

Perceptions of Coach Doping Confrontation Efficacy and Athlete Susceptibility to Intentional and Inadvertent Doping

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Abstract

Objectives: We tested a conceptually-grounded model linking athlete perceptions of strength and conditioning and technical coach doping confrontation efficacy (DCE) with athletes' doping self-regulatory efficacy (SRE), doping moral disengagement (MD), and susceptibility to intentional and inadvertent doping.

Design: Cross-sectional, correlational.

Methods: Participants were high-level athletes (n_{male} = 532; n_{female} = 290) recruited in Australia (*n* = 261), the UK (*n* = 300), and the USA (*n* = 261). All participants completed questionnaires assessing the variables alongside a variant of the randomized response technique to estimate the prevalence of doping.

Results: The estimated prevalence of intentional doping in the sample was 13.9%. Structural equation modelling established: (a) perceptions of technical and strength and conditioning coaches' DCE positively predicted doping SRE; (b) doping SRE negatively predicted doping MD; (c) doping MD positively predicted susceptibility to intentional and inadvertent doping; and (d) the predictive effects of coach perceptions on susceptibility to doping were mediated by doping SRE and doping MD. Multisample analyses demonstrated these predictive effects were invariant between males and females and across the three countries represented.

Conclusions: The findings show the conceptually-grounded model to offer extended understanding of how multiple individuals within the athlete support personnel network may influence athlete doping.

Keywords: Performance-enhancing substances; drug-seeking behavior; multisample analyses; moral disengagement; self-regulatory efficacy

Introduction

Understanding factors that influence doping (i.e., use of prohibited substances/methods with the potential to artificially improve performance through changes in physical and/or mental condition[1]) is important given the relevance of doping to safeguarding fair play and athlete well-being. Critical among these factors is the athlete-support network[2,3]. Personnel within this network are uniquely positioned to shape athlete perspectives and decisions on doping. The present study empirically tested a theory-derived model linking athletes' perceptions of their coaches' efficacy in addressing doping with their susceptibility to doping via psychosocial processes connected with doping.

A meta-analysis of predictors[i] of doping identified moral disengagement (MD) and self-regulatory efficacy (SRE) as key psychosocial processes connected with doping[4]. MD represents the rationalization of harmful behavior and is thought to reduce or eliminate anticipation of distasteful emotions (e.g., guilt) that normally deter such conduct[5]. Accordingly, MD has been positively associated with doping intention, susceptibility, and behavior[2,6-7]. Importantly, Bandura identifies SRE – one's perceived capacity to withstand personal and social influences encouraging harmful conduct – to be a key antecedent of MD, as only those who lack confidence in the ability to withstand such pressures have the need to develop mechanisms to justify and rationalize engagement in transgressive acts such as doping[8]. Thus, enhanced doping SRE should reduce susceptibility to doping[7] via lower MD[5]. However, researchers have not to date examined social influences on susceptibility to doping via SRE and MD.

Coaches represent a key social influence on athletes with the potential to influence athletes' susceptibility to doping via doping SRE and doping MD. For example, a controlling coach climate has been positively linked with susceptibility to doping via MD[6]. Another coach attribute that may help explain such an effect is doping confrontation efficacy (DCE)[3], reflecting the extent to which coaches believe in their ability to effectively confront athletes regarding doping and offer appropriate solutions.

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[i] Our use of the term "predict" refers to statistical prediction and does not infer causal effects.

Importantly, coaches with strong DCE beliefs may be more likely to advise athletes on how to avoid and resist pressures to dope. Athletes who observe such coach behaviors should be more likely to perceive their coach as high in DCE[9]. This can have downstream effects, as supported by athlete perceptions of coach DCE being negatively linked with doping attitudes[10]. Researchers have yet to investigate the potential pathways for such links. For example, athletes with enhanced perceptions of coach DCE may possess stronger SRE beliefs because of recognized contextual support to resist doping. This could lead to reduced susceptibility to doping via reduced MD.

Past work on athlete doping is limited in two further regards. First, extant work has tended to focus only on technical coaches[2,10]. However, strength and conditioning coaches are also well placed to play a role in athlete doping because they interact with athletes in the gym environment, one often associated with doping[11]. Thus, it is important to consider strength and conditioning and technical coaches in doping research. Second, although research on doping has revealed a range of important insights, it has predominantly focused on intentional doping. The presence of prohibited substances in licit dietary supplements and foodstuffs and potential misuse of medication suggest inadvertent doping should also be of concern[12,13,14]. Deliberate attention is required of athletes to avoid inadvertent doping, and coaches perceived to be high in DCE may be more likely to advise athletes on this. Also, continuing to risk inadvertent doping despite awareness of it is ethically questionable given the potential for contravening doping regulations. Thus, perceptions of coach DCE may be linked with athletes' susceptibility to inadvertent doping via the same operational pathway (i.e., SRE and MD) as intentional doping.

To extend our understanding of social and psychological contributors to doping susceptibility, the primary purpose of this study was to test a process model specifying athlete perceptions of coach DCE as determinants of athlete susceptibility to intentional and inadvertent doping via doping SRE and doping MD. We hypothesized athlete perceptions of technical and strength and conditioning coaches' DCE would positively associate with athlete doping SRE, which in turn would negatively associate with doping MD. Doping MD would then positively associate with susceptibility to intentional and inadvertent doping.

Another important consideration for anti-doping efforts is accurate assessment of intentional doping prevalence. Most methods used to estimate doping prevalence have significant limitations, with standard self-report methods being prone to under-reporting[15]. An alternative method is the Randomized Response Technique (RRT), which emphasizes respondent anonymity by including a randomization instruction that determines whether respondents answer a non-sensitive or sensitive question. This promotes honest responding because only respondents know which question is answered[16]. However, very few studies have used the RRT to estimate the prevalence of intentional doping[17]. Thus, we used the RRT with our sample to build the descriptive database on doping prevalence.

Materials and Methods

Male (n = 532) and female (n = 290) athletes (M_{age} = 22.04 years, SD = 5.23) competing at the regional (n = 244), national (n = 296), or international (n = 265) level (17 didn't report) in a wide range of sports (n = 34) participated. All had a technical (n_{male} = 713; n_{female} = 103; 6 didn't report) and strength and conditioning (n_{male} = 795; n_{female} = 17; 10 didn't report) coach and had worked with their technical and strength and conditioning coach for 2.24 (SD = 2.20) and 1.56 (SD = 1.46) years, respectively, on average. Athletes were based in Australia (n = 261), the UK (n = 300), or the USA (n = 261) during data collection.

Upon obtaining ethical approval from institutional ethics boards, participants were recruited through existing contacts, governing bodies, and regional training centers. Appropriate ethical standards (i.e., APA) were followed in the conduct of the study, and the funding organization had no role in the collection of data, data analysis and interpretation, and approval for publication of this manuscript. Following in-person provision of study information and collection of participant consent, volunteers completed an anonymous paper questionnaire pack containing the following instruments.

Perceived coach DCE was assessed using the Doping Confrontation Efficacy Scale (DCES), which examines five sub-dimensions (i.e., legitimacy [5 items], intimacy [3 items[ii]], resources [4 items], initiation [4 items], outcomes [4 items]) underpinning a higher-order DCE dimension[3]. The 20 items (e.g., "Confront an athlete for using PEDs") were preceded by the stem "How confident are you in your technical [strength and conditioning] coach's ability to ...". Items were rated using a 7-point scale ranging from 1 (*no confidence*) to 7 (*complete confidence*). This measure was at the beginning and end of the questionnaire pack, with one administration for technical and the other for strength and conditioning coaches; presentation order was counterbalanced. Higher scores indicate enhanced levels of perceived coach DCE. Past research provides evidence supporting the factorial validity and internal consistency for scores on this measure[3]. The multidimensional structure of the DCES for technical, χ^2 (160) = 809.39, p < .001; CFI = .919; TLI = .904, RMSEA = .072 [95% CI = .067, .077], and strength and conditioning, χ^2 (160) = 806.59, p = < .001; CFI = .922; TLI = .908, RMSEA = .072 [95% CI = .067, .077] coaches showed adequate fit to the data. Latent factor correlations revealed considerable overlap among the five efficacy dimensions for strength and conditioning (ψ = .81 to .90) and technical (ψ = .81 to .92) coaches. Thus, we used unidimensional latent factors for coach DCE perceptions, using parcels representing each DCE subdimension as indicators. Parcels were formed using all relevant items for each subdimension.

Doping SRE was examined with the Doping SRE Scale, a 6-item (e.g., "Resist doping even if you knew you could get away with it?") measure of doping SRE[17]. Items were preceded by the stem "How confident are you right now in your ability to ..." and rated using a 7-point scale ranging from 1 (*no confidence*) to 7 (*complete confidence*). Higher scores indicate greater levels of doping SRE. Doping MD was measured using the Doping MD Scale – Short, a 6-item (e.g., "Compared to most lifestyles in the general public, doping isn't that bad") measure of doping MD[17]. Items were preceded by the stem "What is your level of agreement with the following statements?" and rated using a 7-point scale ranging from 1

[ii] A fourth intimacy item was omitted due to an error in the Appendix of Sullivan et al.[3]

(*strongly disagree*) to 7 (*strongly agree*). Higher scores indicate enhanced levels of doping MD. Past research has provided evidence supporting the construct validity, test-retest reliability, and internal consistency for scores obtained with the doping SRE and doping MD Scales[17].

To assess susceptibility to intentional doping we asked participants to respond to a single item (i.e., "How much consideration would you give to the offer?") when presented with a scenario in which they are offered the opportunity to dope[18]. Participants responded using a 7-point scale ranging from 1 (*none at all*) to 7 (*a lot of consideration*). The scenario was as follows:

If you were offered a banned performance-enhancing substance 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.

A second scenario was developed to assess susceptibility to inadvertent doping. Here, athletes were made aware of the risk of inadvertent doping, and asked to respond to a single item (i.e., "How much effort would you exert to avoid inadvertently doping?") examining the degree of effort they would exert to avoid inadvertently doping using a 7-point scale ranging from 1 (*no effort*) to 7 (*maximum effort*). Scores were reverse scored prior to statistical analyses. The scenario was as follows:

As part of an Anti-Doping Education Program, it is brought to your attention that athletes may dope unwittingly or unintentionally because they are not aware that the food, drinks, supplements, or medications they consume may contain banned substances.

Scores on this scale were reversed so higher scores reflect greater susceptibility for both measures. Past research provides evidence supporting the validity of scores of doping susceptibility using this approach[18].

Prevalence estimates for intentional doping in the past 12 months were obtained using the RRT[19]. Participants considered a non-sensitive question with known response proportions (i.e., "Please consider the date of your mother's birthday"). If the date fell within the first third of the month, participants answered a non-sensitive follow-up question with known response proportions (i.e., "Is the date of your mother's birthday in the first half of the year?"). In contrast, if the date fell outside the first third of the month, participants answered a sensitive follow-up question (i.e., "Have you knowingly used substances [e.g., anabolic steroids, erythropoietin, banned stimulants, growth hormones] or methods [e.g., blood infusions] during the past 12 months that are banned by the WADA and the IOC and therefore would not be permitted in professional sport?"). The RRT was used to provide an accurate indication of prevalence of intentional doping and not for inclusion as a dependent variable during model testing. The nature of the technique (i.e., it is not possible to identify on an individual basis who responded to the sensitive question and who responded to the non-sensitive one) means responses cannot be linked with individual responses to psychometric measures. Prevalence estimates and 95% confidence intervals were calculated[20].

Results

First, preliminary data screening analyses were performed. Missing value analyses demonstrated 0.73% of data points were missing, and missingness appeared random. Missing values were replaced using the expectation-maximization method and scale scores calculated[21]. Outlier analyses identified univariate (n = 37) and multivariate (n = 6) outliers for removal, with no apparent systematic pattern to the source of outliers. Finally, internal consistency was examined using omega[22]; all measures demonstrated good internal consistency. See Table 1 for omega coefficients and results from preliminary and descriptive analyses including zero-order Pearson and factor correlations. The correlational analyses showed moderate positive relations between perceptions of technical and S&C coaches' DCE and athletes' doping SRE, a strong negative relation between doping SRE and doping MD, and moderate-to-strong and strong positive relations between doping MD and susceptibility to inadvertent and intentional doping, respectively. The RRT data were used to estimate the 12-month period prevalence of doping. For the entire sample the estimate was 13.9% (CI: 9.3–18.5%). Subsample estimates were 15.2% (CI: 9.1–21.3%) for male, 11.3% (CI: 3.8–18.9%) for female, 12.9% (CI: 4.7–21.1%) for Australia, 16.7% (CI: 9.1–24.3%) for UK, and 11.1% (CI: 3.1–19.1%) for US athletes.

Structural equation modelling (SEM) was used to test the hypothesized model, with all analyses conducted in Mplus 8[23] using a maximum likelihood estimator with bias-corrected bootstrap 95% confidence intervals (10,000 resamples). To assess model-data fit, chi-square (χ^2), comparative fit index

(CFI), Tucker-Lewis index (TLI), and root mean square error of approximation (RMSEA) were used. Values greater than .90 and .95 for the TLI and CFI and smaller than .08 and .06 for RMSEA indicated adequate and excellent fit, respectively[24]. We employed the 2-step approach to SEM[25], first examining the measurement model, followed by the structural sequence. The measurement model included latent factors for athlete perceptions of technical and strength and conditioning coach DCE, doping SRE, and doping MD, and observed scores for susceptibility to intentional and inadvertent doping. This model showed excellent fit to the data, χ^2 (239) = 887.79, p < 0.001; CFI = .952; TLI = .945, RMSEA = .059 [95% CI = .055, .063]. The structural model showed near-excellent fit to the data, χ^2 (247) = 956.14, p < 0.001; CFI = .948; TLI = .942, RMSEA = .061 [95% CI = .057, .065]. As shown in Figure 1, perceptions of technical and strength and conditioning coach DCE had weak-to-moderate positive associations with doping SRE, doping SRE had a moderate-to-strong negative association with doping MD, and doping MD had moderate-to-strong positive associations with susceptibility to intentional and inadvertent doping. The model accounted for 11% of doping SRE variance, 36% of doping MD variance, 27% of susceptibility to intentional doping variance, and 17% of susceptibility to inadvertent doping variance.

To test the mediational paths shown in Figure 1, we specified the MODEL = INDIRECT function. Perceptions of strength and conditioning coach DCE indirectly predicted susceptibility to intentional (β = -.07, $p < 0.001$, 95% CI = -.10, -.05) and inadvertent (β = -.06, $p < 0.001$, 95% CI = -.09, -.04) doping via doping SRE and doping MD. Similarly, perceptions of technical coach DCE indirectly predicted susceptibility to intentional (β = -.05, $p < 0.01$, 95% CI = -.08, -.02) and inadvertent (β = -.04, $p < 0.01$, 95% CI = -.06, -.02) doping via doping SRE and doping MD.

SEM was used to test for measurement and structural invariance of the final model by sex and data-collection country (see Table 2). We tested four aspects of invariance[26]: (a) configural, when items of all scales are indicators of the same factors in different groups; (b) metric, when all factor loadings are equal across groups; (c) scalar, when factor loadings and item intercepts are equal across groups; and (d) structural, representing the noninvariance of all structural model components between/across groups. To compare fit between models we used ΔCFI and ΔRMSEA, with values $\leq$ to |0.01| for CFI and |0.015| for

RMSEA indicating no significant model differences[26,27]. For the sex analyses, fit of the respective male and female baseline models was adequate. Configural, metric, scalar, and structural invariance were supported by adequate model fit for all models, and |ΔCFI| and |ΔRMSEA| values across the progression of model constraints, providing strong support for the measurement and structural invariance of the final model by sex. For the country analyses, fit of the respective Australia, UK, and USA baseline models was adequate. Configural, metric, scalar, and structural invariance were supported by adequate model fit for all models, and |ΔCFI| and |ΔRMSEA| values ≤ 0.01 across the progression of model constraints, providing strong support for the measurement and structural invariance of the final model by country.

Discussion

This study is the first to link athlete perceptions of coach DCE with outcomes relevant to both intentional and inadvertent doping, building upon the dominant focus on intentional doping[2,10]. We also extended the predominant focus on technical coaches to consider strength and conditioning coaches, who work within environments where doping is prevalent[11]. In also identifying potential psychosocial processes linking athletes' perceptions of their coaches with doping outcomes and demonstrating replicability of the proposed model by sex and across athletes from three continents, this work offers several meaningful advancements to the doping knowledge base.

Significant indirect effects showed athlete perceptions of technical and strength and conditioning coaches' DCE are linked with susceptibility to intentional and inadvertent doping through doping SRE and MD – factors previously associated with doping. Athlete perceptions of coach efficacy are likely based upon relevant coaching behaviors[9]. Therefore, specific coaching behaviors may be critical to the formation of athlete doping SRE and doping MD. A coach modeling the importance of resisting pressures and risks to dope is likely to be perceived as having elevated levels of DCE. Then, through vicarious influence, a coach demonstrating such behavior may enhance athlete doping SRE, which theoretically should tie with reduced doping MD as athletes who feel more confident in their ability to resist pressures and risks to dope should have lesser need to justify and rationalize doping[8]. This possibility that changes in MD explain links between SRE and doping has previously been supported for self-reported doping[11].

That perceptions of technical and strength and conditioning coaches have distinct predictive capabilities highlights the importance of studying both types of coaches in doping research. Their distinct roles may explain the unique connections to doping susceptibility. Whereas technical coaches work primarily on the field of play, strength and conditioning coaches predominantly operate in gymnasia[28]. These differing environments, and the distinct coaching behaviors dictated by them, may explain why athlete perceptions of these coach types are distinctively salient in the doping context. Importantly, the findings suggest that distinct members of the athlete support personnel network can uniquely contribute to doping susceptibility. Accordingly, future research is warranted that examines the broader support team and the respective mechanisms through which various personnel may influence doping.

We assessed prevalence of intentional doping in high-level athletes from Australia, the UK, and the USA using the RRT. Twelve-month prevalence of doping was nearly 14% overall, with greater prevalence in male athletes than female athletes, and some variation by country. The findings contribute meaningfully to knowledge on doping prevalence because, first, the RRT overcomes limitations of most techniques used previously to estimate prevalence[15,16]. Second, few studies have applied the RRT with high-level athletes, restricting estimates to German sport participants and elite athletes from two international events[20,29-30]. We provide reliable estimates of doping for a substantial sample of high-level athletes from Australia, the UK, and the USA.

The observed prevalence estimates are at the lower end of the 14–39% range suggested for adult elite athletes[15]. Similarly, they are lower than previous estimates using the RRT for high-level sportspeople[20,29-30]. Although all athletes were high-level, roughly two thirds were competing regionally or nationally. Thus, about a third were truly elite. In contrast, samples in previous studies were exclusively elite. As such, differences in competitive level between our sample and the samples used for previous RRT-based estimates may explain the lower estimates found presently. However, given the absence of reliable estimates of doping prevalence across competitive levels, this explanation is necessarily speculative. Despite being lower than previous estimates, it is important to note that the prevalence rate of around 14% is much higher than estimates of 1-2% based on official doping control tests[15]. This indicates that intentional doping is a continuing issue in competitive sport that requires further research attention.

In pursuing further knowledge on doping, there is value in addressing limitations and building upon the present research. First, the study design was cross-sectional, and thus we cannot infer the associations in the model to be causal. Future research should assess causality by determining whether enhancements in coach DCE reduce athletes' susceptibility to doping via changes in SRE and MD. Research employing longitudinal or experimental mediation designs would also build upon the current cross-sectional design. Next, we assessed susceptibility to intentional and inadvertent doping, as opposed to actual behavior. Thus, our findings are not as directly interpretable as they would be if we had assessed actual behavior. Given validated methods of assessing behaviors relevant to inadvertent doping have not yet been developed, we chose to examine susceptibility to doping. Further, it is important to acknowledge that we used self-report scales to examine indicators for all latent variables. Thus, some responses may have been influenced by social desirability bias. In addition, the countries involved were all Western, Educated, Industrialized, Rich, and Democratic (WEIRD), necessitating research in non-WEIRD countries to assess the generalizability of findings. Finally, although we focused on links between athletes' perceptions of their coach and athletes' susceptibility to doping, it would be interesting in the future to also determine whether coaches' own efficacy beliefs are linked with such athlete-level outcomes.

In light of our findings, we endorse educating coaches about how to best present alternatives to doping to athletes. Training on effective confrontation techniques within coach anti-doping education should enhance levels of coach DCE and maximize the likelihood of coaches addressing doping with athletes to achieve positive outcomes. Coaches who do so should enhance athlete perceptions of coach DCE, which could translate to athlete psychological outcomes reducing susceptibility to both intentional and inadvertent doping.

Perspective

These findings support the premise that multiple individuals within the athlete-support network could influence athlete doping, necessitating consideration of the broader athlete-support network when trying to understand the psychology of doping. The findings also show the distinct nature of susceptibility to inadvertent and intentional doping, highlighting the need to consider both types of doping when investigating factors influencing doping. Finally, those looking to develop coach education programs on anti-doping should consider including elements specifically focused on developing coaches' abilities to effectively confront athletes on doping issues, incorporate materials relating to intentional and inadvertent doping, and look to deliver such programs to strength and conditioning as well as technical coaches.

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Table 1

Descriptive statistics, omega coefficients, and latent variable and Pearson correlations (n = 779)

Variable	1	2	3	4	5	6
1. Technical Coach DCE	*.95*	.47	.25	-.20	-.13	-.12
2. S&C Coach DCE	.49	*.95*	.28	-.27	-.13	-.19
3. Doping Self-Regulatory Efficacy	.26	.30	*.93*	-.49	-.43	-.35
4. Doping Moral Disengagement	-.24	-.30	-.56	*.80*	.43	.36
5. Susceptibility to Intentional Doping	-.13	-.14	-.43	.49	–	.26
6. Susceptibility to Inadvertent Doping	-.12	-.19	-.36	.39	.26	–
M	5.66	5.78	6.43	2.14	2.37	5.31
SD	1.12	1.00	0.86	0.96	1.73	1.63
Skewness	-0.73	-0.71	-1.76	0.76	1.24	0.84
Kurtosis	-0.14	-0.17	2.72	0.13	0.54	-0.11

Note. DCE = doping confrontation efficacy; Omega coefficients are shown on the diagonal, latent variable correlations below the diagonal, and zero-order Pearson correlations above the diagonal. All correlations are significant at $p < 0.01$.

Table 2

Fit indices for multisample analyses by sex and by country

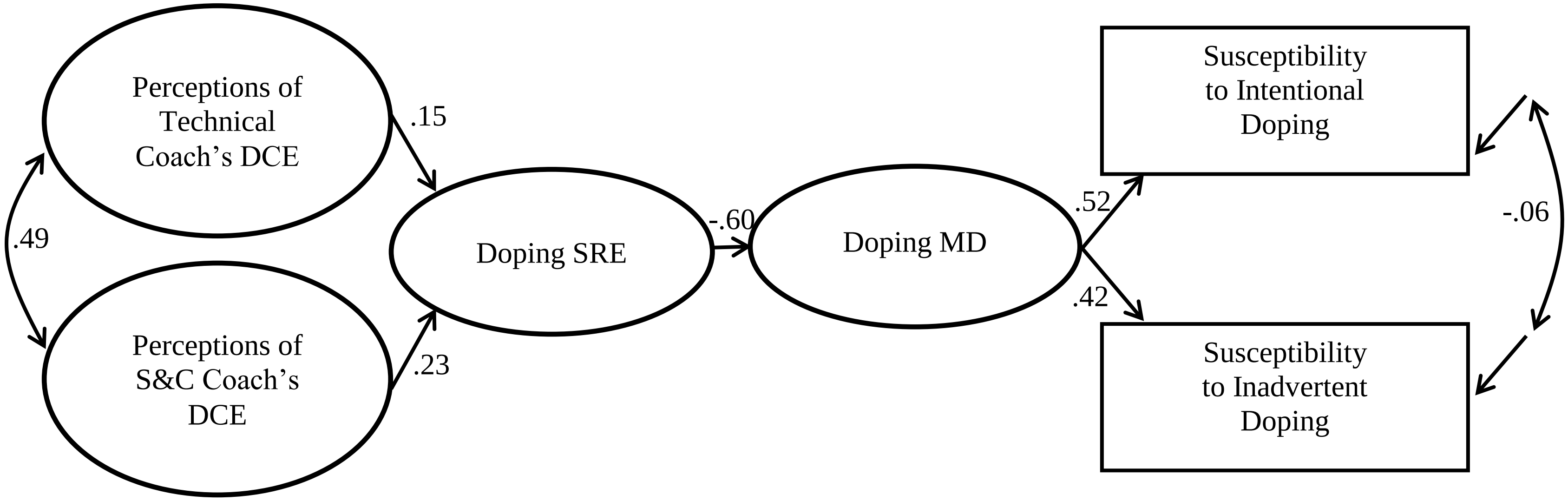
Model	*df*	χ^2	CFI	TLI	RMSEA (95% CI)	|ΔCFI|	|ΔRMSEA|
			Sex				
Baseline Male	247	577.23	.944	.938	.052 (.046, .057)	-	-
Baseline Female	247	436.87	.941	.934	.052 (.044, .060)	-	-
Configural Invariance	494	1027.54	.943	.936	.053 (.048, .057)	-	-
Metric Invariance	516	1122.90	.935	.931	.055 (.051, .059)	.008	.002
Scalar Invariance	538	1234.85	.926	.924	.058 (.053, .062)	.009	.003
Structural Invariance	545	1240.15	.926	.925	.057 (.053, .061)	.000	.001
			Country				
Baseline Australia	247	486.58	.937	.929	.062 (.054, .071)	-	-
Baseline UK	247	534.30	.928	.919	.064 (.057, .071)	-	-
Baseline USA	247	544.35	.909	.899	.070 (.062, .078)	-	-
Configural Invariance	741	1617.44	.923	.914	.067 (.063, .072)	-	-
Metric Invariance	785	1702.20	.919	.915	.067 (.063, .071)	.004	.000
Scalar Invariance	829	1864.10	.909	.909	.069 (.065, .074)	.010	.002
Structural Invariance	843	1895.77	.907	.909	.069 (.065, .074)	.002	.000

Note. CFI = comparative fit index; TLI = Tucker-Lewis index; RMSEA = root mean square error of approximation; χ^2 for all models significant at $p < 0.05$.

Figure Legends

Figure 1. Model testing results. All variables are athlete variables. DCE = doping confrontation efficacy; S&C = strength and conditioning; SRE = self-regulatory efficacy; MD = Moral Disengagement. All paths significant at $p < .001$ except for the non-significant covariance between the two doping outcomes.

Figure 1


Perceptions of Technical Coach's DCE
Perceptions of S&C Coach's DCE
.49
.15
.23
Doping SRE
-.60
Doping MD
.52
.42
Susceptibility to Intentional Doping
Susceptibility to Inadvertent Doping
-.06