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An examination of the Sport Drug Control Model with elite Australian athletes

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1   **Abstract**

2   **Objective**: This study presents an opportunistic examination of the theoretical tenets outlined in the

3   Sport Drug Control Model[1] using questionnaire items from a survey of 643 elite Australian athletes.

4   **Design and Method**: Items in the questionnaire that related to the concepts in the model were

5   identified and structural equation modelling was employed to test the hypothesised model.

6   **Results**: Morality (cheating), benefit appraisal (performance), and threat appraisal (enforcement)

7   evidenced the strongest relationships with attitude to doping, which in turn was positively

8   associated with doping susceptibility. Self-esteem, perceptions of legitimacy and reference group

9   opinions showed small non-significant associations with attitude to doping. The hypothesised

10   model accounted for 30% and 11% of the variance in attitudes to doping and doping susceptibility,

11   respectively.

12   **Conclusion**: These present findings provide support for the model even though the questionnaire

13   items were not constructed to specifically measure concepts contained in it. Thus, the model

14   appears useful for understanding influences on doping. Nevertheless, there is a need to further

15   explore individual and social factors that may influence athletes' use of performance enhancing

16   drugs.

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1 **Introduction**

2   The use of performance-enhancing drugs (PEDs) in sport, otherwise referred to as 'doping',

3 has received considerable attention by medical, physiology and social science researchers in recent

4 years. Whereas medical and physiology researchers focus on improving methods (e.g. blood, urine,

5 gene) for detecting and deterring athletes from engaging in doping activities[2], social science

6 researchers strive to better understand psycho-social variables (e.g. attitudes, environment, beliefs)

7 that may be salient in educational programs directed towards the prevention of such behaviour[3].

8 With a recognition that the majority of social science research on doping in sport has been largely

9 descriptive and atheoretical[3], the general purpose of the current study was to empirically examine

10 the utility of (untested) theory in furthering understanding of key psycho-social factors associated

11 with using PEDs in sport.

12   While there have been a number of applications of various cognitive decision or other

13 behavioural science models to doping studies, these have tended to have a limited focus[4-6]. For

14 example, some researchers have drawn upon criminal decision-making theory to elucidate the costs,

15 benefits and situational factors that might influence an athlete's decision to use PEDs[4]. Empirical

16 examinations of models grounded in criminal decision-making theory identify personal moral

17 beliefs and health 'costs' as important influences on athletes' hypothetical decisions to use PEDs[4].

18 Others have applied and tested tenets of the theory of planned behaviour[5] to explore the social-

19 cognitive mechanisms regulating adolescents' use of doping substances[6]. Researchers have also

20 proposed non-social cognitive explanations of doping behaviour that encompass both micro (e.g.

21 morality, threat appraisals, social sanctions, 'win at all costs' culture of sport) and macro issues (e.g.

22 government funding, technological advances in detecting PED, nationalism)[7]. Other non-social

23 cognitive explanations have focused specifically on the goal-directed nature of sport contexts[8].

24 Recently, researchers[9] have sought the views and experiences of key stakeholders (e.g. athletes,

25 coaches, physiotherapists, sport scientists) to develop an empirical model of athlete decisions to use

26 PEDs that includes four key components: objective of PED use, about the PED, deterrence system

1   and consequences of being detected. Collectively, the aforementioned research and theory

2   underscore the multifaceted and complex nature of social science approaches to understanding PED

3   use in sport.

4   One of the earliest attempts to provide a comprehensive understanding of PED use was the

5   Donovan et al.[1] Sport Drug Control Model (SDCM) (see Figure 1). This model was derived from

6   three prominent behavioural science frameworks (social cognition models, threat/fear appeals, and

7   instrumental and normative approaches) that have been widely used and empirically supported for

8   informing effective health promotion and injury prevention campaigns, including for related issues

9   such as alcohol and illicit drug use[10 - 14]. Central to this model of PED use is an athlete's attitude

10   towards engaging in doping, which is said to be influenced by six major inputs: threat appraisal

11   (deterrence factor based on perceived likelihood of being caught, perceived 'costs' of being caught

12   and potential negative health effects); incentive appraisal (perceived benefits of PED use); reference

13   group opinions (importance of peer and relevant others' approval or disapproval of doping);

14   personal morality (perceptions of right and wrong of PED use); perceived legitimacy of doping laws

15   and anti-doping agencies' implementation of these laws; and personality factors such as self-esteem

16   and optimism. In turn, attitude to doping is said to influence intention to engage in PED use, which

17   is subject to the affordability and availability of the banned substances. Donovan[16] later placed the

18   individual decision-making model in two broader contexts of influence: the sporting environment

19   per se (e.g. intensification of training schedules; medicalisation of sport) and the wider societal

20   environment (e.g. elite sport as entertainment; medicalisation of society in general) (see Figure 2).

21   Donovan et al.[1] drew from the then fairly limited literature on factors influencing athletes'

22   use of PEDs to support their model. Hence, despite providing a sound foundation with which to

23   better understand the use of PEDs in sport, the tenets outlined in the SDCM[1] are based on

24   theoretical frameworks of related phenomena and research in non-sporting populations that remain

25   untested. Accordingly, there is an inherent presumption that prevention methods in sporting

26   contexts link with other health and injury prevention behaviours (e.g. road safety; underage alcohol

1   and tobacco use; illicit recreational drugs). The purpose of the current study is to address this gap in

2   the literature by empirically examining the utility of the SDCM with an elite sample of Australian

3   athletes. The analysis reported herein was an opportunistic examination of concepts in the SDCM

4   that were included in a larger questionnaire that was concerned with personality profiling of elite

5   athletes and their susceptibility to doping.

6   **Methods**

7   A total of 670 athletes returned a completed survey (response rate = 33%). The sample

8   included both male ($n = 285$) and female athletes ($n = 383$) aged between 14 and 66 years ($M =$

9   23.75; $SD = 8.49$). Despite the large age range, only 49 participants were aged 36 and above. These

10   49 athletes were from equestrian sports (n = 6), shooting (n = 6), hockey (n = 5), weightlifting (n =

11   5), and basketball, archery, curling, table tennis, and lawn balls (n = 3 from each sport). In terms of

12   the total sample, the sports represented included a variety of team (e.g. rowing, hockey, baseball,

13   rugby) and individual sports (e.g. cycling, athletics, triathlon, judo). Athletes' highest level of

14   competition included the Olympic Games (20%), world (49%), national (24.5%), and state

15   championships (4.5%) with a large portion having attained an international (10%) or national title

16   (60%) as their highest achievement. Participants were also highly experienced with 86% having

17   competed in their sport for five or more years. The questionnaire contained items that represented

18   the following concepts (see Table 1): doping susceptibility; attitude to doping; threat appraisal; self-

19   esteem; legitimacy; morality; benefit appraisal; and reference group opinion. Although some scales

20   were drawn from established questionnaires, it is important to note that others items were not

21   developed specifically to assess constructs of interest (i.e. threat appraisal, legitimacy, benefit

22   appraisal, reference group opinion); rather, they were developed as part of ongoing assessments of

23   elite athletes' opinions of sport issues of which PED use is a central focus.

24   Curtin University's human ethics committee granted approval for this project prior to

25   commencing the study. Five Sport Institutes/Sport Academies and 13 National Sporting

26   Organisations (NSO) such as the Australian Rugby League, Hockey Australia, and Australian

1 Water Polo were approached. Only one Institute of Sport and four NSOs declined the invitation to

2 take part in the study. An information sheet describing the aims and procedures of the study as well

3 as the research grant proposal were sent to relevant personnel (e.g. Director, Sport Science

4 Manager) at each Australian Institute of Sport/Sport Academy and other NSO. If an organisation

5 agreed to participate, both the research team and industry partner signed a confidentiality agreement

6 ensuring that any confidential information provided to the other party would be used for the

7 purposes of this study only. Questionnaire packages (including a reply-paid envelope) were then

8 couriered directly to athletes who were asked to complete the surveys at a time and place

9 convenient to them. Instructions were provided within the questionnaire package. A covering letter

10 highlighted that athletes were free to participate or not.

11   The data were screened for missing values and outliers[19]. Twenty-seven participants were

12 excluded because more than 5% of their data was missing, they did not respond to the doping use

13 variable, and/or were considered an outlier leaving 643 participants for the main analyses. Of the

14 remaining 643 participants, only 1.3% of the data was missing and these data were unrelated to any

15 variable, thus they were assumed to be missing at random; missing values were replaced using the

16 expectation maximisation method[20].

17   Following a basic descriptive and internal reliability analysis of the study variables using

18 SPSS, AMOS was employed to assess the measurement models of the five latent variables

19 (attitudes to doping, threat appraisal, self-esteem, legitimacy, morality) using confirmatory factor

20 analysis (CFA) and the hypothesised model using structural equation modelling (SEM). To assess

21 model fit for CFA and SEM analyses, we employed well-established indices such as comparative fit

22 index (CFI), incremental fit index (IFI), Tucker-Lewis index (TLI), and the root-mean-square error

23 of approximation (RMSEA) in addition to the Bollen-Stine χ^2 test. The RMSEA 90% confidence

24 intervals are also provided to assist in interpreting these point estimates. For the CFI, IFI, and TLI

25 indices, values ≥ 0.90 and ≥ 0.95 are typically considered an acceptable and excellent fit to the data,

1 respectively. For well specified models, a RMSEA of $\leq$ 0.06 reflects an excellent fit and a value $\leq$

2 0.08 indicates an acceptable fit[21].

Results

4   Descriptive statistics and reliability estimates for all study variables are presented in Table 2.

5 With regards to doping use, no athlete reported regularly trying or using banned a PED, four

6 reported occasionally using a banned PED for specific purposes, and one athlete reported briefly

7 using a banned PED in the past. Thus, as only five of the 643 athletes reported a non-abstinence

8 state, we refer to this outcome variable as 'doping susceptibility' hereafter. Gucciardi and

9 colleagues[22] have previously defined doping susceptibility as "the absence of a firm resolve not to

10 engage in doping activities or to give any consideration at all to an offer to do so" (p. 481). All

11 measures showed adequate reliability (Cronbach's α = .70) except for attitudes to doping (α = .67)

12 and threat appraisal (α = .68). These subscales were retained in subsequent analyses, as alpha

13 coefficient values were just below the recommended minimum level of .70 for exploratory

14 research[23].

15   Evaluation of normality indicated the presence of multivariate non-normality (Mardia's

16 index = 94.45). Thus, measurement and structural models were evaluated using bootstrapping (2000

17 bootstrap samples) to address this[24]. Independent CFAs of the five latent variables indicated an

18 acceptable fitting measurement model of each construct thereby supporting their inclusion in

19 subsequent SEM analysis. The results of the SEM analysis are summarised in Figure 3.With the

20 exception of a significant Bollen-Stine χ^2, which tends to become inflated with a large sample

21 size[14], fit indices supported an acceptable fitting model [$\chi^2(170) = 347.32$, $p < .001$, Bollen-Stine p

22 = .004, CFI = .94, IFI = .94, TLI = .93, RMSEA = .040 (90% CI = .034 to .046)] that accounted for

23 30% and 11% of the variance in attitudes to doping and doping susceptibility, respectively. The

24 standardised parameter estimates indicate a moderate relationship between attitudes to doping and

25 both morality and benefit appraisals, and a lesser relationship with threat appraisals. In turn, doping

1 susceptibility was moderately associated with attitudes to doping. All other relationships were non-

2 significant ($p > .05$).

3 **Discussion**

4   To the best of our knowledge, this study is the first to examine the theoretical tenets outlined

5 in the SDCM[1]. We tested a structural model in which attitudes to doping as a single predictor of

6 doping susceptibility was preceded by six psycho-social variables (threat appraisal, benefit

7 appraisal, reference group opinion, morality, legitimacy of doping law and agencies, self-esteem).

8 Support for the hypothesised model was found with some, but not all of the relationships reaching

9 statistical significance.

10   Aligned with the hypothesised relations, attitudes to doping evidenced a moderate

11 relationship with doping susceptibility. This finding is consistent with a body of research that

12 highlights doping attitudes as a central component for understanding PED use in sport[6, 8]. When

13 considering the six hypothesised attitudinal antecedents together, appraisals of threat and benefit as

14 well as morality (inclination to cheat) revealed the strongest associations with doping attitudes. That

15 is, athletes who believe they can get away with doping if tested during or out of competition and

16 that PEDs are beneficial for performance, and are willing to cheat to perform have more favourable

17 attitudes to doping. Morality evidenced the strongest relationship with attitudes to doping. Until

18 recently[4, 6], the concept of personal morality for doping behaviour has received little attention by

19 social science researchers. The neglect of morality in the doping arena is surprising given the wealth

20 of research on this construct in sport contexts[25] and personal perspectives of athletes. Bodybuilders,

21 for example, have reported that their decision to take steroids was characterised by feelings of guilt

22 and/or compromised morals[26]. Similarly, athletes tend to view the use of PEDs as the most serious

23 form of cheating across sports when compared with other questionable sporting actions (e.g.

24 intending to injure an opponent, disguising a foul)[27]. Education programs that deal with morality

25 issues of PED use should be developed and evaluated for incorporation in preventative efforts. Such

26 programs may target stakeholders such as coaches and parents (e.g. educating them about the

1   importance of promoting prosocial behaviours, such as congratulating an opponent) and athletes

2   (e.g. using moral dilemmas or scenarios to encourage discussion and reflection). It is also likely that

3   morality-based interventions may be more beneficial for younger athletes in their formative years

4   when compared with adult participants whose morals are largely established and thus more stable[28].

5   The emergence of appraisals of threat relating to enforcement and benefit to performance as

6   important variables for doping susceptibility are key extensions of previous research. Campaigns

7   that focus on deterring athletes via threat appeals are common practice in the sport context but are

8   virtually impossible to implement 100% of the time[1]. Some commentators[29] question the long-term

9   effectiveness of such campaigns as some athletes "perceive" considerable benefits to enhanced

10   performance via PED use. Although changes in attitudes and morality may be more effective in the

11   long term, short-term strategies involving deterrence methods are often required for those

12   individuals in most need of attitudinal and moral changes[30]. The current findings support the need to

13   both enforce deterrence methods and challenge athletes' appraisals of the benefits of PED use for

14   performance.

15   The non-emergence of the hypothesised relationships between doping attitudes and

16   reference group opinions, legitimacy of doping law and agencies, and personality are at odds with

17   previous research[6, 31]. Such inconsistencies across studies may be related to the different methods of

18   measurement and sample characteristics. For example, previous research has focused on high

19   school adolescent athletes aged 10 to 18 years[6, 31] whereas our focus was on a broader age range of

20   elite athletes. Alternatively, whereas our focus was on a broader assessment of self-esteem others[6]

21   have provided evidence for the usefulness of behaviour-specific forms of personality constructs

22   such as doping-specific self-regulatory efficacy. Conceptually, it may be that reference group

23   opinions, legitimacy of doping law and agencies, and personality are less influential in the context

24   of appraisals of threat and benefit as well as morality. An alternative explanation, particularly with

25   regard to reference group opinions, relates to the complex network of relationships (e.g. coaches,

26   trainers, peers) that underpin the supply of and demand for PEDs in sport contexts. Attempts to

1   measure and therefore delineate the influence of specific reference groups rather than a general

2   indicator as used in the current study would prove useful. Nonetheless, whether the inconsistency in

3   findings is related to methodological and/or conceptual issues is an important avenue for further

4   investigation.

5   **Limitations and future research**

6   There are certain limitations that should be acknowledged when interpreting the current

7   findings and many of these give rise to avenues for future research. First, the opportunistic nature of

8   the study meant that some of the indicators were not designed to specifically measure the constructs

9   of interest. Therefore, there is a need for future work to replicate and extend the current research

10   using carefully crafted indicators and psychometrically sound measures of target constructs.

11   Second, the cross-sectional nature of the study does not permit inferences about the direction of the

12   hypothesised relationships. Prospective designs (e.g. assessing key constructs over multiple time

13   points) and experimental studies (e.g. manipulating different types and levels of threat appraisals)

14   represent exciting avenues of future research. Third, as self-reports of doping-related constructs can

15   be affected by attempts to respond in a socially desirable manner[22], we should exercise caution

16   when interpreting findings that rely solely on subjective data. Accounting for social desirability is a

17   must for future research involving self-reported data. Fourth, with our focus on elite Australian

18   athletes it is important for future research to examine the extent to which the current findings

19   generalise to athletes at other levels if competition as well as those of different cultural

20   backgrounds. Invariance analyses in which the measurement and structural properties of

21   hypothesised models are examined across groups (e.g. gender, age, sport type) may prove fruitful in

22   ascertaining the robustness of theoretical explanations of doping in sport. Fifth, it may have been

23   that those athletes who did not return a completed survey may have been more likely to take PED

24   than those individuals who participated in this study. Indeed, there is evidence to support the notion

25   that athletes in different sports have a different approach to doping[9, 32].

26

Conclusion

Despite the aforementioned limitations, the current study makes an important contribution to the social science doping literature by providing the first empirical examination of the SDCM[1]. Findings lend support for the robustness of previous research but also highlight points of difference that indicate the need for further research to explore how well the current findings generalise to other athlete populations. Qualitative research that generates key stakeholders' perspectives on the doping phenomenon appears to be a useful approach for integrating important features of social science research on PED use[9]. Collectively, the current findings and those of previous research[4, 6, 9] indicate that attitudes to doping, morality, and appraisals of benefit for performance and threat of enforcement warrant further scrutiny as key features of a comprehensive, formalised theory of the psycho-social aspects of the doping phenomenon. More broadly, it is encouraging to note the emerging consistencies between deductively[1, 7, 8] and inductively[9] derived models of PED use in sport.

Practical implications

• Efforts to deter and reduce doping need to be multifaceted and comprehensive.

• Discussions that challenge and/or improve athletes' beliefs underlying their attitudes to doping, along with increased emphasis on moral aspects may prove effective in reducing susceptibility to PED use, and, for athletes with little moral basis for not doping, frequent out-of-competition random testing is useful as a doping deterrent.

Acknowledgements

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Table 1. *Overview of the study constructs and associated items with response scales/categories included in the questionnaire package.*

Construct	Item(s)	Response Scale/Categories
Doping use	Which of the following most applies to you?	(1) never considered using a banned PED; (2) at one stage thought briefly about using a banned PED; (3) at one stage thought quite a bit about using a banned PED; (4) still think occasionally about using a banned PED because other athletes are using them; (5) briefly used a banned PED in the past but no longer do so; (6) occasionally use a banned PED now for specific purposes; and (7) regularly try or use banned PED
Attitudes to Doping [15]	1. Athletes often lose time due to injuries and drugs can be used to help make up the lost time. 2. Athletes who take recreational drugs use them because they help them in sport situations. 3. The risks related to doping are exaggerated. 4. Doping is an unavoidable part of competitive sport. 5. There is no difference between drugs and the technical equipment that can be used to enhance performance (e.g., hypoxic altitude simulating environments).	(1) Strongly disagree to (7) strongly agree
Threat Appraisal	1. 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? 2. 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? 3. From what you know or have heard, how likely is it for an athlete to successfully appeal a penalty for a positive drug test in your sport?	(1) Not at all likely to (7) very likely
Self-Esteem [17]	1. I feel that I'm a person of worth, at least on an equal basis with others. 2. I am able to do things as well as most people. 3. I take a positive attitude toward myself. 4. On the whole, I am satisfied with myself.	(1) Strongly disagree to (7) strongly agree
Legitimacy	1. How secure are the Australian Sports Anti-Doping Authority's drug testing procedures in Australia? (That is, in taking of samples and care of samples). 2. How serious do you feel the Australian Sports Anti-Doping Authority is in preventing banned performance enhancing substance use in Australia? 3. Overall, how effective do you feel the Australian Sports Anti-Doping Authority is in preventing banned performance enhancing substance use in sport in Australia?	(1) Not at all secure to (7) very secure (1) Not at all serious to (7) very serious (1) Not at all effective to (7) very effective
Morality (cheating) [18]	I would cheat if I thought it would help me win. If other people are cheating, I think I can too. I cheat if I can get away with it.	(1) Strongly disagree to (7) strongly agree
Benefit Appraisal	In your sport, how necessary do you believe it is for athletes to use banned performance enhancing substances at least at some of the time to perform at the very highest levels?	(1) Definitely don't have to use banned performance substances at some time to (7) definitely do have to use banned performance substances at some time
Reference Group Opinion	If you were given the opportunity to use a banned performance enhancing substance, how much would the following stop you from doing it: What people would think of you if you were caught?	(1) Definitely would not stop me to (7) definitely would stop me

Note: Measurement models of established questionnaires were analysed using pilot data ($n = 224$) collected before the administration of the final questionnaire package. As some measurement models did not receive adequate support, modifications were made based on statistical and conceptual grounds. Thus, scales employed to assess attitudes to doping, morality, and self-esteem in the current study are not exact replications of their original models. Interested readers can contact the corresponding author for a full description of these analyses and results.

Table 2. *Descriptive statistics and internal reliability estimates for all study variables (n = 643).*

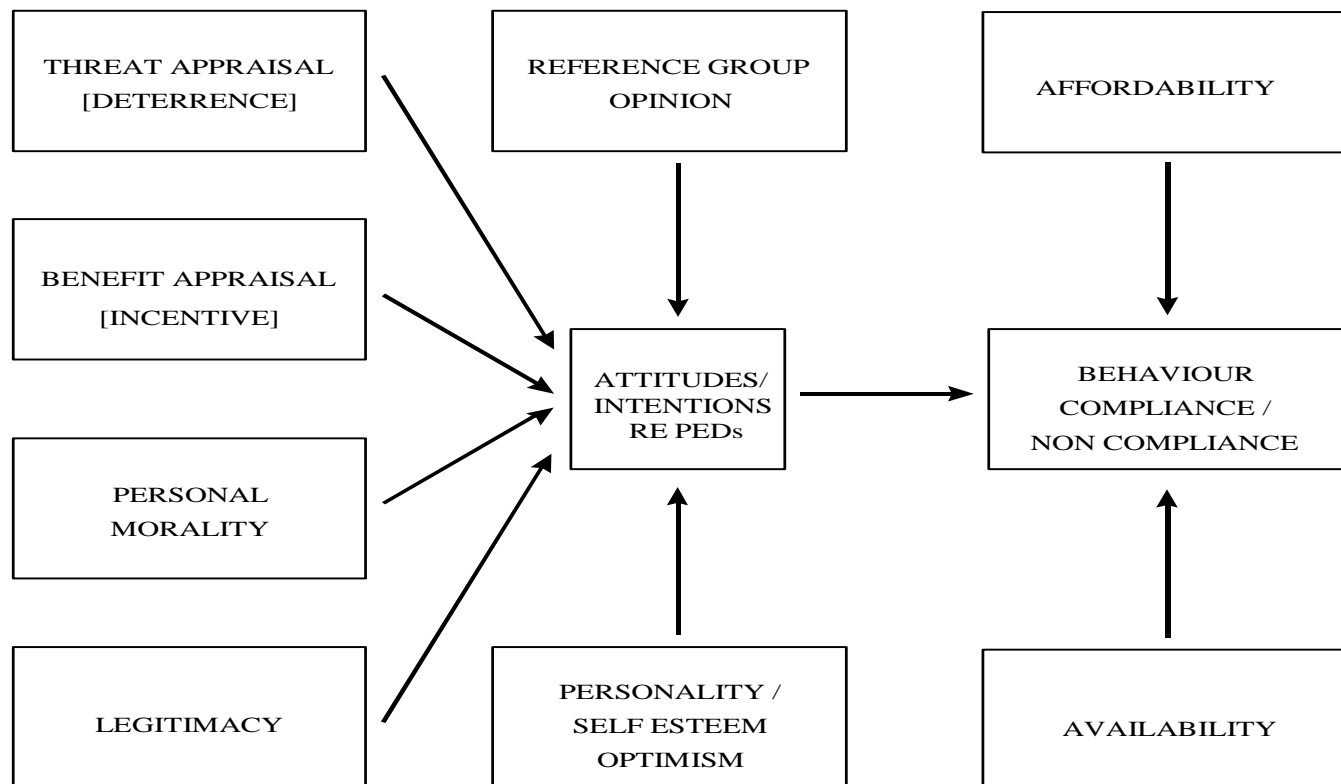| Variable	Range	M	SD	α
Doping susceptibility	1–6	1.10	.51	-
Attitudes to doping	1–7	2.18	.99	.67
Threat appraisal	1–7	2.89	1.33	.68
Self-esteem	2.25–7	5.68	.89	.75
Legitimacy	2.33–7	5.64	1.06	.75
Morality	1–7	1.53	.98	.84
Benefit appraisal	1–7	1.34	.98	-
Reference group opinion	1–7	6.27	1.55	-

Figure 1. The Sport Drug Control Model[1].

Figure 2. Overall framework for predictors of athletes' use of performance-enhancing drugs[7].