

**Predicting attitude towards performance enhancing substance use: A comprehensive test of the Sport Drug Control Model with elite Australian athletes**

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1 **Predicting attitude towards performance enhancing substance use: A comprehensive**  
2 **test of the Sport Drug Control Model with elite Australian athletes**

3  
4 **Abstract**

5 *Objective:* This study presents a comprehensive examination of the Sport Drug Control  
6 Model via survey data of elite Australian athletes.

7 *Design and method:* A cross-sectional nationwide mail survey of 1,237 elite Australian  
8 athletes was conducted. Structural equation modeling was employed to test the model.

9 *Results:* Morality (personal moral stance on performance-enhancing substances use),  
10 reference group opinion (perceived moral stance of reference group on performance-  
11 enhancing substances use) and legitimacy (perceptions of the drug testing and appeals  
12 processes) evidenced significant relationships with attitude towards performance-enhancing  
13 substances use, which in turn was positively associated with doping behaviour. The model  
14 accounted for 81% and 13% of the variance in attitude towards performance-enhancing  
15 substances use and doping behaviour, respectively.

16 *Conclusion:* These findings validate the usefulness of the Sport Drug Control Model for  
17 understanding influences on performance-enhancing substances use. Nevertheless, there is  
18 a need to survey athletes representing a broader range of competition levels and cross-  
19 cultural research to test the model's applicability to other populations of athletes.

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21

22 **Keywords:** doping in sport, performance-enhancing substances

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## 28 INTRODUCTION

29 There is limited application and empirical validation of doping models in sport. The lack of  
30 empirical evidence to support or refute these conceptual models leaves a significant gap in  
31 the literature in understanding influences on performance-enhancing substances (PES) use.

32

33 Donovan et al.'s<sup>1</sup> Sport Drug Control Model (SDCM) was the first comprehensive published  
34 theoretical model of factors influencing PES use. The model consists of six components  
35 believed to predict an athlete's attitudes and intentions towards PES use: (1) threat  
36 appraisal; (2) benefit appraisal; (3) personal morality; (4) reference group opinion; (5)  
37 legitimacy; and (6) personality. In addition, two 'market' factors believed to facilitate or inhibit  
38 the translation of attitudes and intentions into behaviour, the affordability and availability of  
39 PES, were included in the model (see Figure 1). Donovan<sup>2</sup> later placed the model in two  
40 broader contexts: an overall sociocultural context (e.g., a ready acceptance of new  
41 technologies that save time and effort, prolong life, prevent suffering and enhance body  
42 image and cognitive functioning); and a sport culture that has become medicalised and  
43 commercialised. Similar to Donovan's<sup>2</sup> expansion, Stewart and Smith's<sup>3</sup> model of drug use in  
44 sport combines the micro orientation of individual athlete intentions with a macro orientation  
45 on sporting context and culture. The authors argue that decisions made by athletes are not  
46 always rational or bound by clear intentionality. Hence contextual factors may affect athletes'  
47 values, beliefs, and decision making.

48

49 Strelan and Boeckmann's<sup>4</sup> Drugs in Sport Deterrence model postulates that the costs  
50 associated with PES use are weighed up against the benefits of using such substances, and  
51 this cost-benefit analysis is influenced by situational factors. There are no published data  
52 examining the utility of this model. However, Strelan and Boeckmann<sup>5</sup> applied the principles  
53 of deterrence theory to hypothetical decisions to use a PES among a sample of 116  
54 Australian footballers and soccer players.

55  
56 Petróczi and Aidman's<sup>6</sup> life-cycle model of performance enhancement posits that in the  
57 course of their career, athletes constantly set goals and make choices regarding the way  
58 these goals can be achieved. Opportunities for behaviour change, including PES use, are  
59 presented throughout the cycle of choice – goal commitment – execution – feedback on goal  
60 attainment – goal evaluation/adjustment. The model is based on expectancy theory, hence  
61 athletes' motivation to engage in PES use is assumed to be influenced by the desire to attain  
62 expected positive outcomes, and, at the same time, controlled by the expected undesirable  
63 outcomes from use of PES. There is no published empirical testing of this model, the  
64 difficulty of which is recognised by the authors: "Considering the complexity and reiterative  
65 nature of the model, empirical testing of the model as a whole is not feasible" (p. 7).<sup>6</sup>

66  
67 Mazanov and Huybers'<sup>7</sup> qualitative research provided support for the variables in these four  
68 models that are purported to influence PES use. Based on their findings, the authors  
69 presented a model of PES use in which 10 factors ('choice' determinants) thought to  
70 influence an athlete's decision to use or abstain from PES use were grouped into four  
71 themes: (1) objective of PES use (expected performance and financial outcomes); (2) about  
72 the PES (sources of information and influence on decision to use PES; expected effects of  
73 PES use on health; (3) the deterrence system (likelihood of detection of PES use; likelihood  
74 of prosecution if caught using PES); and (4) consequences if prosecuted (expected financial  
75 and non-financial consequences). Further, three individual differences variables (termed  
76 'control' variables) were included in the model: (1) decision-making style; (2) stage of career;  
77 and (3) type of sport.

78  
79 Gucciardi, Jalleh and Donovan<sup>8</sup> presented findings from an opportunistic examination of  
80 some of the constructs in the SDCM. Data were from a survey of 643 elite Australian athletes  
81 conducted for the purpose of personality profiling of elite athletes and their susceptibility to

82 PES use. Items in the questionnaire were identified that related to the following concepts in  
83 the model: threat appraisal (i.e., perceived likelihood of detection out-of-competition and  
84 while competing; successfully appealing a positive drug test); personality (i.e., self-esteem);  
85 legitimacy (i.e., perceived seriousness and effectiveness of the Australian Sports Anti-Doping  
86 Authority in preventing PES use; perceived security of the drug testing procedures in  
87 Australia); morality (i.e., cheating behaviour); benefit appraisal (i.e., perceived necessity for  
88 athletes to use PES to perform at the very highest levels); and reference group opinion (i.e.,  
89 relevant others' perceptions of them if they were caught using PES).

90  
91 Structural equation modeling (SEM) revealed that the model accounted for 30% of the  
92 variance in attitude towards PES use. Morality, benefit appraisal and threat appraisal  
93 evidenced the strongest relationships with attitude towards PES use. Self-esteem,  
94 perceptions of legitimacy and reference group opinion showed small non-significant  
95 associations with attitude towards PES use. Despite the fact that the questionnaire items  
96 were not constructed to specifically measure the constructs, these findings provided  
97 preliminary support for the model and its usefulness in understanding influences on athletes'  
98 attitude towards PES use. This paper presents the findings from a study that purposefully  
99 comprehensively examined the SDCM.

100

## 101 **METHODS**

102 The study design was a cross-sectional nationwide mail survey of elite Australian athletes  
103 conducted in 2004. Curtin University's human ethics committee granted approval for this  
104 project. The five Australian Sport Institutes/Sport Academies, the Australian Sports Drug  
105 Agency (now the Australian Sports Anti-Doping Authority), and four national sporting  
106 organisations (Basketball Australia, Australian Football League, National Rugby League,  
107 Australian Rugby Union) were approached to distribute the survey to athletes on their  
108 databases. Only two Australian Sport Institutes/Academies declined to participate in the

109 study. Athletes were mailed a package containing the questionnaire, a Curtin University  
110 covering letter, a covering letter from their sporting organisation encouraging athletes to  
111 participate, and a Curtin University-addressed reply-paid envelope. Table 1 presents the  
112 questionnaire items that represented all of the constructs of the SDCM shown in Figure 1.  
113 The major dependent variables were doping behaviour (single item) and attitude towards  
114 PES use (two items). These are listed first in Table 1.

115  
116 Of the 1,257 surveys returned (response rate: 26%), 1.6% were excluded due to non-  
117 responses to all of the items measuring the dependent variable (i.e., self-reported use of  
118 banned PES). In total, 1,237 cases were used in the analyses.

119  
120 Following a basic descriptive and internal reliability analysis using SPSS, AMOS was  
121 employed to assess the model using SEM. Model fit was examined using chi-square  
122 statistics and several other indices for goodness-of-fit: root-mean-square residual (RMR);  
123 root-mean-square error of approximation (RMSEA) and 90% confidence intervals; goodness-  
124 of-fit index (GFI); adjusted goodness-of-fit index (AGFI); comparative fit index (CFI); Tucker-  
125 Lewis index (TLI); and incremental fit index (IFI).<sup>9</sup> For CFI, TLI, IFI, GFI and AGFI values of  
126 0.90 and 0.95 reflect acceptable and excellent fit to the data respectively. For the RMSEA  
127 and RMR, values of 0.05 or less indicate a good fit, and between 0.05 and 0.08 a moderate  
128 fit.<sup>9,10</sup>

129  
130 For each of the single indicator constructs in the structural equation model (i.e., personality,  
131 reference group opinion, availability and affordability of PES), Munck's<sup>11</sup> formula was used to  
132 calculate both the regression coefficients and measurement error variances. These values  
133 were used for the single indicator constructs in the structural equation model.

134

135 **RESULTS**

136 The sample included both male ( $n = 603$ ) and female athletes ( $n = 612$ ) (not specified:  $n =$   
137 22), with a mean age of 23 years ( $SD = 7.8$  years). Athletes were represented from a large  
138 number of sports, including athletics (8.4%), swimming (7.8%), hockey (7.0%), rowing  
139 (6.3%), soccer (5.7%), basketball (4.7%), netball (4.1%), cycling (3.5%), softball (3.3%), AFL  
140 (3.3%), and weight lifting/power lifting (3.1%). Of the total sample, 10.8% had participated in  
141 the Olympics/Paralympics, 46.3% at World Championship events, 37.1% at the national level  
142 and 5.0% at the state/regional level. The vast majority had competed in their sport for five or  
143 more years/seasons (84%) and 60% had attained an international (38%) or national title  
144 (22%).

145  
146 Of the total sample, 6.9% reported ever using a banned substance (used in the last 12  
147 months: 3.4%). Among those who had ever been drug tested ( $n = 759$ ), 1.1% reported  
148 testing positive for a banned PES.

149  
150 Descriptive statistics and reliability estimates for the study variables are presented in Table 1.  
151 All of the composite variables (i.e., affordability and availability of PES; benefit appraisal:  
152 improving performance; threat appraisal: threat to health; personal morality: moral emotions;  
153 reference group; personality) showed adequate reliability with alpha coefficient values above  
154 the recommended minimum level of .70.<sup>12</sup> Convergent validity was assessed by examining  
155 composite reliability (CR) and average variance extracted (AVE) from the composite  
156 variables. The CR values of the composite variables were between 0.84 and 0.94 and all are  
157 above the suggested minimum of 0.70.<sup>12</sup> Their AVE values were all above 0.5, providing  
158 further evidence of convergent validity.<sup>13</sup> Evaluation of normality indicated the presence of  
159 multivariate non-normality (Mardia's index=58.76). Therefore, assessment of the structural  
160 equation model fit was evaluated using bootstrapping (1,000 bootstrap samples).<sup>10</sup>

161

162 The results of the SEM analysis are summarised in Figure 2. With the exception of a  
163 significant Bollen–Stine  $\chi^2$ , which tends to become inflated with a large sample size, fit  
164 indices supported an acceptable fitting model [ $\chi^2(162)=653.6$ ,  $p < .001$ , Bollen–Stine  $p =$   
165  $.001$ , RMR=.03, GFI=.95, AGFI=.93, CFI=.88, IFI =.88, TLI=.86, RMSEA=.050 (90% CI=.046  
166 to .054)] that accounted for 81% and 13% of the variance in attitude towards PES use and  
167 doping behaviour, respectively.

168  
169 Examination of modification indices suggested that affordability be allowed to covary with  
170 availability. Given that affordability and availability of other substances use are commonly  
171 interrelated in terms of consumption,<sup>14-15</sup> and were theorised by Donovan et al.<sup>1</sup> to be  
172 interrelated in terms of PES use, the model was re-analysed with that change. The refitted  
173 model provided a good fit to the data. A significant Bollen-Stine index of fit was observed  
174 ( $\chi^2(161)=564.0$ ,  $p < .001$ ). All other indices of fit were satisfactory [RMR=.03, GFI=.96,  
175 AGFI=.94, CFI=.90, IFI =.90, TLI=.89, RMSEA=.045 (90% CI=.041 to .049)].

176  
177 The standardised parameter estimates indicate a significant and strong relationship between  
178 attitude towards PES use and personal morality (0.64), a significant and moderate  
179 relationship with legitimacy (0.25), and a significant but lesser relationship with reference  
180 group opinion (0.19). The moderate relationship between attitude towards PES use and  
181 benefit appraisal (0.40) approached significance ( $p = .091$ ). In turn, PES use was significantly  
182 and moderately associated with attitude towards PES use (0.36). All other relationships were  
183 non-significant ( $p > .05$ ).

184

## 185 **DISCUSSION**

186 In this study, 1.1% of athletes who were drug tested reported testing positive for a banned  
187 PES. This is consistent with the proportion of samples analysed by the International Olympic  
188 Committee and World Anti-Doping Agency accredited anti-doping laboratories that resulted



189 in adverse analytical findings and atypical findings from 1993 to 2011 (ranged between 1.3%  
190 and 2.1%)<sup>16,17</sup> Self-reported use of banned PES was 6.9%. This is within the range of self-  
191 reported use studies in adult athletes between 1980 and 1996 (5% to 15%)<sup>18</sup> and similar to  
192 recent surveys of elite athletes.<sup>19,20</sup> Hence we can be reasonably confident that our sample  
193 is representative of the population of athletes with respect to doping behaviour.

194  
195 A favourable attitude towards PES use was associated with actual use of a banned  
196 substance thus providing support for past research reporting associations between attitude  
197 towards PES and actual use of these substances among US male college athletes<sup>21</sup> and  
198 Australian athletes,<sup>8</sup> as well as intentions to use these substances among Italian high school  
199 students<sup>22,23</sup> and gym users in the Netherlands.<sup>24</sup> The hypothesised relationships between  
200 availability and affordability of PES and the use of these substances were non-significant.  
201 However, this result was impacted by a substantial proportion of athletes reporting that they  
202 did not know whether the six presented substances were accessible or affordable: 47.3% to  
203 61.8% and 58.6% to 69.8% for each substance respectively.

204  
205 When considering the six hypothesised psychosocial variables together, personal morality  
206 revealed the strongest association with attitude towards PES use. That is, athletes with a  
207 weaker moral stance against PES use had a more favourable attitude towards PES use.  
208 Donovan et al.<sup>1</sup> appears to have been the first published paper to highlight personal morality  
209 as an important component for understanding PES use in sport. In this study, personal  
210 morality was conceptualised and measured in terms of moral judgement towards PES use,  
211 and moral emotions experienced if caught using PES. Since the Donovan et al.<sup>1</sup> paper, there  
212 have been no published studies on athletes' moral judgement towards PES use and only the  
213 Strelan and Boeckmann<sup>5</sup> study investigated moral emotions. In that study, guilt anticipated  
214 from use of human growth hormone was the strongest influence on Australian footballers and  
215 soccer players' hypothetical decision not to use that substance. The Strelan and

216 Boeckmann's<sup>5</sup> study and this study provide support for the importance of moral emotions in  
217 influencing PES use.

218  
219 In a sporting context, morality has been associated with the concept of cheating, with PES  
220 use viewed by athletes as the most serious form of cheating.<sup>25</sup> In Donovan, Jalleh and  
221 Gucciardi's<sup>26</sup> study, acceptance of cheating as measured by the Attitudes to Moral Decision-  
222 Making in Youth Sport Questionnaire<sup>27</sup> was significant in differentiating athletes according to  
223 low, moderate and high susceptibility to PES use. In Gucciardi, Jalleh and Donovan's<sup>8</sup> study,  
224 of the constructs examined, morality – measured in terms of cheating – evidenced the  
225 strongest relationship with attitude towards PES use. More recently there has been  
226 considerable interest in the construct of moral disengagement. For example, studies have  
227 found that moral disengagement is: significantly associated with intentions to use PES,<sup>22,28</sup>  
228 positively associated with antisocial behaviour (e.g., trying to injure opponents and breaking  
229 the rules of the game); and negatively associated with prosocial behaviour (e.g., helping  
230 injured opponents and congratulating opponents for good play).<sup>29</sup> These studies provide  
231 further support for the importance of morality in understanding PES use.

232  
233 There was a significant relationship between perceived reference group opinion on the  
234 morality of PES use and attitude towards PES use. The direction of the association was the  
235 same as for personal morality, but the strength of the association was less. There are no  
236 published studies on the moral stance of athletes' reference groups on PES use.

237  
238 There was a significant moderate relationship between legitimacy and attitude towards PES  
239 use. The components of legitimacy tested were in relation to distributive justice (i.e.,  
240 perceived fairness of the drug testing process) and procedural justice (i.e., perceived fairness  
241 of the appeals process). The data supported Donovan et al.'s<sup>1</sup> theorising that if athletes  
242 perceive an anti-doping organisation's drug enforcement regime to be fair and just, then the

243 legitimacy of the anti-doping organisation in conducting drug testing and prosecution is likely  
244 to be enhanced and compliance with anti-doping regulations is more likely. This is a new and  
245 promising dimension in understanding PES use.

246  
247 The moderate relationships between attitude towards PES use and both threat and benefit  
248 appraisals did not reach significance. This is contrary to the findings in Gucciardi, Jalleh and  
249 Donovan's<sup>8</sup> study in which there was a significant moderate relationship between attitude  
250 towards PES use and benefit appraisal, and a significant but small relationship with threat  
251 appraisal. The inconsistencies in findings may well be due to variations in measurement of  
252 these two constructs between the two studies. In this study, threat appraisal was  
253 conceptualised and measured in terms of threats relating to both ill-health effects of PES use  
254 and enforcement, while benefit appraisal was measured in terms of both rewards for  
255 performing well in sport and perceived impact of PES on performance. In Gucciardi, Jalleh  
256 and Donovan's<sup>8</sup> study, threat and benefit appraisals were measured only in terms of the  
257 latter measure for each construct (i.e., appraisal of threat of enforcement, and perceived  
258 impact of PES on performance).

259  
260 In this study, personality was not a significant predictor of attitude towards PES use. This  
261 finding is consistent with Gucciardi, Jalleh and Donovan's<sup>8</sup> study. It is noteworthy that both  
262 studies were limited to a single measure of personality: risk taking propensity (this study) and  
263 self-esteem (Gucciardi, Jalleh and Donovan's<sup>7</sup> study). In line with this study, Donovan, Jalleh  
264 and Gucciardi<sup>26</sup> found that risk taking propensity (measured by the Risk Propensity Scale<sup>30</sup>)  
265 did not significantly differentiate athletes with respect to susceptibility to PES use.

266  
267 The model accounted for a substantial proportion of the variance in attitude towards PES use  
268 (81%) but only 13% of the variance in use of PES. Kraus's<sup>31</sup> meta-analysis of 88 attitude-  
269 behaviour studies revealed that attitudes significantly and substantially predicted future

270 behaviour. However the reported mean correlation of 0.38 can be considered as a low-  
271 moderate correlation. These data highlight the complexity of the attitude-behaviour  
272 relationship and predicting behaviour per se. Notwithstanding attitude towards PES use,  
273 there are a multitude of environmental and situational factors that may facilitate or inhibit  
274 PES use.<sup>2</sup> These constitute a rich area for further research.

275  
276 The data analysis technique employed in this study (i.e., SEM) allows evaluation of the  
277 hypothesised causal pathways. However, this study is limited by its cross-sectional design  
278 which does not allow causal inferences about the direction of the various relationships in the  
279 model. Longitudinal study designs are required to validate these cross-sectional findings and  
280 make assertions about cause and effect relationships. Since the time of data collection for  
281 this study, there have been published scales measuring some of the concepts in the SDCM,  
282 mainly in relation to attitude towards PES use<sup>32</sup> and personality.<sup>26</sup> Future studies may  
283 consider the use of these scales to provide a more comprehensive measure of these  
284 constructs. However, consideration must be given to the additional length of the survey  
285 instrument as the Performance Enhancement Attitude Scale consists of 17 items and  
286 Donovan, Jalleh and Gucciardi's<sup>26</sup> study found that a number of personality variables  
287 differentiated athletes with respect to susceptibility to PES use.

288  
289 Research studies on moral disengagement in a sporting context have focused mainly on its  
290 impact on antisocial and prosocial behaviours and attitude towards PES use, but none has  
291 investigated its association with PES use. Given that personal morality is a significant factor  
292 in understanding PES use, research examining and applying mechanisms to morally engage  
293 athletes in relation to PES use warrants further investigation. Future studies could survey  
294 athletes representing a broader range of competition levels and involving cross-cultural  
295 research to test the model's applicability and the relative importance and relevance of the  
296 various constructs in other populations of athletes.

297

**298 CONCLUSION**

299 Current anti-doping education programs focus on building awareness and knowledge of  
300 banned PESs, reporting and testing requirements, and penalties for non-compliance. Such  
301 programs may include sporting values to assist athletes in resisting inclinations or invitations  
302 to use banned PES.<sup>33</sup> However, this 'education' approach ignores psychosocial variables  
303 increasingly being found to be related to attitude towards PES use. The results of this study  
304 have a number of implications for anti-doping programs, and particularly with respect to two  
305 largely ignored areas: morality and legitimacy. This study's findings suggest that in addition  
306 to educational components, anti-doping prevention may benefit from attention to morality and  
307 legitimacy issues that influence attitude towards PES use.

308

**309 Practical implications**

- 310 • This study comprehensively examined the Sport Drug Control Model via survey data of  
311 elite Australian athletes.
- 312 • These findings suggest that anti-doping education programs that include only education  
313 and information on banned PES, reporting and testing requirements, and penalties for  
314 non-compliance will have little impact on susceptible athletes' propensity to use PES.
- 315 • Based on this study's findings, anti-doping education programs would be more effective  
316 in influencing attitude towards and actual use of PES by including components  
317 discussing moral decision making behaviour, moral affect resulting from being caught  
318 using PES, the legitimacy base of the anti-doping organisation, the stringency of drug  
319 testing, and the equitable and fair treatment of all athletes in drug testing and appeals  
320 process for anti-doping rule violations.

321

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327

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413 **Figure Legend:**414 Fig. 1. The Sport Drug Control Model.<sup>1</sup>415 Fig. 2. Overview of results of structural equation model analysis ( $n = 1,237$ ). Note: \* $p < .01$ ;416 \*\* $p < .001$ ; latent variable indicators are not shown for simplicity reasons.

**Table 1: Descriptive statistics and internal reliability estimates for the variables measuring the constructs in the Sport Drug Control Model (N = 1,237)**

<b>Variables</b>	<b>Range</b>	<b>M</b>	<b>SD</b>	<b><math>\alpha</math></b>	<b>CR</b>	<b>AVE</b>
<b>Doping behaviour</b>	(0) Self-reported never use of a PES to (1) self-reported ever use of a PES	.08	.27	---	---	---
<b>Attitude towards PES use</b>						
Need to use banned PES to perform at the very highest level	(1) Definitely don't have to use PES at some time to (4) definitely have to use PES at some time	1.52	.94	---	---	---
Consideration of an offer to use PES	(1) None at all to (4) a lot of consideration	1.68	.93	---	---	---
<b>Affordability of PES</b>	(1) Very expensive to buy to (5) very cheap to buy	2.47	.79	.93	.94	.75
<b>Availability of PES</b>	(1) Probably impossible/very hard to buy to (5) very easy to buy	2.64	.81	.90	.93	.69
<b>Benefit appraisal</b>						
Impact of PES on performance	(1) Definitely would not improve performance to (5) definitely would improve performance	3.23	1.04	.87	.90	.66

Rewards for performing well	(1) Little rewards to (5) a lot of rewards	3.79	.76	---	---	---
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**Threat appraisal**

***Appraisal of threat to health:***

Use of PES once or twice	(1) A lot of harm to (5) no harm	2.34	1.03	.91	.93	.69
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Regular use of PES	(1) A lot of harm to (5) no harm	1.55	.75	.87	.91	.62
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***Appraisal of threat of enforcement:***

Deterrence in competition	(1) High threat of detection to (3) low threat of detection	1.44	.53	---	---	---
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Deterrence out of competition	(1) High threat of detection to (3) low threat of detection	1.63	.56	---	---	---
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**Personal morality**

Moral judgment on PES use	(1) PES use is morally wrong under any circumstances to (3) PES is morally OK under any circumstances	1.11	.32	---	---	---
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Moral emotions	(1) Moral emotions experienced to a great extent to (5) moral emotions not experienced at all	1.06	.29	.80	.88	.71
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<b>Reference group moral judgment on PES</b>	(1) PES use is morally wrong under any circumstances	1.16	.38	.74	.84	.51
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<b>use</b>	to (3) PES use is morally OK under any circumstances					
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**Legitimacy**

***Testing process:***

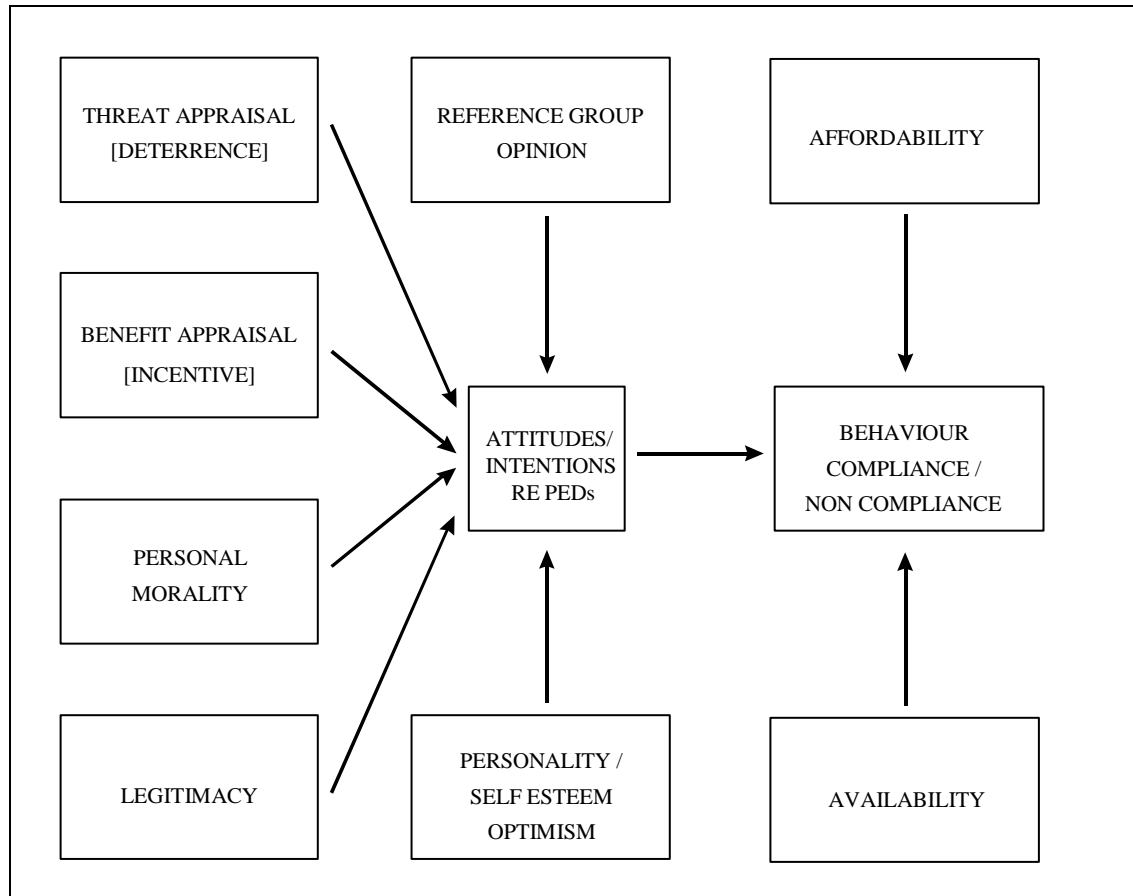
Security of testing procedure	(1) Very secure to (4) not at all secure	1.48	.54	---	---	---
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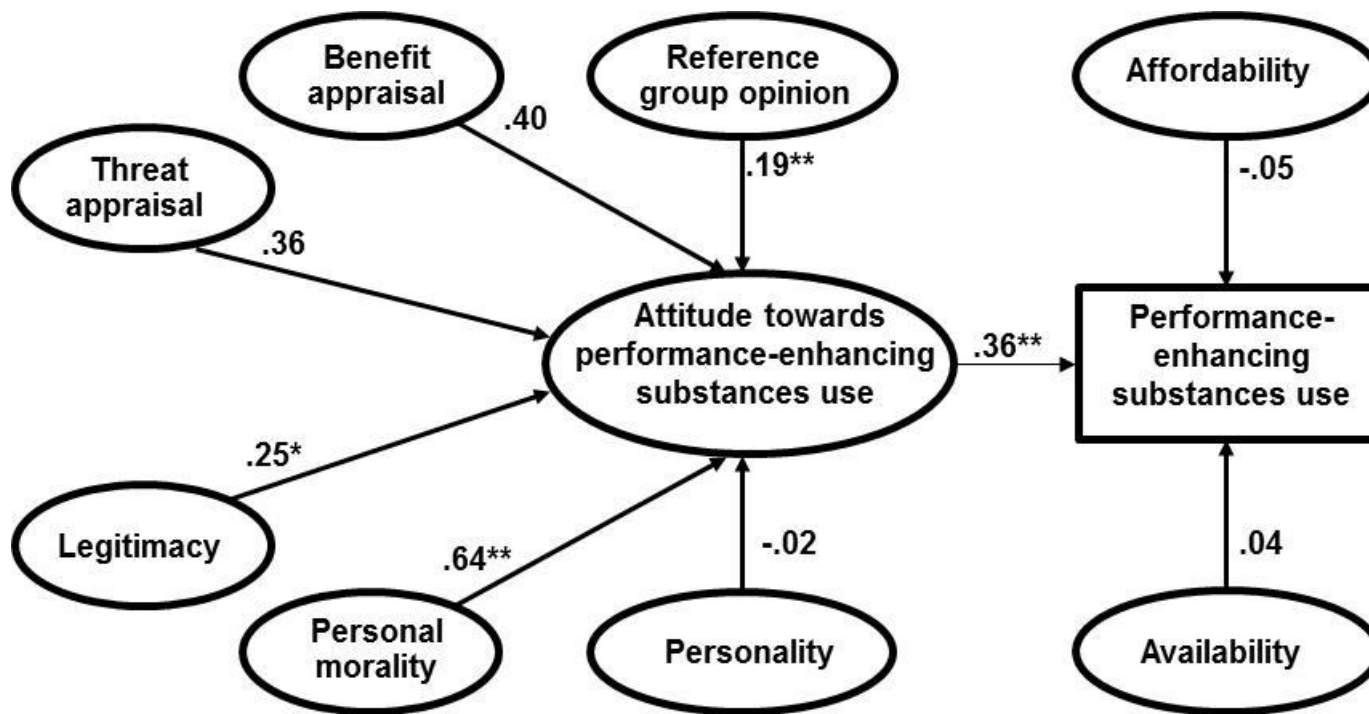
Equitable treatment of athletes	(1) Very fair to (4) very unfair	1.68	.66	---	---	---
<b>Appeals process:</b>						
Fair hearing for positive test appeal	(1) Very satisfied to (4) very dissatisfied	1.88	.60	---	---	---
Fair hearing before decision on sanctions	(1) Very satisfied to (4) very dissatisfied	1.88	.64	---	---	---
Fair hearing in Court of Arbitration	(1) Very satisfied to (4) very dissatisfied	1.82	.56	---	---	---
<b>Personality</b>						
Risk taking propensity	(1) Risk adverse to (5) risk seeking	3.60	.85	.75	.86	.75

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Note: A full description of the measures and construct development is available elsewhere.<sup>34</sup>

Figure(s)





**Supplement Table: Questionnaire items for the variables measuring the constructs in the Sport Drug Control Model**

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**Variables/Items**

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**Doping behaviour:**

Which one of the following most applies to you?

(1) I have never considered using a banned PES; (2) At one stage I thought briefly about using a banned PES; (3) At one stage I thought quite a bit about using a banned PES; (4) I still think occasionally about using a banned PES because other athletes are using them; (5) I briefly used a banned PES in the past but no longer do so; (6) I occasionally use a banned PES now for specific purposes; (7) I regularly try or use banned PES.

In the last 12 months, have you used any of the following, for whatever reason: anabolic steroids; beta-blockers; human growth hormones (hGH); diuretics; doping methods; alphas; designer steroids like tetrahydrogestrinone (THG); erythropoietin (EPO) and other similar substances?

(1) Have never used; (2) Did not use in the last 12 months; (3) 1 to 2 times; (4) 3 to 5 times; (5) 6 to 10 times; (6) More than 10 times.

Have you ever tested positive for a banned PES?

(1) Yes; (2) No.

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**Attitude towards PES use:**

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 banned PES at some time; (2) Probably have to use banned PES at some time; (3) Might or might not have to use banned PES at some time; (4) Probably don't have to use banned PES at some time; (5) Definitely don't have to use banned PES at some time.

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 performance and was currently not detectable, how much consideration do you think you might give to the above offer?

(1) A lot of consideration; (2) Some consideration; (3) A little consideration; (4) None at all.

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**Affordability of PES:**

How cheap or expensive would it be for you personally to buy each of the following types of substances: anabolic steroids; beta-blockers; human growth hormones (hGH); diuretics; designer steroids like tetrahydrogestrinone (THG); erythropoietin (EPO) and other similar substances?

(1) Very cheap; (2) Quite cheap; (3) Neither; (4) Quite expensive; (5) Very expensive; (6) Don't know.

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**Availability of PES:**

How easy or difficult would it be to get each of the following types of substances: anabolic steroids; beta-blockers; human growth

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hormones (hGH); diuretics; designer steroids like tetrahydrogestrinone (THG); erythropoietin (EPO) and other similar substances?

(1) Probably impossible; (2) Very hard; (3) Fairly hard; (4) Fairly easy; (5) Very easy; (6) Don't know.

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**Benefit appraisal:**

If you were to use the following, how likely is it that would improve your performance in your sport: anabolic steroids; beta-blockers; human growth hormones (hGH); designer steroids like tetrahydrogestrinone (THG); erythropoietin (EPO) and other similar substances?

(1) Definitely would not; (2) Probably would not; (3) Might or might not; (4) Probably would; (5) Definitely would; (6) Don't know.

What outcomes does your sport offer you if you perform well: national celebrity status; lucrative sponsorship deals; personal best achievements; opportunities for remaining in the sport as coach, trainer or administrator; future financial security; international celebrity status?

(1) A lot; (2) A little; (3) Not at all.

How much would you like these outcomes for performing well in your sport: national celebrity status; lucrative sponsorship deals; personal best achievements; opportunities for remaining in the sport as coach, trainer or administrator; future financial security; international celebrity status?

(1) A lot; (2) A little; (3) Not at all.

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**Threat appraisal**

***Appraisal of threat to health:***

How much harm to your health, if any, do you think would be caused by using each of the following substances once or twice ever: anabolic steroids; beta-blockers; human growth hormones (hGH); diuretics; designer steroids like tetrahydrogestrinone (THG); erythropoietin (EPO) and other similar substances?

(1) No harm; (2) A little harm; (3) Some harm; (4) A lot of harm; (5) Don't know.

How much harm to your health, if any, do you think would be caused by using each of the following substances regularly: anabolic steroids; beta-blockers; human growth hormones (hGH); diuretics; designer steroids like tetrahydrogestrinone (THG); erythropoietin (EPO) and other similar substances?

(1) No harm; (2) A little harm; (3) Some harm; (4) A lot of harm; (5) Don't know.

***Appraisal of threat of enforcement:***

How likely is it that athletes at your level would be drug tested at least once a year: out of competition; in competition?

(1) Very likely; (2) Quite likely; (3) A little likely; (4) Not likely; (5) Not at all likely.

From what you know or have heard, if you were to take banned performance enhancing substances (out of competition)/(while competing), how likely do you think that you could get away with it if you really tried to?

(1) Very likely; (2) Quite likely; (3) A little likely; (4) Not likely; (5) Not at all likely.

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) Very likely; (2) Quite likely; (3) A little likely; (4) Not likely; (5) Not at all likely.

Deterrence in competition

Deterrence out of competition

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**Personal morality:**

Regardless of whether you believe performance enhancing substances should be banned or allowed, which of the following statements best describes your personal feelings about deliberately using banned performance enhancing substances?

(1) I believe deliberately using banned PES to improve performance is morally wrong under any circumstances; (2) I believe deliberately using banned PES to improve performance is morally OK under some circumstances, but wrong under others; (3) I believe deliberately using banned PES to improve performance is morally OK under any circumstances.

If you were caught using banned performance enhancing substances, to what extent would you experience the following feelings:

ashamed; embarrassed; guilty?

(1) Not at all to (5) To a great extent.

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**Reference group:**

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People involved in sports in general:

What about the following people's feelings about using banned PES: most other athletes, most spectators, most of the general public, sports lawyers in general, sports journalists in general?

(1) Deliberately using banned PES to improve performance is morally wrong under any circumstances; (2) Deliberately using banned PES to improve performance is morally OK under some circumstances, but wrong under others; (3) Deliberately using banned PES to improve performance is morally OK under any circumstances.

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**Legitimacy:**

***Testing process:***

*Security of testing procedure:*

How secure is the Australian Sports Drug Agency's drug testing procedures in Australia? (That is, in taking of samples and care of samples).

(1) Very secure; (2) Quite secure; (3) Not really secure; (4) Not at all secure.

*Equitable treatment of athletes:*

How fair is the Australian Sports Drug Agency in terms of treating all athletes equally?

(1) Very fair; (2) Fair; (3) Unfair; (4) Very unfair.

**Appeals process:**

How satisfied are you that athletes who appeal a positive test in Australia will be given a fair hearing?

(1) Very satisfied; (2) Somewhat satisfied; (3) Somewhat dissatisfied; (4) Very dissatisfied.

How satisfied are you that athletes who test positive in your sport will be given a fair hearing before a decision is made about applying a penalty?

(1) Very satisfied; (2) Somewhat satisfied; (3) Somewhat dissatisfied; (4) Very dissatisfied.

How satisfied are you that athletes who appeal a positive test before the Court of Arbitration in Sport, will be given a fair hearing?

(1) Very satisfied; (2) Somewhat satisfied; (3) Somewhat dissatisfied; (4) Very dissatisfied.

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**Personality:**

Please indicate whether you agree or disagree, or have mixed feelings with it: I am the kind of person who avoids risk; I am the kind of person who enjoys risk?

(1) Strongly agree; (2) Agree; (3) No feelings/mixed feelings; (4) Disagree; (5) Strongly disagree.

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