Science Research Package for Antidoping Organizations. Available online at: https://www.wada-ama.org/en/ resources/education-andprevention/research-package-for-anti dopingorganizationsados (accessed January 15, 2019).

World Anti-Doping Agency. (2020). 2018 Anti-doping Rule Violations (ADRVs) Report. Available online at: https://www.wada-ama.org/en/resources/generalanti- doping-information/anti-doping-rule-violations-adrvs-report (accessed August 10, 2021).

Appendix

Appendix A. Sport Drug Control Model 44-items Questionnaire.

Questions	Scale
Q1. In the list below there are some things that people have said about cheating and fair play in sport. Please read each one and circle one of the numbers beside it to show how much you agree or disagree with it. Some of these are not very different so you will have to carefully examine each statement. 1. It is ok to cheat if nobody knows. 2. Winning and losing are a part of life 3. I sometimes try to wind up the opposition 4. I would cheat if I thought it would help me win. 5. It is ok to lose sometimes because in life you don't win everything. 6. It is not against the rules to psych people out so it's ok to do so. 7. If other people are cheating, I think I can too. 8. If you win properly, it feels better than if you did it dishonestly. 9. Sometimes I waste time to unsettle the opposition. 10. I cheat if I can get away with it. 11. You have to think about the other people and not just winning. 12. If I don't want another person to do well then I put them off a bit. 13. When I get the chance, I fool the official. 14. I get annoyed by people trying to "win at all Costs". 15. It is a good idea to upset your opponent. 16. I always play by the rules. 17. Winning is all that matters. 18. I would never psych anybody out. 19. I would cheat if I thought it would help me or my team win. 20. It is understandable that players swear in the heat of the moment.	(1) Strongly disagree to (5) Strongly agree
Q2. Regardless of whether you believe performance enhancing substances or methods (PESM) should be banned or allowed, which of the following statements best describes your own personal feelings about deliberately using banned PESM? 1. I believe deliberately using banned PESM to improve performance is morally wrong under any circumstances. 2. I believe deliberately using banned PESM to improve performance is morally OKunder some circumstances, but wrong under others.	(1) to (3)

3. I believe deliberately using banned PESM to improve performance is morally OK under any circumstances.	
Q3 If you were caught using banned performance enhancing substances or methods, to what extent would you experience the following feelings. 1. Ashamed 2. Embarrassed 3. Guilty	(1) Not at all to (5) a great extent
Q4. A number of statements describing thoughts that athletes might have about competitive sport are listed below. Please read these statements carefully and indicate your level of agreement. 1. Doping is alright because it helps your team. 2. Doping is just a way to "maximize your potential". 3. Compared to the illegal things people do in everyday life, doping in sport is not very serious. 4. Players cannot be blamed for doping if their teammates pressure them to do it. 5. A player should not be blamed for doping if everyone on the team is doing it. 6. Doping does not really hurt anyone.	(1) Strongly disagree to (7) strongly agree
Q5. How fair is AEPSAD in terms of treating all athletes equally?	(1) Very fair to (4) very unfair + I do not know
Q6. How secure is the AEPSAD'S drug testing procedures in Spain? That is, in the taking of samples and the care of samples?	(1) Very secure to (4) not at all secure + I do not know
Q7. How accurate do you feel the current drug tests are in terms of being able to correctly identify the following substances? 1. Anabolic steroids 2. Beta-blockers 3. Designer steroids like tetrahydrogestrinone (THG) 4. Erythropoietin (EPO) and other similar substances 5. Human growth hormones (hGH) 6. Diuretics	(1) Very accurate to (4) not at all accurate + I do not know
Q8. If you were to use the following substances, how likely is it that these substances would improve your performance in your sport? 1. Anabolic steroids. 2. Beta-blockers. 3. Designer steroids like tetrahydrogestrinone. 4. Erythropoietin (EPO) and other similar substances. 5. Human growth hormones (hGH).	(1) Definitely would not to (5) Definitely would + I do not know
Q9. If you were to use a banned performance enhancing substance of your choice, how likely is it that you would improve your performance in your sport?	(1) Definitely would not to (5)

	Definitely would + I do not know
Q10. How much would you personally like these outcomes for performing well in your sport? 1. National celebrity status 2. Lucrative financial sponsorship deals 3. Personal best achievements 4. Opportunities for remaining in the sport as coach, trainer or administrator 5. Future financial security 6. International celebrity status	(1) A lot to (3) not at all
Q11. To what extent does your sport offer athletes these outcomes if they perform well? 1. National celebrity status 2. Lucrative financial sponsorship deals 3. Personal best achievements 4. Opportunities for remaining in the sport as coach, trainer or administrator 5. Future financial security 6. International celebrity status	(1) A lot to (3) not at all
Q12. How likely is it that athletes at your level would be drug tested at least once a year? 1. In competition at least once a year. 2. Out of competition at least once a year.	(1) Very likely to (5) not at all likely + I do not know
Q13. It has been said that athletes who take banned substances can use various methods to avoid testing positive. 1. From what you know or have heard, if you were to take banned performance-enhancing substances while competing, how likely do you think that you could get away with it if you really tried to? 2. From what you know or have heard, if you were to take banned performance-enhancing substances out of competition, how likely do you think that you could get away with it if you really tried to?	(1) Very likely to (5) not at all likely + I do not know
Q14. From what you know or have heard, are the penalties for a positive drug test in your sport severe or lenient?	(1) Very severe to (4) very lenient + I do not know
Q15. How much harm to your health do you think would be caused by using each of the following substances for a short time say up to two months? 1. Anabolic steroids. 2. Beta-blockers. 3. Designer steroids like tetrahydrogestrinone. 4. Erythropoietin (EPO) and other similar substances. 5. Human growth hormones (hGH). 6. Diuretics	(1) No harm to (4) a lot of harm + I do not know

Q16. Here are several scenarios that you may have encountered or may come across during your career in sport. Please rate the extent to which you currently feel capable in being able to avoid or overcome these situations using the scale below. 1. To avoid using banned PEDMs before a competition even when you know you can get away with it. 2. To avoid using banned PEDMs in sport even when you feel down physically. 3. To resist the temptation to use banned PEDMs to improve your performance. 4. To resist the temptation to use banned PEDMs to have a body that others would admire, even when no-one would ever know. 5. To resist the temptation to use banned PEDMs to have a great appearance. 6. To avoid using banned PEDMs to have your body look as you would like. 7. To avoid using banned PEDMs to get results more quickly, even when no one would ever know. 8. To not use banned PEDMs, despite the pressure to do so from others. 9. To avoid using banned PEDMs to improve your performance in the sport you practice, even when you know that it will not have side-effects. 10. To avoid using banned PEDMs, even when most of those who practice your sport use them	(1) Not at all capable to (7) completely capable
Q17. Success in sport can mean different things to different people. The statements in this section of the survey capture a variety of ways in which athletes define their sporting success. Please read these statements carefully and indicate your level of agreement with each one. In sport, I feel most successful when I …. 1. I reach personal goals. 2. I show clear personal improvement. 3. I perform to the best of my ability. 4. I overcome difficulties. 5. I reach a goal. 6. I work hard. 7. I show other people I am the best. 8. I am the best. 9. I am clearly superior. 10. I outperform my opponents. 11. I beat other people. 12. I win.	(1) Strongly disagree to (5) Strongly agree
Q18. If you decided to use a banned performance enhancing substance, to what extent do you think each of the following	(1) Would definitely approve

people would approve or disapprove, or would not care either way if you did that? 1. Your coach. 2. Parents. 3. Team mates/training partners. 4. Team doctor. 5. Close friends. 6. Manager.	to (5) Definitely disapprove
Q19. If you were considering using a banned performance enhancing substance, how much would you take into account these people's opinions on whether you should or should not do so? 1. Your coach. 2. Parents. 3. Team mates/training partners. 4. Team doctor. 5. Close friends. 6. Manager.	(1) Would definitely take into account to (5) Definitely not take into account
Q20. The following statements are intended to provide an insight into your beliefs about other people's opinions towards the athlete using doping. 1.Most people I know would approve of me using prohibited substances to enhance my performance during his season. 2.People who are important to me would approve of me using prohibited substances to enhance my performance during this season. 3.Most people close to me expect me to use prohibited substances to enhance my performance during this season.	(1) Strongly disagree to (7) strongly agree
Q21. How easy or difficult would it be for you to get each of the following types of substances if you wanted to? 1. Anabolic steroids. 2. Beta-blockers. 3. Designer steroids like tetrahydrogestrinone. 4. Erythropoietin (EPO) and other similar substances. 5. Human growth hormones (hGH). 6. Diuretics	(1) Probably impossible to (5) very easy + I do not know
Q.22 If you wanted to get and use a banned PES, which of the following people, if any, do you think would help you if you asked them to do so? 1. Your coach. 2. Parents. 3. Team mates/training partners. 4. Team doctor. 5. Close friends. 6. Manager.	(1) Would definitely help me to (5) definitely would not help me + I do not know

Q23. If you wanted to use a banned PES, how easy would it be to get good medical advice on how to use the substance?	(1) Probably impossible to (5) very easy + I do not know
Q24. How serious do you feel the following authorities are in preventing trafficking of banned performance enhancing substances in Spain? 1. Police/Guardia Civil 2. AEPSAD	(1) Not at all serious to (5) very serious
Q25. Overall, how effective do you feel the following authorities are in preventing trafficking of banned performance enhancing substances in Spain? 1. Police/Guardia Civil 2. AEPSAD	(1) Not at all effective to (5) very effective
Q26. How expensive would it be for you personally to buy each of the following types of substances? 1. Anabolic steroids. 2. Beta-blockers. 3. Designer steroids like tetrahydrogestrinone. 4. Erythropoietin (EPO) and other similar substances. 5. Human growth hormones (hGH). 6. Diuretics	(1) Very cheap to (5) very expensive + I do not know
Q27. The following statements are intended to provide an insight into your beliefs regarding other athletes' use of doping. 1. Out of 100%, how many athletes in your sport do you believe engage in doping to enhance their performance? 2. Out of 100%, how many elite athletes in your country do you believe engage in doping to enhance their performance? 3. Out of 100%, how many elite athletes do you believe will be engaged in doping during the next 2 years to enhance their performance? 4. Out of 100%, how many coaches in your sport do you believe would encourage their athletes to use doping to enhance their performance? 5. Out of 100%, how many coaches in elite sports in your country do you believe would encourage their athletes to use doping to enhance their performance?	Indicate percentage:
Q28. How much pressure, directly or indirectly, do you think the Spanish government or the Spanish Olympic Committee puts on elite athletes to win Olympic gold medals?	(1) No pressure at all to (4) a lot of pressure
Q29. To what extent, if at all, do you think commercial influences on the Olympics and sport in general have increased a 'win at all costs' attitude amongst elite athletes?	(1) Had no effect to (4) increase a lot
Q30. To what extent, if at all, do you think commercial influences on the Olympics and sport in general have increased	(1) Had no effect to (4) increase a lot

the temptation amongst elite athletes to use banned performance enhancing substances?	
Q31. How often have you used any of these nutritional supplements in the past 12 months? 1. Vitamin or mineral supplements. 2. Herbal products. 3. Creatine. 4. Sports drinks. 5. Energy bars. 6. Caffeine. 7. Protein-carbohydrate shakes.	(1) Never to (6) Systematically
Q32. How often have you used any of these methods or technologies in the past 12 months? 1. High altitude stages. 2. Hypoxic training. 3. Intravenous therapy with permitted substances. 4. Ozone therapy	(1) Never to (6) Systematically
Q33. Which one of the following most applies to you? 1. I have never considered using a banned performance-enhancing substance. 2. At one stage I thought briefly about using a banned performance-enhancing substance. 3. At one stage I thought quite a bit about using a banned performance-enhancing substance. 4. I still think occasionally about using a banned performance-enhancing substance because other athletes are using them. 5. I briefly used a banned performance-enhancing substance in the past but no longer do so. 6. I occasionally use a banned performance-enhancing substance now for specific purposes. 7. I regularly try or use banned performance-enhancing substances.	(1) to (7)
Q34. In the last 12 months, how often have you used any of the following, for whatever reason? 1. Anabolic steroids. 2. Beta-blockers. 3. Designer steroids like tetrahydrogestrinone. 4. Erythropoietin (EPO) and other similar substances. 5. Human growth hormones (hGH). 6. Diuretics 7. Doping methods	(1) Had never use to (6) more than 10 times
Q35. Indicate the athletic discipline you practice: 1. Sprinting – hurdles 2. Middle distance / long distance (includes race walking on road). 3. Jumps and throws 4. Multi-events	(1) to (4)

Q36. What is the highest level you have competed at? 1. Olympic games 2. World championship 3. European championships 4. Other International competition with the national team 5. National level competition 6. Regional level competition	(1) to (6)
Q37. What is your total annual income from all sport sources? 1. Less than 5,000 euros. 2. 5,000 to 9,999. 3. 10,000 to 19,999. 4. 20,000 to 39,999. 5. 40,000 to 59,999. 6. More than 60,000	(1) to (6)
Q38. What is your age group? 18-20 21-24 25-28 29-32 33-36 More than 37	(1) to (6)
Q39. Are you: Male Female	(1) to (2)
Q40. If you were offered a banned PES under medical supervision at low or no financial cost and the banned performance enhancing substance could make a significant difference to your performance and was currently not detectable, how much consideration do you think you might give to this offer?	(1) None at all to (4) a lot of consideration
Q41. Given the pressures athletes are often under to win, how confident are you that you could refuse this offer?	(1) Very confident could refuse to (5) would not want to refuse
Q42. How confident are you in being able to resist pressure from your team mates to use a banned substance?	(1) Very confident could resist to (5) would not want to resist
Q43. Do you intend to use prohibited substances or methods to enhance your performance or gain a competitive edge against your opponents during this season?	(1) Definitely not to (5) definitely will
Q44. In your sport, how necessary do you believe it is for athletes to use banned PES at least at some time, to perform at the very highest levels?	(1) Definitely have to use to (5) definitely do not have to use

AEPSAD: Agencia Española de Protección de la Salud en el Deporte (Spanish National Anti-doping Organization); PES: performance-enhancing substances; PESM: performance-enhancing substances and methods.

Appendix B. Adaptation of the Sport Drug Control Model for coaches

Constructs	Instrument adaptation
Moral disengagement	Coaches were asked to indicate their level of agreement with six statements measured on a Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). Example items are: "Athletes cannot be blamed for doping use if their teammates pressure them to do it" and "Athletes should not be blamed for doping use if everyone is doing it."
Benefits Appraisal	Benefit appraisal is measured in terms of (1) perceived performance-enhancing effects of banned substances and methods use and (2) likelihood of potential positive outcomes for performing well in sport. Questions were reformulated to adapt them to coaches. For example, to assess (1), participants were asked to rate from definitely would not (1) to definitely would (5) "If any of your athletes were to use a banned PESM of his/her choice, how likely is it that he/she would improve his/her performance?" To assess (2) participants were asked "To what extent does your sport offer you these outcomes if your athletes perform well?" and rate from a lot (1) to not at all (3) six answer-items (i.e., national celebrity status, future financial security).
Threat Appraisal	Threats relating to (1) deterrence and (2) ill-health effects were measured. To assess (1) coaches were asked two questions to measure their perceived likelihood of an athlete being tested in and out of competition, and of evading detection if using doping in and out of competition, using a 5-point scale ranging from (1) very likely to (5) not at all likely. To assess (2) participants were asked to score the harm level of six different PESMs using a 5-point scale from 1 (a lot of harm) to 5 (no harm).
Self-Efficacy to Refrain From Doping	To assess coaches' ability to avoid the use of PESMs within their athletes or resist doping temptation, the ten-item Doping Self-efficacy scale (Lucidi et al., 2008) was used and adapted to coaches (i.e., "to avoid using PESMs with my athletes before a competition even when I know I can get away with it," "to resist the temptation to use PESMs with my athletes to improve their performance"). Participants were asked to rate from completely capable (1) to not at all capable (7).
Goal Orientation	Coaches were asked to indicate their level of agreement with six statements from the ego-oriented subscale (i.e., "I am the best," "I show other people I am the best") using a five point Likert scale from strongly disagree (1) to strongly agree (5).
Subjective Norms	Coaches' perceptions of others' attitudes toward doping were assessed with the following question: "If any of your athletes decided to use a PESM, to what extent do you think each of

	the following people would approve or disapprove or would not care either way if they did that?" Six-response items were presented to participants (i.e., parents, teammates, sport doctors, and manager) and asked them to rate from would definitely approve it (1) to would definitely disapprove it (5).
Descriptive Norms	To assess coaches' beliefs regarding others' use of doping, they were asked to indicate the percentage of perceived doping prevalence in five statements (i.e., "Out of 100%, how many athletes in your sport do you believe engage doping to enhance their performance," "Out of 100%, how many coaches in your sport do you believe would encourage their athletes to use doping to enhance their performance?").
Attitudes Toward Doping	Following the work of Petroczi (2002) a single-item was used to measured coaches' attitudes toward the use of PESM: "In your sport, how necessary do you believe it is for athletes to use banned performance-enhancing substances at least at some time, to perform at the very highest levels?" Responses were rated on a Likert scale ranged from 1 (definitely have to use) to 5 (definitely don't have to use).
Susceptibility to Doping	Susceptibility to doping is measured using a hypothetical scenario adapted from previous research (Bamberger and Yaeger, 1997; García-Grimau et al., 2021). Coaches were asked to imagine a situation to use a PESM with their athletes to enhance their performance. The scenario is described below: "If you were offered a banned PES under medical supervision at low or no financial cost and the banned PES could make a significant difference to your athletes' performance and was currently not detectable, how much consideration do you think you might give to this offer?" Responses were rated from not at all consideration (1) to a lot of consideration (4).
Doping Prevalence	Doping prevalence among coaches is measured in terms of self-reported administration or attempted administration to athletes of a PESM (lifetime or in the last 12 months). For the lifetime doping prevalence, participants were presented with seven items/statements and told to indicate which one of the statements most applies to them. Each item was scored from 1 (I have never considered using a banned PESM with my athletes) to 7 (I regularly try or use banned PESM with my athletes). This variable was transformed in a dichotomous variable range from 0 (never use PESM) to 1 (ever use). For the prevalence of doping in the last 12 months, coaches were presented with six different PESM and asked: "In the last 12 months, how often have you used any of the following PESM with your athletes, for whatever reason?" Responses were rated from 1 (have never used) to 6 (more than 10 times). This

	variable was transformed in a dichotomous variable range from 0 (never use PESM) to 1 (use 12months). These two variables were combined and recoded into a single variable measuring total doping prevalence among coaches. This variable only measures one of the seven possible ADRV that ASP can commit
Indirect Doping Prevalence Among Athletes	Indirect doping prevalence among athletes were measured by asking coaches the following dichotomous question: "Have any of your athletes ever tested positive for a banned PES?"

ADRV: anti-doping rule violation. ASP: athlete support personnel. PES: performance-enhancing substances; PESM: performance-enhancing substances and methods.