Self-Determined Motivation in Sport Predicts Anti-Doping Motivation and Intention: A Perspective from the Trans-contextual Model

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Abstract

Objectives: Motivation in sport has been frequently identified as a key factor of young athletes' intention of doping in sport, but there has not been any attempt in scrutinising the motivational mechanism involved. The present study applied the trans-contextual model of motivation to explain the relationship between motivation in a sport context and motivation and the social-cognitive factors (attitude, subjective norm, perceived behavioral control, and intention) from the Theory of Planned Behavior (TPB) in an anti-doping context.

Design: A cross-sectional survey was conducted.

Methods: Questionnaire data was collected from 410 elite and sub-elite young athletes in Australia (Mean age [17.7± 3.9 yr], 55.4% male, Years in sport [9.1±3.2]). We measured the key model variables of study in relation to sport motivation (Behavioral Regulation in Sport Questionnaire), and the motivation (adapted version of the Treatment Self-Regulation Questionnaire) and social cognitive patterns (the Theory of Planned Behavior Questionnaire) of doping avoidance. The data was analyzed by variance-based structural equation modeling with bootstrapping of 999 replications.

Results: The goodness-of-fit of the hypothesized model was acceptable. The bootstrapped parameter estimates revealed that autonomous motivation and amotivation in sport were positively associated with the corresponding types of motivation for the avoidance of doping. Autonomous motivation, subjective norm, and perceived behavioral control in doping avoidance fully mediated the relationship between autonomous motivation in sport and intention for doping avoidance.

Conclusions: The findings support the tenets of the trans-contextual model, and explain how motivation in sport is related to athletes' motivation and intention with respect to anti-doping behaviors.

Keywords: doping avoidance; self-determination theory; theory of planned behavior; trans-contextual process; theoretical integration

Introduction

Performance enhancement has always been regarded as an essential element of elite sport. However, the rapid advancement of biomedical technology in recent years has provided increasingly greater options and opportunities for athletes to enhance their performance illegally by using prohibited substances or methods.[1, 2] The World Anti-Doping Agency (WADA), in response, leads the anti-doping movement predominantly using a detection and punishment strategy via their anti-doping code, legislation and penalties.[3] However, legislation and testing are considered to be one step behind the developers and users of doping substances or methods[1], and it is unlikely that anti-doping agencies will be able to detect all doping incidents that have directly or indirectly affected athletes' performances. More importantly, law enforcement is typically restricted to elite athletes given the costly procedures involved in testing and analyses, so its effects on younger or lower level athletes (e.g., club, school, regional, or recreational athletes) are limited. A growing number of criticisms have been raised for focusing primarily on a detection and punishment strategy, as statistics for doping incidence show no sign of decreasing.

As a result, more attention is being placed on investigating the psychological and social aspects of doping prevention, with the assumption that doping is a goal directed and self-regulated behavior heavily influenced by one's conscious decision making process. For example, a growing amount of attention has been placed on constructs such as the social-cognitive variables (i.e., attitude, subjective norm, and perceived behavioral control)[4, 5], morality[6] and moral disengagement[7], achievement goal orientation, sportpersonship orientations, and sport motivation[8, 9], to predict doping susceptibility, intention, or behaviors. The central rationale for these studies is that by understanding the psychological antecedents of doping behaviors, appropriate psychological interventions could be developed to reduce the likelihood of doping.

However, in reality, even when athletes have consciously made a decision not to dope in sport, they have to act *proactively* to prevent themselves from taking banned performance enhancing banned substances[10]. Similarly, it is essential for athletes to prevent themselves from unintentionally taking banned performance enhancing substances. For example, research has found that more than 10% of nutritional supplements (e.g., multivitamins, minerals, and amino acids) on the market contain stimulants, anabolic steroids, or other prohibited substances[11]. Likewise, there is evidence about patterns of binge drinking and the use of illicit drugs (e.g., marijuana, cocaine) among youth and adult sport players in recreational, amateur, and elite level [12] where these substances are banned in certain sports (e.g., alcohol in golf) or situations (e.g., marijuana during competition) according to the anti-doping code. Moreover, in some situations, athletes may perceive pressure from the team manager, coaches, and their peers or teammates who pressure them to take performance-enhancing drugs[13]. Hence, to effectively avoid doping in sport, athletes have to equip themselves with better knowledge about the substances or medical procedures that are prohibited in sport, be aware of the presence of these substances or methods in their daily life (e.g., taking supplements or pills for medical/ health reasons, admitted to the hospital for treatment), and be prepared to avoid or handle situations where they are offered drugs, unknown food, or drinks that might possibly contain prohibited substances.[5, 14] Understanding the psychological factors underlying these various behaviors, could be highly useful for promoting athletes' proactive actions into doping avoidance.[5, 14] In this study, we aim to apply the trans-contextual model of motivation[15, 16] to explain the motivational and social-cognitive pattern of doping avoidance among elite and sub-elite athletes.

The Trans-Contextual Model

The trans-contextual model (TCM)[16] integrates the hierarchical model of motivation (HMM)[17], self-determination theory (SDT)[18], and the theory of planned behavior (TPB)[19] to explain the processes by which motivation in one behavioral context (e.g., engaging in formal physical education activities) influences motivation and social-cognitive variables toward behavior in a

related context (i.e., leisure-time physical activity). Based on the HMM and SDT, the TCM posits that when an individual is motivated more by autonomous motivation (i.e., personal interests, values, and life goals consistent with sense of self) than controlled motivation (i.e., for externally referenced reasons, contingent self-worth, or avoiding guilt and shame) for one particular behavior, then he/she is more likely to be motivated by autonomous motivation rather than controlled motivation to engage in another related behavior[15, 16]. The TCM also incorporates concepts from the TPB[19], and articulates that the relationship between motivation and intention in the secondary behavioral context is mediated by attitude (i.e., one's subjective evaluation of the behavior), subjective norm (i.e., perceived appropriateness and prevalence of the behavior by significant others), and perceived behavioral control (PBC; i.e., perceived controllability over the behavior).

Initial evidence for the TCM was obtained from physical education, where students' self-determined motivation in physical education was predictive of their self-determined motivation (i.e., a pattern highlighted by high autonomous motivation and low controlled motivation) in leisure-time physical activity, and attitude, subjective norm, and PBC were shown to be the mediators of the relationship between self-determined motivation and intention of leisure-time physical activity[15]. The tenets of the model also have been applied in health and safety contexts, such as injury prevention and rehabilitation[20]. Thus, evidence has been provided to demonstrate that motivation can transfer from a general context (e.g., motivation in sport or work) to a specific health-related behavior within the behavioral context (e.g., motivation for injury prevention). It may be that individuals are able to draw from these motivational 'scripts' and use them as the basis for motivation and action in similar contexts. In addition, if a particular behavior in a given context is one that optimally services basic psychological needs for autonomy, then similar behaviors may also serve this function and may therefore lead to matched motivational orientations toward similar behaviors across contexts[16, 17, 20]. This leads to our speculation that the TCM could be applied to explain the process by which sport motivation predicts motivational and behavioural patterns of anti-

doping actions among athletes. This argument could be partially supported as motivation in sport (a general sport context) has been shown to predict attitude and intention of doping (a sport-related context) in previous studies.

Barkoukis and colleagues found that an aggregate measure of self-determined motivation in sport, known as the relative autonomy index, was negatively associated with attitudes and subjective norms toward doping [8], as well as with intentions toward doping [8, 9]. Moreover, a recent study by Hodge and colleagues [7] indicated that a controlling coaching climate (i.e., the psychosocial antecedent of controlled motivation according to SDT) [18], and controlled motivation in sport were indirectly related to athletes' doping attitude and susceptibility toward performance enhancing drugs. Finally, a recent meta-analysis summarizing all published and unpublished data about the psychological factors of doping showed that autonomous motivation and controlled motivation in sport were in general a negative predictor and a positive predictor (respectively) of doping intention [4].

Overall, both theory and research indicate that intentions and attitudes toward doping are likely to be reduced when an athlete endorses more autonomous motivation and less controlled motivation for their sport. Nevertheless, the complete process of how sport motivation would be linked to intentions toward doping avoidance, and whether the link would be mediated by motivation for doping avoidance and social-cognitive variables, has not been previously researched. The trans-contextual linkage between motivation for sport and motivation for doping avoidance is theoretically sound because autonomously motivated athletes are more likely to oppose the use of banned performance-enhancing substances because doping is perceived to be against personal values and moral codes that they identified with in sport[7], and according to TCM[15, 16], they are more likely to be autonomously engaging in doping avoidance because the behavior is consistent with their global motivational orientations in sport[20]. In contrast, athletes engaged in sport for controlled reasons might avoid taking banned performance-enhancing substances in order to stay away

from the negative consequences of doping (e.g., getting caught, lengthy ban, poor reputation) that are likely to affect their goal attainments (e.g., winning and gaining financial rewards) in sport[20]. Hence, The TCM might be a plausible framework that could offer explanation of the trans-contextual mechanism of the psychological variables between the overall sport context and anti-doping sub-context.

The Present Study

This study involves a test of the TCM in relation to examining whether motivations in sport are predictive of motivations and social-cognitive factors related to doping avoidance. In the current study we make a clear distinction between three types of motivation: autonomous motivation, controlled motivation; and amotivation (i.e., lack of intrinsic and extrinsic reasons behind the action) within the TCM, which is closer to its original specification[15]. This is in contrast to previous studies of the TCM that typically adopts a single aggregate construct comprising weighed averages of the different self-determination theory constructs, known as the relative autonomy index[16, 20]. In addition, the relative autonomy index does not take amotivation into account, so previous studies have not examined the trans-contextual relationship of amotivation across two behavioral contexts. This study, therefore, is not only a preliminary application of the TCM in an anti-doping context, but also provides an initial test of the trans-contextual relationship of amotivation between two contexts.

Based on the tenets of the TCM and from research elsewhere, we propose the following hypotheses (see Figure 1 for the hypothesized pathways of the TCM in doping avoidance):

(1) Autonomous motivation, controlled motivation, and amotivation in sport would be positively associated with their corresponding types of motivation in the context of doping avoidance.

(2) The associations of the non-corresponding types of motivation between the two contexts (e.g., autonomous motivation in sport and controlled motivation in doping avoidance) would be negative or statistically non-significant.

(3) Autonomous motivation, controlled motivation, and amotivation in sport would be a positive predictor, negative/ statistically non-significant predictor, and negative/ statistically non-significant predictor of each of the social-cognitive variables from the TPB (i.e., attitude, subjective norm, and PBC), respectively, and intention of doping avoidance.

(4) The predictive effect of autonomous motivation for doping avoidance on the social-cognitive variables and intention would be positive, but that of controlled motivation and amotivation in doping avoidance would be negative or statistically non-significant.

(5) The effects of motivation for doping avoidance on intention would be mediated by the social-cognitive variables from the TPB (attitude, subjective norm, and PBC)[1].

Insert Figure 1 about here

Method

Ethical approval for the study was obtained from the Human Research Ethics Committee of [name masked for blinded review] University. Questionnaire data were obtained from 410 young athletes (mean age = 17.70, *SD* = 3.92; male = 55.4%) who regularly received sport training in the [name masked for blinded review] Institute of Sport. Participants were elite (35.7% of the sample were national level, 1.3% international level, 1.8% world-class) or sub-elite (22.9% regional level, 29.4% state level,) athletes of a number of different sports, including six individual sports (i.e., athletics track, athletics field, badminton, gymnastic, swimming, and triathlon; 39.9%), and six team sports (i.e., cricket, soccer, basketball, field hockey, rugby, and water polo; 60.1%). On average, they had 12.4 hours of training per week (*SD* = 5.6 hours) and had participated in their sport for 9.1 years (*SD* = 3.2). We ensured that participants understood the aims of the study, including their rights of participation. Participants and their parent/legal guardians had to sign a consent form before they could begin the survey.

To evaluate motivation in sport, the Behavioral Regulation in Sport Questionnaire (BRSQ)[21],

was used and we followed Hodge and colleagues'[7] formula to compute the indicator scores for autonomous motivation and controlled motivation. The latent factor of amotivation used the original item responses as the indicators. To measure motivation for doping avoidance, we adapted the items from the Treatment Self-Regulation Questionnaire (TSRQ)[22] to measure motivation for doping avoidance. The adaptation was based on the results of an open-ended pilot survey among 57 elite and sub-elite athletes (*Mean age* = [18.02, *SD* =2.72) regarding the pros and cons of doping. Finally the measurement of the social-cognitive variables (i.e., attitude, subjective norm, PBC, and intention) was constructed according to Fishbein and Ajzen's guidelines[5]. Appendix A contains the items and anchors of all the scales used in the present study.

Variance-based structural equation modeling (VB-SEM) was employed using the WarpPLS 3.0 statistical software to examine the hypothesized model. Unlike the typical covariance-based structural equation modeling where the model estimates are biased by sample size and normality, VB-SEM benefits from the use of a distribution-free algorithm, namely partial least-squares, for the estimation of goodness-of-fit and parameter estimates. The algorithm permits the estimation of error-free latent factors regardless of the complexity of the model, small sample size, or non-normality of the data. Therefore, VB-SEM is very useful for predictive research, particularly when the models have hierarchical and complex structures.

In VB-SEM, factor loadings, cross-loadings, average variance extracted (AVE), composite score reliability, and Cronbach's alpha are used to reveal the convergent and discriminant validity of the hypothesized factors. Goodness-of-fit (GoF) index, averaged R-squared (ARS), averaged variance inflation factor (AVIF), and averaged path coefficient (APC) may reveal the global fit of the model. When the GoF (for medium effect size) exceeds .25, the *p*-values of ARS and APC are less than .05, and the AVIF is less than 5, the global fit of the model is considered acceptable[23]. A bootstrapping resampling technique with 999 replications was implemented in VB-SEM to produce the averaged path estimates, direct and indirect effects,

and associated significance levels among replicated samples. Mediation analysis was used for examining whether the relationship between motivation for sport and the social-cognitive variables was mediated by motivation for doping avoidance. Mediation was only shown when the mediator established statistically significant links with sport motivation and the social-cognitive variables, and the direct effect, total indirect effects of sport motivation on the social-cognitive variables were statistically significant. When these pre-requisites of mediation were met, full mediation was shown when controlling the effects of mediator led to a statistically non-significant direct effect of sport motivation on the social-cognitive variables. Otherwise mediation was considered as partial. Another set of mediation analyses was conducted to test whether the social-cognitive variables mediated the relationship between motivation for doping avoidance and intention. Participants' age, gender (1 = male, 2 = female), type of sport (1 = individual sport, 2 = team sport), and sport level (1 = sub-elite, 2 = national level, 3 = international level, 4 = world-class) were included as covariates of the PLS models and mediation analyses.

Results

An examination of the measurement level of the hypothesized model by VB-SEM revealed that the convergent and discriminant validity of the latent variables in this study were acceptable[23]. The Cronbach's alpha (range = .70 to .93), composite score reliability (range = .81 to .95), AVE (range = .52 to .82), and factor loadings (range = .71 to .91) met published criteria for acceptable convergent validity. Results also showed acceptable levels of discriminant validity indices. The factor loadings were higher than the cross-loadings by an average of .59 (range = .42 to .87), and the squared-root of the AVE was higher than the mean factor-to-factor correlation of any latent factor by an average of .70 (range = .55 to .91). Finally, the goodness-of-fit indicators (GoF = .35; ARS = .16, $p < .01$; AVIF = 1.30; APC = .11, $p < .01$) also revealed that the hypothesized model supported the data acceptably according to published criteria for a well-fitting model for VB-SEM. Appendix B displays the

latent-factor correlation matrix, descriptive statistics, and details of the validity indices for each factor.

In relation to the structural level model, autonomous motivation in sport was positively associated with autonomous motivation, controlled motivation, attitude, subjective norm, PBC, and intention for doping avoidance, and negatively associated with doping avoidance amotivation. Mediation analysis revealed that the effects of autonomous motivation in sport on attitude (partial mediation with autonomous motivation in doping avoidance as the statistically significant mediator), subjective norm (full mediation with all three types of motivation in doping avoidance as statistically significant mediators), and PBC (partial mediation with autonomous motivation for doping avoidance as the statistically significant mediators) were statistically significantly mediated by motivations for doping avoidance. The effect of autonomous motivation for sport on intention was fully mediated by autonomous motivation for doping avoidance, subjective norm, and PBC.

Controlled motivation for sport was negatively correlated with doping avoidance, autonomous motivation, amotivation, attitude, and subjective norm, and unexpectedly, it was positively correlated with amotivation in sport. Mediation analysis revealed that the effects of controlled motivation for sport on attitude (partial mediation with autonomous motivation in doping avoidance as the statistically significant mediator) and subjective norm (full mediation with autonomous motivation and amotivation in doping avoidance as the statistically significant mediators) were statistically significantly mediated by autonomous motivation and amotivation for doping avoidance. The effect of controlled motivation for sport on intention was not statistically significant.

Amotivation for sport established a statistically significant and positive relationship with amotivation for doping avoidance, but did not statistically significantly predict other

motivational and social-cognitive variables of doping avoidance. Hence, the proposed mediations in relation to amotivation for sport were not supported.

Regarding the links between the variables in the doping avoidance context, autonomous motivation for doping avoidance formed positive relationships with attitude, subjective norm, PBC, and intention. The positive effect of autonomous motivation for doping avoidance on intention was fully mediated by subjective norm and PBC. Controlled motivation in doping avoidance unexpectedly linked positively to subjective norm. The indirect effects of controlled motivation and amotivation for doping avoidance on intention were not statistically significant, so the mediation role of the social-cognitive variables was not supported. Finally, subjective norm and PBC were positively related to intention, but the relationship between attitude and intention was not statistically significant. The fit indices, bootstrapped estimates, and effect decompositions of the models are presented in Table 1. Figure 2 displays the path estimates and explained factor variances in the mediation model.

Insert Figure 2 and Table 1 about here

Discussion

The present study is the first study investigating the psychological factors associated with intention of doping avoidance, and is also the first test of the TCM in the context of anti-doping in sport. The results generally supported the tenets of the TCM[15, 16], insofar as self-determined motivation in the general context of sport was related to self-determination in the specific behavioral context of doping avoidance. The findings not only enrich theoretical understanding about how motivational dynamics operate within the TCM, but they also provide an initial evidenced-based explanation as to why self-determined motivation in sport could be related to athletes' behavioral responses of doping avoidance[7].

The positive autonomous-autonomous relationship, negative autonomous-amotivation relationship, negative controlled-autonomous relationship, positive controlled-amotivation relationship, and positive amotivation-amotivation relationship between sport and doping

avoidance are consistent with the propositions of the TCM regarding relationships of forms of motivation across two related contexts[15, 16]. Our introduction of amotivation into the TCM has drawn a clearer picture about the transfer of motivation along the continuum of self-determination. Such findings could extend the tenets of the locus of causality[24] where the motivational orientations of SDT aligned along the continuum of self-determination[21] would correlated stronger and more positive to those being closer together (e.g., intrinsic motivation and identified motivation) than those being further apart (e.g., introjection and extrinsic motivation). Although we did not specify the type of motivation in autonomous motivation and controlled motivation, we essentially provided initial evidence about the trans-contextual process of the locus of causality across contexts because autonomous motivation for sport tended to form a stronger and more positive correlation with autonomous motivation for doping avoidance than it did with controlled motivation and amotivation in doping avoidance. Likewise, the negative controlled-autonomous relationship, positive controlled-amotivation, and positive amotivation-amotivation relationship of motivations between sport and doping avoidance could also support this argument. Therefore, the present study might have provided additional theoretically-consistent findings among the constructs within trans-contextual model, as the findings generally supported hypotheses that forms of motivation from the perceived locus of causality in one context would be more likely to form positive and stronger relationships with the corresponding types of motivation in the other related context.

The pattern of relations was fully supported by the data except the positive relationship between autonomous and controlled motivation. The finding is in contrast with hypotheses of the TCM and could be due to the possibility that the endorsed values of autonomously-motivated athletes (e.g., exploring personal sporting potential, seeking challenges, experiencing a sense of enjoyment and true accomplishment), might exaggerate the perceived severity of the consequences for breaking the anti-doping code (e.g., feelings of guilt, shame, and regret)[2, 5, 13], making them even more obliged to engage in doping avoidance, considering the destructive effects of doping on their core values in sport. Yet,

these arguments should be investigated in further research, particularly the reasons why autonomously motivated athletes would avoid doping for controlled reasons.

The relationship between autonomous motivation in sport and intention of doping avoidance is not direct, but it is rather mediated by the motivational orientations and the social-cognitive factor of doping avoidance. Such mechanisms support the tenets of TCM, and provide an alternative and more in-depth understanding of why self-determined motivation in sport might be related to the social-cognitive variables[8], intention[4, 8, 9], and susceptibility[7] of doping. On the other hand, the corresponding predictive effects of controlled motivation in sport were either negative (i.e., controlled motivation → attitude, subjective norm) or not statistically significant, as expected. In agreement with the tenets of SDT[18, 25], our findings reveal that controlled motivation in sport is less likely to related to adaptive behavioral patterns. The findings may imply that athletes who participate in sport for money, winning, avoidance of pressure, or pride, are less likely to have positive attitudes toward doping avoidance, and they tended to perceive that their significant others (e.g., coach) did not support doping avoidance. Stewart and Smith[2] have nicely summarized the literature on how globalization, commercialization, and culture in sport has led to more pressure on athletes to win or to attain financial rewards, and the resulting motivational patterns in sport could set the stage for some athletes who consider doping as a way to cheat in sport. In a similar vein, our findings have demonstrated that athletes who perceived their reasons for participating in sport as controlling rather than autonomous are less likely to regard doping avoidance as a behavior in which they should engage. However, further research is required to incorporate basic need satisfaction into the application of TCM in the doping avoidance context[20].

Finally, the statistically non-significant predictive effects of amotivation in sport on the social-cognitive variables and intention clearly demonstrated that we had to examine amotivation as a unique construct of motivation, rather than using a low relative autonomy index score as an indicator of amotivation[8, 9]. Otherwise, the statistically non-significant effect of amotivation

would elevate the error variance of self-determined motivation in the prediction of the doping avoidance outcomes. Although amotivation in sport was not a statistically significant predictor of doping avoidance, it was a strong negative predictor of autonomous motivation in sport, a finding that is consistent with those from other studies[7-9]. The findings again highlight the importance of fostering amotivated athletes' sense of ownership to their sport behaviors which may counteract the potential for autonomous motivation to be undermined in other related contexts such as doping avoidance.

Autonomous motivation in doping avoidance was predictive of attitude, subjective norm, and PBC, but its positive effect on intention was mediated by subjective norm and PBC only. This pattern of result was generally congruent with the propositions of the TCM regarding the theoretical integration between SDT and the TPB[15, 16], and the findings of previous studies that examined the relationships between these constructs in health contexts[26, 27]. The results addressed the importance of autonomous motivation in the decision-making process of health behaviors. Indeed, controlled motivation for doping avoidance surprisingly exerted a positive effect on intention in the similar magnitude to that of autonomous motivation for doping avoidance, but the hypothesized mediation through the social-cognitive variables was not supported. This leads to our speculation that the predictive effect of controlled motivation for doping avoidance on intention could be more direct than that of autonomous motivation.

This could be attributed to fact that the existing strategies and culture for doping avoidance in sport have been very controlling[2]. Elite athletes are regularly being inspected or monitored for any suspicious doping activities, and those who caught engaging in doping are identified and heavily punished[3]. Therefore, the most compelling reasons for athletes to decide not to dope in sport could be the negative consequences of doping, including lengthy bans from sport, a bad reputation, and health side-effects[2, 6], which are very controlling in nature according to SDT[18]. In this special environment, the primary motive for athletes to avoid doping might well be controlled motivation because it is apparently consistent with the

motivational climate of behavioral context[28]. Thus, controlled motivation might have a unique role of the behavioral pattern in doping avoidance, which warrants further research to scrutinize the motivational mechanism.

However, subjective norm was positively predicted by controlled motivation and negatively predicted by amotivation. Although their corresponding mediation pathways to the prediction of intention were not supported, the findings still provided partial support of theoretical integration between SDT and the TPB[26, 27]. A previous study in injury prevention context with reported positive association between controlled motivation and subjective norm[26]. Our findings may imply that athletes who are endorsing controlled motivation in doping avoidance perceive social approval of the behavior from their significant others, but the indirect effect of controlled motivation on intention via the perception of normative influence does not appear to be effective. Overall, the findings regarding motivation in doping avoidance suggest that the anti-doping movement predominantly led by controlled reasons, such as legislation and law-reinforcement, might be somewhat useful, but fostering athletes' autonomous motivation by increasing their intrinsic value and sense of ownership to doping avoidance could be a better approach because autonomous motivation is related to behavioral intention through a number of direct and indirect pathways.

A number of limitations of this study should be addressed, so we should cautiously interpret our findings, and suggest future research directions for overcoming these limitations. The cross-sectional design with correlational analysis means that causal inferences based on the current findings should be avoided. The complexity of the TCM creates a lot of challenges in conducting an experiment (e.g., randomized controlled trials) because the transfer of each type of motivation should be tested independently, and it is difficult to manipulate one variable while holding or controlling all the other related variables in the model. A longitudinal study with cross-lagged panel design or latent growth curve analysis might be a more practical solution, but adequate time or a very careful experimental manipulation should be

given to enable a precise observation of how the variation of motivation in sport could be associated with the changes of the motivational patterns in doping avoidance. In addition, the self-reported measures adopted for the doping-related variables could also be affected by social desirability and response bias. Also, the sample consisted of young and elite/ sub-elite athletes who participated in competitive sports, so the findings might not be generalizable to recreational level or senior sport players, and the participants of other sport events (e.g., bodybuilding, fitness, and dancing). Future studies should consider social desirability as a potential mediator or control variable in the TCM of doping avoidance, and should replicate the study with more variety of sport participants.

On top of methodological limitations, our study was theoretically limited as it merely examined relationships between psychological variables. There were no measures of the social environment (e.g., culture, coaching style) or behavioral outcomes (e.g., the use of banned performance enhancing substances, the adherence of doping avoidance behavior). Hodge and colleagues[7] examined the effects of perception of autonomy support and controlling behaviors from coaches and teammates on athletes' motivation in sport and their susceptibility of doping. These psychosocial environments (autonomy support/ controlling behavior), according to SDT[18, 25], are factors that influence individuals' motivational pattern, so further studies should include the measures of these psychosocial factors while tapping the athletes' perception of autonomy and controlling environmental conditions (e.g., provided by coaches, teammates, family, doping control officers) regarding the doping/ anti-doping in sport. Also, doping avoidance may involve a broad range of behaviors, and doping could take place at any time and anywhere, so we should develop better methods to reliably and objectively measure doping avoidance. The use of an implicit association test might be a feasible solution for measuring the awareness of doping, as growing amounts of studies have applied this technique to measure implicit attitudes towards doping[29, 30].

Conclusion

The present study has brought forth a number of theoretical contributions for the research concerning about the TCM and the psychological aspects of doping in sport. The findings regarding the interplay of autonomous motivation, controlled motivation, and amotivation between the contexts of sport and doping avoidance not only advanced the theoretical knowledge about the trans-contextual process of motivation, but it also provides initial evidence-based explanation about why motivation in sport could be related to the motivational and social-cognitive patterns of doping. The findings suggest that athletes being autonomously motivated for sport, in comparison to those being controlled motivated or amotivated for sport, are more likely to be autonomously motivated for doping avoidance, a motivational orientation that is shown to be the most favorable to the formation of positive attitude, subjective norm, PBC, and intention of doping avoidance.

Practical implications

- The patterns of results depict that controlled motives in sport such as winning and financial rewards are linked to less adaptive motivational and social-cognitive patterns of doping avoidance.
- Although controlled motives for doping avoidance that are reinforced by the external pressure, punishment, legislation and doping control process, are also positive predictors of behavioral intention of doping avoidance, researchers and practitioners in anti-doping should begin to look at the potential benefits of facilitating athletes' autonomous values, life meanings, and the satisfaction of learning and personal growth in sport.
- Promotion of autonomy alongside an anti-doping educational program that focuses on athletes' attitudes, normative beliefs, and self-efficacy with respect to anti-doping is important because such motives are important in promoting adaptive behavioral patterns toward doping avoidance.

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Footnote

[1]We did not draw any hypotheses regarding the relationships between the social-cognitive variables and intention of doping avoidance because the data for such relationships have been reported in another manuscript about the application of the theory of planned behavior into doping avoidance[5]. However, the data regarding motivation in sport and motivation in doping avoidance has not been reported in any previous studies. This study, therefore, focused on the motivational dynamics between these two contexts and how motivations link to the social-cognitive variables and intention of doping avoidance.

Table 1: Path estimates of the PLS model and the results of mediation analysis.

Path	Mediators	IV → Mediator	Mediator → DV	Direct Effect	Combined Effect	Indirect Effect	Total Effect	Type of Mediation
Auto-Sport → Attitude	Auto-Davoid	.28**	.31**	.20**	.12*	.08**	.21**	Partial
	Cont-Davoid	.26**	.10					
	Amo-Davoid	-.14*	-.03					
Auto-Sport → Norm	Auto-Davoid	.28**	.24**	.17**	.08	.09**	.17**	Full
	Cont-Davoid	.26**	.16**					
	Amo-Davoid	-.14*	-.07**					
Auto-Sport → PBC	Auto-Davoid	.28**	.29**	.24**	.17**	.06*	.24**	Partial
	Cont-Davoid	.26**	.07					
	Amo-Davoid	-.14*	-.07					
Auto-Sport → Intention	All mediators	−	−	.16**	.01	.07*	.18*	Full
Cont-Sport → Attitude	Auto-Davoid	-13*	.31**	-.12**	-.09*	-.04**	-.12*	Partial
	Cont-Davoid	-.09	.10					
	Amo-Davoid	.14*	-.03					
Cont-Sport → Norm	Auto-Davoid	-13*	.24**	-.17**	-.13*	-.04*	-.17**	Partial
	Cont-Davoid	-.09	.16**					
	Amo-Davoid	.14*	-.07**					
Cont-Sport → PBC	Auto-Davoid	-13*	.29**	.01	-.03	-.03	-.05	None
	Cont-Davoid	-.09	.07					
	Amo-Davoid	.14*	-.07					
Cont-Sport → Intention	All mediators	−	−	.13**	-.08	-.02	-.13*	None
Amo-Sport → Attitude	Auto-Davoid	-18	.31**	-.15	-.09	-.04	-.13	None
	Cont-Davoid	.07	.10					
	Amo-Davoid	.29**	-.03					
Amo-Sport → Norm	Auto-Davoid	-18	.24**	-.08	-.01	-.03	-.02	None
	Cont-Davoid	.07	.16**					
	Amo-Davoid	.29**	-.07**					
Amo-Sport → PBC	Auto-Davoid	-18	.29**	-.17	-.09	-.02	-.12	None
	Cont-Davoid	.07	.07					
	Amo-Davoid	.29**	-.07					
Amo-Sport → Intention	All mediators	−	−	.08	.00	-.02	-.05	None
Auto-Davoid → Intention	Attitude	.31**	.07	.25**	.11	.13**	.24*	Full
	Norm	.24**	.19*					
	PBC	.29**	.38**					
Cont-Davoid → Intention	Attitude	.10	.07	.21**	.16*	.04	.20**	None
	Norm	.16*	.19*					
	PBC	.07	.38**					
Amo-Davoid → Intention	Attitude	-.03	.07	-.13	.08	-.01	.08	None
	Norm	-.07*	.19*					
	PBC	-.07	.38**					

Note. IV = independent variable; DV = dependent variable; Auto-Sport = autonomous motivation in sport; Cont-Sport = controlled motivation in sport; Amo-Sport = amotivation in sport; Auto-Davoid = autonomous motivation in doping avoidance; Cont-Davoid = controlled motivation in doping avoidance; Amo-Davoid = amotivation in doping avoidance; Norm = subjective norm; PBC = perceived behavioral control. Age, gender, sport type, and sport level were control variables that were inserted as covariates of all VB-SEM analyses, and their parameter estimates in the models could be obtained from the first author on request. ** $p < .01$ at 2-tailed, * $p < .05$ at 2-tailed.

Figure legends

Figure 1: The hypothesized trans-contextual model of motivation for anti-doping.

PBC = perceived behavioral control. The black vectors are hypothesized positive paths. The broken vectors are hypothesized negative or statistically non-significant paths.

Figure 2: The path estimates and explained factor variances of the mediation model.

PBC = perceived behavioral control. The black vectors are statistically significant positive paths. The broken vectors are statistically significant negative. The non-significant paths, and the paths associated with the control variables (i.e., age, gender, sport type, and sport level) are omitted for clarity reason.

Appendix A

Scales and Items for this Study
(Supplementary Online Material)

Scale	Items
Behavioral Regulation in Sport Questionnaire	Anchors: 1 = not true at all, 7 = very true. Stem: I participate in my sport … Intrinsic Motivation (4 items) Because I enjoy it. Integrated Motivation (4 items) Because it allows me to live in a way that is true to my values. Identified Motivation (4 items) Because the benefits of sport are important to me. Introjected Motivation (4 items) Because I would feel guilty if I quit. External Motivation (4 items) Because I feel obligated to continue. Amotivation (4 items) But I wonder what's the point.
Treatment Self-Regulation Questionnaire for Doping Avoidance	Anchors: 1 = not true at all, 7 = very true. Stem: I avoid using banned performance-enhancing substances/ methods in sport … Autonomous Motivation 1. Because I feel that I want to take responsibility for my actions. 2. Because I personally believe it is the best thing for me. 3. Because I have carefully thought about it and believe it is very important for many aspects of my life. 4. Because I don't like using banned substances / methods. 5. Because it is consistent with my life goals. 6. Because I personally feel that avoiding using these substances/ methods is very important. Controlled Motivation 1. Because I would feel guilty or ashamed of myself if I used these substances / methods. 2. Because I would feel bad about myself if I used these substances / methods. 3. Because I feel pressure from others to do so. 4. Because I would receive a lengthy ban from sport if I got caught using these substances/ methods. Amotivation 1. But, I really don't think about why. 2. Because it is easier to do what I am told than think about it. 3. But, I don't really know why.
The Theory of Planned Behavior Items for Doping Avoidance	Anchors: 1 = Strongly disagree, 7 = Strongly agree. Stem: For me, to avoid using banned performance-enhancing substances/ methods in sport in the forthcoming month is something … Intention 1. I intend to do 2. I will try to do 3. I plan to do

Subjective Norm

1. Most people who are important to me in sport think that I should do
2. Expected of me
3. The people in my life whose opinions I value would approve me to do
4. Many people like me to do

Perceived Behavioral Control

1. Possible for me to do
2. I could do if I want to
3. Over which I have complete control
4. That is completely down to me to decide to do
5. Easy for me to do

Attiude

Stem: For me, to avoid using banned performance-enhancing substances/ methods in sport in the forthcoming month is …

Anchors:

1. 1 = Useless, 7 = Useful.
2. 1 = Foolish, 7 = Wise.
3. 1 = Undesirable, 7 = Desirable.
4. 1 = Negative, 7 = Positive.
5. 1 = Harmful, 7 = Beneficial.
6. 1 = Disadvantageous, 7 = Advantageous.

Note. We only display one example item per dimension for BRSQ are displayed due to copyright reasons. Please refer to Lonsdale and colleagues[21] for the items of BRSQ.

Appendix B

Correlation Matrix and Convergent Validity Indices
(Supplementary Online Material)

Correlations										
	1	2	3	4	5	6	7	8	9	10
1. Autonomous Motivation in Sport	1									
2. Controlled Motivation in Sport	.02	1								
3. Amotivation in Sport	-.14**	.80**	1							
4. Autonomous Motivation in Doping Avoidance	.34**	-.26**	-.29**	1						
5. Controlled Motivation in Doping Avoidance	.27**	-.13**	-.14**	.69**	1					
6. Amotivation in Doping Avoidance	-.12*	.36**	.41**	-.01	.05	1				
7. Attitude	.28**	-.20**	-.21**	.39**	.30**	-.03	1			
8. Subjective Norm	.19**	-.21**	-.21**	.36**	.31**	-.11	.44**	1		
9. Perceived Behavioral Control	.26**	-.11*	-.17**	.37**	.28**	-.01	.39**	.43**	1	
10. Intention	.20**	-.11*	-.09	.25**	.26**	.00	.25**	.41**	.43**	1
Control Variables										
11. Age	-.01	.05	.05	.06	.05	.04	.07	.02	-.02	.03
12. Gender	.13*	-.06	-.09	.17**	.16**	-.05	.17**	.11*	.14**	.05
13. Sport Type	.04	-.05	-.10*	-.04	.00	-.12*	.05	.03	-.01	-.06
14. Sport Level	-.11*	.00	.01	.11*	.14**	.03	-.02	.06	.07	.08
Mean	25.10	14.85	2.93	6.11	6.10	3.95	6.35	6.29	5.93	6.18
SD	3.90	7.21	1.80	1.06	1.12	1.85	1.09	1.37	1.53	1.60
α	.91	.93	.89	.82	.79	.76	.82	.70	.86	.89
Composite Score Reliability	.94	.95	.92	.87	.87	.86	.87	.81	.90	.93
Average Variance Extracted	.79	.82	.75	.52	.62	.67	.53	.54	.64	.82
Square roots of AVEs	.89	.90	.87	.72	.79	.82	.73	.73	.80	.90
Mean factor loadings	.89	.90	.86	.72	.78	.82	.73	.71	.80	.90
Mean crossed loadings	.13	.00	-.02	.17	.18	.05	.15	.16	.17	.15

**p < .01 at 2-tailed, *p < .05 at 2-tailed.