Young Athletes' Awareness and Monitoring of Anti-Doping in Daily Life:
Does Motivation Matter?

Derwin K. C. Chan¹, Robert J. Donovan¹, Vanessa Lentillon-Kaestner², Sarah J. Hardcastle¹,
James A. Dimmock³, David A. Keatley¹, & Martin S. Hagger¹

Curtin University, Australia¹

University of Teacher Education, Switzerland²

University of Western Australia, Australia³

Correspondence concerning this article should be addressed to Derwin K. C. Chan, Health Psychology and Behavioural Medicine Research Group, School of Psychology and Speech Pathology, Faculty of Health Sciences, Curtin University, Perth, Australia. Email:

derwin.chan@curtin.ac.uk or kc.derwin@gmail.com

Acknowledgement

This project was funded by the Australian Government Anti-Doping Research Programme (#01-CURTIN-2011-12) awarded to Prof. Martin Hagger (Curtin University, Australia).

Abstract

This study was a preliminary investigation into the prevention of unintentional doping on the basis of self-determination theory (SDT). Specifically, we examined the relationship between athletes' motives for doping avoidance and their behavior when offered an unfamiliar food product. Participants were young Australian athletes (N = 410) that were offered a free lollipop prior to completing a questionnaire. It was noted whether participants refused to take or eat the lollipop and whether they read the ingredients of the lollipop. The questionnaire assessed autonomous and controlled forms of motivation, amotivation, doping intentions, and adherence regarding doping avoidance behaviours. The results showed that young athletes who adopted controlled reasons to avoid doping in sport (e.g., not getting caught) tended to report higher adherence to behaviours related to avoiding and monitoring banned substances, whereas those who adopted autonomous reasons (e.g., anti-doping being consistent with life goals) appeared to be more willing to read the ingredients of the provided food. The significant interaction effect between autonomous and controlled motivation indicated that autonomous motivation was more predictive to doping intention for athletes with low controlled motivation. It is concluded that SDT may help understand the motivational processes of the prevention of unintentional doping in sport.

Keywords: Doping avoidance; substance abuse; drug control in sport; banned performance-enhancing substances.

Young Athletes' Awareness and Monitoring of Anti-Doping in Daily Life:
Does Motivation Matter?

Despite the efforts of sport medicine professionals and governing bodies in doping detection, education, and prevention, there have been few indications of a substantive reduction in doping incidence in the past decade (Laure & Binsinger, 2007; Laure et al., 2004; World Anti-Doping Agency, 2012). Research examining the factors that drive doping practices in sport has focused on the psychological antecedents of doping behaviour (Lucidi et al., 2008; Petroczi, 2007; Wiefferink et al., 2008), and there is substantive evidence that doping practices are linked to athletes' moral values and general beliefs about the consequences of their behaviour (Hoff, 2012; Lentillon-Kaestner et al., 2012; Petroczi, 2007). Psychological factors such morality (Jalleh et al., 2013), moral disengagement (Hodge et al., 2013; Lucidi et al., 2008; Zelli et al., 2010), attitude, subjective norm, and perceptions of control (Gucciardi et al., 2010; Lucidi et al., 2004; Lucidi et al., 2008; Zelli et al., 2010) have been shown to be important predictors of athletes' intention to dope, susceptibility to doping, and doping behaviour.

The aforementioned studies are based on the assumption that doping is a goal-directed and self-regulated behaviour governed by athletes' decision-making process (Gucciardi et al., 2011; Petroczi & Aidman, 2008). However, in reality, a highly moral athlete who dislikes doping and intends not to dope is still susceptible to unintentionally taking banned substances or using banned medical treatments. Unintentional doping can occur when athletes do not realize the food, drinks, nutritional supplements, or medication they take in daily life contain prohibited substances (Lamont-Mills & Christensen, 2008). It has been reported that more than one in every ten nutritional supplements on the market (e.g., multivitamins, minerals,

and amino acids) contain banned substances such as stimulant and anabolic steroids (Baume et al., 2006; Geyer et al., 2008). Similarly, with respect to the use of illicit drugs (e.g., cannabis, cocaine) and binge drinking (i.e., alcohol), which are evident among youth and adult sport players of all levels (Ama et al., 2003; Moore & Werch, 2005), athletes will be at risk of unintentional doping if they are not aware that these are prohibited in certain sports (e.g. cocaine during competition, alcohol use in darts and golf; World Anti-Doping Agency, 2013).

The avoidance of unintentional doping, therefore, requires considerable conscious effort and vigilance by athletes in monitoring their diet and supplement use as they go about their daily routine (Lentillon-Kaestner, 2013; Lentillon-Kaestner & Carstairs, 2010). This includes being aware of the ingredients and chemicals in the food, drinks, supplements, and medications they take, and actively engaging in strategies to monitor the ingredients of the products they use (Chan, Dimmock, et al., 2014; Chan, Hardcastle, et al., 2014). In this study, we attempt to widen the investigation of the psychological factors associated with anti-doping, by focusing on ‘doping avoidance’; that is, how athletes can actively avoid taking banned substances in their daily life. This perspective is highly relevant to young athletes as the proportion of ‘intentional dopers’ in this age group is very small (between 1.3% and 3.0%; (Laure & Binsinger, 2007). In other words, a majority of youth athletes are “clean” and likely to stay “clean” under normal circumstances, but very few studies have attempted to examine the psychological processes associated with how young athletes would actively avoid ‘unintended’ doping in their daily life.

Self-determination theory (Deci & Ryan, 1985, 2008) has been applied to account for athletes’ motivation towards many positive or adaptive behavioural patterns in sport contexts, such as the avoidance of sport injury (SDT; Deci & Ryan, 1985, 2008), rehabilitation following sport injury (Chan & Hagger, 2012c, d), adherence to sport training, and

satisfaction with sport performance. The central proposition of SDT is that the reasons athletes endorse for their actions, or *motives*, are the antecedents of behavioural commitment and persistence. According to the theory, people are inherently inclined toward engaging in behaviours consistent with their interests, life values, and important goals (Chan & Hagger, 2012a; Chan et al., 2009). Such behaviours are characterized as *autonomously motivated*. In contrast, individuals may perform actions merely in compliance with external demands, avoidance of punishment, conforming to social pressure, attaining contingent self-worth, or avoiding internal guilt and shame. Such behaviours are characterized as *controlled motivated*. Finally, engaging in behaviours in the absence of any clear reason is termed *amotivation*. Amotivation is highlighted by the absence of both autonomous and controlled forms of motivation, and it could be attributed to inadequate confidence or learned helplessness.

According to SDT (Deci & Ryan, 1985, 2008), autonomous motivation is more effective than controlled motivation and amotivation in promoting behavioural persistence. Actions driven by autonomous motivation are perceived as emanating from one's genuine sense of self (Deci & Ryan, 1985, 2008), and are, thus, less costly in terms of effort and demand (Deci & Ryan, 1985, 2008; Hagger & Chatzisarantis, 2011; Hagger et al., 2014). With respect to doping in sport, recent studies demonstrated that autonomous sport motivation was a negative predictor of doping intentions and past use of prohibited substances in sport (Barkoukis et al., 2011; Barkoukis et al., 2013), and controlled sport motivation was a positive predictor of athletes' doping attitude and susceptibility toward performance enhancing drugs (Hodge et al., 2013). A recent meta-analysis of the psychological correlates of doping also supported the prediction of autonomous motivation and controlled motivation in sport on doping intention (Ntoumanis et al., 2013, 2014).

As far as we are aware, only one published paper has formally examined how autonomous motivation, controlled motivation, and amotivation are associated with young

athletes' intentions toward doping avoidance in sport. Chan and colleagues (2014) examined the three forms of motivation in both the context of sport and doping avoidance. They found that autonomous motivation and controlled motivation, but not amotivation, in doping avoidance were positive predictors of intention, but the effect of autonomous motivation was stronger as it forms a number of significant direct and indirect pathways to intention (Chan, Dimmock, et al., 2014). Controlled motivation is traditionally viewed as a maladaptive form of motivation that is often linked to low adherence (Deci & Ryan, 1985, 2008). Nevertheless, when it comes to the context of doping, controlled motivation might be as powerful as autonomous motivation because it fits the controlling sport culture (Chan, Dimmock, et al., 2014) where legislation, surveillance, and punishment against doping are the primary reasons that athletes typically adopt for anti-doping (Stewart & Smith, 2008). Therefore, athletes may feel 'under pressure' to avoid doping because they focus on avoiding punishment and penalties for any infringement, beliefs that have been pervasive in research on athletes doping behavior (Lentillon-Kaestner et al., 2012).

Many studies of SDT adopted the traditional view that autonomous motivation and controlled motivation (and sometime amotivation) could be combined into a single composite score to represent the overall self-determined motivation (i.e., relative autonomy index). Although this method is consistent with the locus of causality hypothesis in SDT (Ryan & Connell, 1989) and could substantially simplify the model, due to the unique adaptive role of controlled motivation in doping avoidance, it was argued that research into anti-doping motivation may be inappropriate to regard autonomous motivation and controlled motivation as two opposing constructs on a continuum of self-determination; rather, each type of motivation should be viewed as an orthogonal construct (Chan, Dimmock, et al., 2014). It is preferable because it allows a comprehensive examination of the unique effect of each type of motivation on behavioural outcomes (Chan, Dimmock, et al., 2014). In addition, recent

literature revealed that motivation could have collaborative or synergistic effects with other motivational related constructs in the behavioural context (Ratelle et al., 2007; Vansteenkiste & Lens, 2006), so the interaction between autonomous motivation, controlled motivation, and amotivation could illustrate how one type of motivation might moderate the effect of other types of motivation on the behavioural outcomes.

Purpose and Hypotheses

In the present study, we aimed to utilise SDT to explain the motivational mechanism of the avoidance of unintentionally or accidentally taking banned performance-enhancing substances in sport. We examined the propositions of SDT by exploring the relationships between young athletes' motives toward doping avoidance and their behavioural responses when offered an unfamiliar food (i.e., a lollipop of an unfamiliar brand). Based on findings from previous research (Chan, Dimmock, et al., 2014; Hodge et al., 2013; Ntoumanis et al., 2013, 2014), we hypothesized that: (1) adaptive doping avoidance actions such as refusal to take or eat the unknown food, reading the ingredients table of the unknown food, and self-reported adherence to doping avoidance behaviours would be positively associated with autonomous motivation and controlled motivation; (2) The aforementioned adaptive doping avoidance actions would not be related to amotivation; (3) Doping intention would correlate negatively with autonomous and controlled forms of motivation, and it would not be related to amotivation.

On top of these fundamental tenets of SDT, we were also interested in conducting a preliminary examination of interactive effect of autonomous motivation, controlled motivation, and amotivation on doping intention and doping avoidance behaviour. These hypothesized interactions are based on the premise that these three types of motivation have been proposed to have synergistic effects on behavioural performance (Ratelle et al., 2007). Although there has been a relative dearth of research that has explored what synergistic

effects of these motivational constructs on intention and behaviour might entail, some conceptual and empirical basis has been provided in a previous study in the education context. The study demonstrated that the effect of intrinsic goals (the antecedent goal of autonomous motivation according to SDT) on behavioural adherence and performance would be exaggerated by autonomy-supportive motivational climate, and ameliorated by controlling motivational climate (Vansteenkiste & Lens, 2006). As a consequence, we hypothesized that (4) the endorsement of one type of motivation would impair the effects of the other types of motivation on behavioural outcomes. That is, when an athlete exhibited low autonomous motivation in doping avoidance, the effects of controlled motivation and amotivation on the behavioural outcomes (e.g., doping intention) would be higher than those who endorsed high autonomous motivation.

Methods

Participants

Participants were 410 young elite and sub-elite athletes (mean age = 17.70, $SD = 3.92$; male = 55.4%) recruited from sport clubs and teams in Western Australia (22.9% regional level, 29.4% state level, 35.7% national level, 10.3% international level, 1.8% world-class). Athletes were involved in a number of different sports including six individual sports (athletics-track, athletics-field, badminton, gymnastics, swimming, and triathlon), and six team sports (basketball, cricket, soccer, field hockey, rugby, and water polo). On average, athletes reported participating in competitive sport for an average of 9.1 years ($SD = 3.2$), and trained an average of 12.4 hours per week ($SD = 5.6$ hours).

Procedures

The Research Ethics Committee of Curtin University approved the research protocol. Prior to the commencement of the study, participants and their parents or legal guardians read and signed the consent form to indicate that they fully understood the purpose of study and

their rights as participants, including the voluntary nature of their participation, that they were free to withdraw from the study or to ask their data to be deleted at any time without giving a reason, and the anonymity and confidentiality of their data. Participants received \$10 AUD in advance for their participation.

Those who agreed to participate were offered an unfamiliar brand of ‘lollipop’ at the beginning of the study, with the cover story that it was to thank them for taking part in the study. We used a lollipop instead of an energy bar or drink to more closely resemble a ‘daily life’ situation, and to ensure that the given food was unfamiliar to the athletes. This was important because we wanted to come up with a measure of participants’ responses to unknown (or unbranded) food items that they are likely to be offered and come into contact with in their everyday lives. We did consider using an energy bar or drink instead of lollipop but we had concerns that a sport-related product might have been viewed by participants as having performance enhancing effects or recovery benefits, making them more likely to be vigilant toward these kinds of products.

The ingredients table was clearly printed on the package of each lollipop. None of the participants reported having a prior familiarity towards the lollipop brand. The questionnaire measured a set of psychological variables from SDT and self-report behavioural measures as follows. All measures are available in Appendix A as online supplemental material.

- *Motivation to avoid doping.* Three types of motives to avoid using banned performance-enhancing substances in sport based on SDT were assessed: autonomous motivation (6 items); controlled motivation (4 items); and amotivation (3 items). Items were adopted from the doping avoidance version of the Treatment Self-Regulation Questionnaire (Chan, Dimmock, et al., 2014).

- *Intentions*. Based on Ajzen's guidelines (Ajzen, 2002; Fishbein & Ajzen, 2010), the intention to use banned performance-enhancing substances in sport in the forthcoming month was measured (3 Items).
- *Behavioural adherence*. Participants reported the frequency (3 items) and effort (4 items) of their doping avoidance behaviours, such as checking the ingredients of medication and supplements, seeking professional advice on substances, and avoiding high-risk situations. The items were adapted from the Self-Reported Treatment Adherence Scale developed and used in other health contexts (Chan & Hagger, 2012a, d).
- *Behavioural response*. Participants reported whether they refused to take the lollipop (*not-taking*), whether they took but decided not to eat the lollipop (*not-eating*), and whether they read the ingredients table printed on the lollipop (*reading*). To ensure the responses were genuine, the experimenter responsible for delivering the lollipop at the beginning of the study cross-checked the items of *not-taking* and *not-eating* when collecting the completed questionnaires from the participants.

Analysis

Hierarchical multiple linear regression and linear logistic regression analyses were employed to examine the predictive effects of motivation on doping intention, self-reported adherence to doping avoidance behaviours, and behavioural responses to the lollipop, respectively. Focusing on the design of the regression models, in the first step of each model, we regressed the potential confounders proposed by Chan and colleagues (2014), including 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) on the outcome variable (e.g., intention, adherence). In the second step, autonomous motivation, controlled motivation, and amotivation were inserted as additional independent variables. In step three, the cross-products (i.e., the products of the Z-scores) of each pair of the

motivational combination (i.e., autonomous X controlled, autonomous X amotivation, controlled X amotivation) were input to examine the interaction between the three types of motivation (Keith, 2005). When a significant interaction effect was observed, we employed simple slopes analysis to probe the interaction. In the analysis, we ran median splits for each type of motivation, and calculated the slope of the motivation-outcome variable relationship separately for participants who were either high (top 34% percentile) or low (bottom 34% percentile). The independent variables, including the key study variables and control variables, that did not form significant zero-order correlations with the corresponding outcome variables, were removed from the regression model for parsimonious model structures.

As such, two sets of multiple linear regression models were conducted with doping intentions and behavioural adherence of doping avoidance, respectively, as the dependent variables (see Table 2). Three sets of linear logistic regression models were conducted with the three dichotomous behavioural response variables (*not-taking*, *not-eating*, and *reading*), respectively, as the dependent variables.

Results

Data screening and score reliability

Correlations and Cronbach's alpha reliability statistics for the study variables are displayed in Table 1. Missing data were less than 1% and were replaced by expectation maximisation; this estimation is deemed to be less biased and more precise than traditional approaches such as mean-replacement (Roth, 1994). The internal consistency of each of the continuous variables in the study was acceptable (Cronbach's alphas, $\alpha > .75$) and Shapiro-Wilk's tests showed that the distributions of these variables did not significantly deviate from normality. Although autonomous motivation and controlled motivation exhibited a correlation of .67, the variance inflation factors (VIF) of these variables and all other independent

variables were less than 1.57 (i.e., smaller than the cut-off value of 10.00), thus multicollinearity was unlikely to affect the regression analyses (Chen et al., 2008). The Pearson correlation matrix showed that amotivation was not significantly correlated with any other outcome variables, so this variable and its related interaction terms were omitted from subsequent analyses.

In relation to the control variables, doping intention correlated significantly with gender, and behavioural adherence was associated with gender and sport level, so they were inserted as covariates in their corresponding regression models. For the categorical variables, response patterns were approximately evenly distributed for *not-taking* (40.6% refused to take the lollipop) *not-eating* (45.3% refused to eat the lollipop), and *reading* (16.1% read the ingredients table of the lollipop) variables.

Regression analyses

Table 2 displays the standardised beta estimates, *F*-statistics, and effect sizes of the multiple linear regression models. In the prediction of doping intention, autonomous motivation and controlled motivation in Step 2 were significant negative predictors that accounted for significant ΔR^2 in variance explained in intention in Step 1 (gender was a significant negative control factor). The autonomous x controlled motivation interaction term in Step 3 was significant and led to significant ΔR^2 over Step 2. In the prediction of behavioural adherence of doping avoidance, controlled motivation was the only significant (positive) predictor of adherence in Step 2 that resulted in a significant ΔR^2 from Step 1 (sport level was a significant positive control factor). The interaction term in Step 3 was not significant and the ΔR^2 was also not significant.

Due to the autonomous x controlled motivation significant interaction term in the prediction of doping intention, we conducted simple slopes analyses independently for participants with low or high level of autonomous and controlled forms of motivation. Results

showed that the relationship between autonomous motivation and doping intention was significant and negative ($\beta = -.43$, $SE = .08$, $t(151) = -5.97$, $p < .001$) when controlled motivation was low, but it was not significant ($\beta = .07$, $SE = .07$, $t(163) = -.57$, $p = .57$) when controlled motivation was high. The relationship between controlled motivation and doping intention was significant and negative ($\beta = -.38$, $SE = .08$, $t(155) = -5.02$, $p < .001$) when autonomous motivation was low, but the relationship was not significant ($\beta = .06$, $SE = .05$, $t(142) = -.67$, $p = .50$) when autonomous motivation was high.

Logistic linear regression models with the three dichotomous behavioural response variables to the offer of the lollipop (Table 3) revealed that controlled motivation was a positive predictor of *not-taking* and *not-eating* the lollipop, and autonomous motivation was a positive predictor of *reading* the ingredient table of the product. The interaction between autonomous motivation and controlled motivation was not significantly related to any of the lollipop behavioural variables.

Discussion

This study was a preliminary investigation into the motivational mechanisms of young athletes' avoidance of unintended or accidental doping in sport. The relationships between young athletes' doping avoidance motives and behavioural responses when offered an unknown food product as part of their daily routine were tested in accordance to the framework of SDT. Results were consistent with our hypothesis that autonomous motivation and controlled motivation toward doping avoidance would be positive predictors of doping avoidance behaviours with respect to the offered lollipop, and that autonomous and controlled motivation were negative predictors of doping intention. Also, as expected, amotivation was not significantly related to any lollipop behavioural responses, nor to doping intention or behavioural adherence to doping avoidance.

Hence, our findings supported the tenets of SDT (Deci & Ryan, 1985, 2008) in relation to autonomous motivation and amotivation. However, the relationship between controlled motivation and doping intention was again in contrast to the proposition of SDT. Consistent with findings reported by Chan and colleagues (2014), we found that controlled motivation was less effective in predicting doping avoidance intention than autonomous motivation, but it was still a significant predictor.

In this study, controlled motivation was a positive predictor of self-reported behavioural adherence and behavioural responses to avoid unintentionally taking banned substances, and a negative predictor of doping intention. That is, the more that athletes adopted controlled reasons for doping avoidance, such as avoiding “getting caught”, “being banned from sport”, and “having a bad reputation”, the more likely it was that they would invest effort and time in anti-doping, seek professional advice, and avoid high-risk situations. Chan and colleagues (2014) argued that young athletes who were autonomously motivated in sport could also adopt highly controlled motives for doping avoidance because anti-doping behaviours were perceived as something they had to do to satisfy their autonomous goals in sport. In that case, controlled motivation for doping avoidance might be an adaptive form of motivation because it is important for their goals in sport (Chan, Dimmock, et al., 2014).

Another plausible explanation is that the existing strategies and culture of the anti-doping movement in sport are very controlling in nature (Chan, Dimmock, et al., 2014). The fundamental goals for young athletes to refuse or avoid taking banned substances are to avoid the external negative consequences of doping such as negative social image, breaking the law, severe penalties, and negative health-side effects, which are very avoidance-oriented and controlling (Deci & Ryan, 1985, 2008). Given this climate, it is perhaps unsurprising that athletes’ are motivated to avoid doping and monitor their food and supplements for controlled reasons (Chan, Dimmock, et al., 2014). Controlled motivation perhaps has a unique role in

driving anti-doping behaviour because it appears to be more closely-matched to the motivational ‘climate’ of the behavioural context (Deci & Ryan, 2008; Sebire et al., 2009). Previous research in rehabilitation contexts has shown that controlled motivation was not necessarily a maladaptive form of motivation, particularly if the controlling contingency was omnipresent (Lens et al., 2002; Vansteenkiste & Lens, 2006). It might imply that when the consequences of non-adherence behaviours are severe, controlled motivation might outweigh autonomous motivation as a path to action because controlled goals appear to be more relevant and compelling to individuals in those situations (Hagger & Chatzisarantis, 2014).

However, when such negative consequences are perceived to be absent or less likely, such as when an athlete is offered a prohibited peptide hormone which is believed to be undetectable, behavioural relapse would be extremely likely according to SDT (Deci & Ryan, 1985, 2008) and previous literature (Chan & Hagger, 2012b; Chan et al., 2011). The effect of interaction between autonomous motivation and controlled motivation on doping intention might somewhat supports this argument because doping intention was shown to be more dependent on autonomous motivation of doping avoidance when athletes’ held less controlled reasons of doping avoidance. Similarly, doping intention was shown to be more reliant on controlled motivation when athletes adopted lower autonomous motivation for doping avoidance. Such interesting pattern of result may imply that athletes’ intention to dope would be mostly up to the external contingencies of breaking the anti-doping regulation particularly when they do not regard doping avoidance as personally important and meaningful to their life. The significant interaction confirmed the proposed synergistic effects of motivational regulations on doping avoidance (Ratelle et al., 2007), and may suggest that athletes with a high-controlled and low-autonomous motivational pattern in doping avoidance would be at higher risk of taking banned performance enhancing substances when doping test or the punishment of doping are perceived to be absent or less salient (e.g., athletes in certain sport

events where doping tests are not presence). Therefore, a worthy avenue for future research would be to examine the effects of removing the external negative outcomes of doping on the motivational and behavioural patterns of doping avoidance among athletes. Such research could be achieved through the use of hypothetical scenarios and experimental manipulations.

Limitation and Further Directions

A number of theoretical and methodological limitations associated with this study should be pointed out. Theoretically, the present investigation only examined how motivational constructs could predict doping avoidance behaviour and doping intention, but the antecedents of motivation were not tested. According to SDT (Deci & Ryan, 1985, 2008), a psychosocial environment with the emphasis of supporting one's psychological needs of autonomy, competence, and relatedness by providing rationale, providing experiences of success, and creating a warm, welcoming, and collaborative environment, respectively, may facilitate one's perception of autonomy support for the advisory actions, and such perception is key to the formation of adaptive motivation (i.e., autonomous motivation). Similarly, a perception that significant others hold a controlling interpersonal style signified by conditional reinforcement (e.g., reward, disregard, intimidation) and excessive personal control may foster the development of controlled motivation (Hodge et al., 2013). Hodge and colleagues (2013) have demonstrated the predictive effects of autonomy-supportive and controlling coaching style on young athletes' attitude and intention of doping, so coaches could well be important to athletes' anti-doping behaviours, too. Given parents/ family, friends, and medical professionals are also regarded as key social agents of athletes in the context of anti-doping (Chan, Hardcastle, et al., 2014; Chan et al., in press), future studies should examine the effects of psychological need support and controlling behaviours from all the social agents on athletes' intention and behaviours of doping avoidance.

Furthermore, there has been a trend in recent literature in utilising or integrating multiple theoretical frameworks to explain athletes' doping-related behavioural patterns. Doping attitudes, intentions, or doping itself has been predicted by motivation based on SDT, in conjunction with constructs derived from the Achievement Goal Theory and the Theory of Planned Behaviour (Barkoukis et al., 2011; Barkoukis et al., 2013; Chan, Dimmock, et al., 2014). Promising findings from these investigations indicate that incorporating the concepts of these two theories and SDT into a unified model for explaining athletes' anti-doping behaviour would be an interesting avenue for future research.

A number of methodological aspects may have influenced these findings. First, using a lollipop as a test of athletes' doping avoidance behaviours could confound the result because athletes' personal preferences and habits might affect whether or not they took or ate the lollipop. Using a sport-related product (e.g., energy bar or drink) can be an alternative solution, but individual differences in tastes and preferences still exist, and athletes might pay more attention to ingredient table because of the potential sport-related benefits of the products. However, it would be interesting to replicate our study using energy bar or drink, and compare the result to our findings using lollipop as a measure of doping avoidance behaviour. Future studies should also include a measure of participants' attitude towards and consumption habits with respect to whatever product is offered. Second, and more generally, self-reported measures (e.g., behavioural adherence, awareness of the ingredient table) could be affected by response bias due to social desirability, especially for items related to doping in sport (Gucciardi et al., 2010). However, a majority of our questions were related to doping avoidance, which was a socially appropriate behaviour in sport, so the potential influence of social desirability should be smaller (Chan, Hardcastle, et al., 2014). Finally, the cross-sectional and correlational design of the study restricted our ability to draw conclusions about the causal effects of motivation on doping avoidance behaviours.

Nevertheless, these preliminary findings, if replicated and confirmed with other products, could serve as a basis for developing interventions targeting the motivational orientations of young athletes so as to facilitate doping avoidance and compliance with anti-doping behaviours. Successful interventions have been reported using SDT as the psychological framework to intervene and change individuals' behavioural adherence toward a wide range of health behaviours, including exercise adherence and reduction in binge drinking and cigarette smoking (Hagger et al., 2010; Williams et al., 2006). Similarly, in the context of doping, the target intervention could be developed through a rigorous intervention-mapping process (Hagger & Hardcastle, 2014; Michie et al., 2008), in which strategies for the promotion of behavioural modifications could be systematically identified by matching the key social psychological determinants of the motivational variables that have been shown to be adaptive to behavioural change or persistence in this particular context. Such strategies should be implemented in the doping context using fully-factorial, randomized-controlled designs so that the efficacy of the theory-based intervention, together with the causal effects of the psychosocial determinants and motivational orientations could be thoroughly scrutinised.

Perspectives

The present study explored the relationships between athletes' motivation to avoid doping and their response to an offered food product and their self-reported adherence to monitoring of their food and supplements to avoid unintentionally consuming banned performance-enhancing substances. The findings supported the tenets of SDT (Deci & Ryan, 1985, 2008) that motivational orientations may underpin athletes' intention and behaviours regarding the prevention of unintended doping in sport. Young athletes who reported autonomous reasons for avoiding doping, such as for life goals, personal values, and responsibility, tended to report lower intentions to dope in sport and would be more likely to

take notice of the ingredients of their food intake in their daily life. On the other hand, those who did so for controlled reasons, such as the avoidance of negative consequences of doping, had higher adherence toward doping avoidance behaviours, such as avoidance and monitoring of foods and supplements for banned substances, and would be less likely to consume unfamiliar food products. The findings are insightful to developing an intervention fostering athletes' motivation of preventing unintended doping in sport.

References

- Ajzen I. Constructing a TPB questionnaire: Conceptual and methodological considerations. 2002.
- Ama PFM, Betnga B, Moor VJA, Kamga JP. Football and doping: study of African amateur footballers. *Br J Sports Med*. 2003; **37**: 307-310.
- Barkoukis V, Lazuras L, Tsorbatzoudis H, Rodafinos A. Motivational and sportpersonship profiles of elite athletes in relation to doping behavior. *Psychol Sport Exerc*. 2011; **12**: 205-212.
- Barkoukis V, Lazuras L, Tsorbatzoudis H, Rodafinos A. Motivational and social cognitive predictors of doping intentions in elite sports: An integrated approach. *Scand J Med Sci Sports*. 2013; **23**: E330-E340.
- Baume N, Mahler N, Kamber M, Mangin P, Saugy M. Research of stimulants and anabolic steroids in dietary supplements. *Scand J Med Sci Sports*. 2006; **16**: 41-48.
- Chan DKC, Dimmock JA, Donovan RJ, Lentillon-Kaestner V, Hardcastle S, Hagger MS. Self-determined motivation in sport predicts motivation and intention of anti-doping behaviors: A perspective from the Trans-contextual Model. *J Sci Med Sport*. 2014: **Advanced online publication**.
- Chan DKC, Hagger MS. Autonomous forms of motivation underpinning injury prevention and rehabilitation among police officers: An application of the trans-contextual model. *Motiv Emotion*. 2012a; **36**: 349-364.
- Chan DKC, Hagger MS. Self-determined forms of motivation predict sport injury prevention and rehabilitation intentions. *J Sci Med Sport*. 2012b; **15**: 398-406.
- Chan DKC, Hagger MS. Theoretical integration and the psychology of sport injury prevention. *Sports Med*. 2012c; **42**: 725-732.
- Chan DKC, Hagger MS. Trans-contextual development of motivation in sport injury prevention among elite athletes. *J Sport Exerc Psychol*. 2012d; **34**: 661-682.
- Chan DKC, Hagger MS, Spray CM. Treatment motivation for rehabilitation after a sport injury: Application of the trans-contextual model. *Psychol Sport Exerc*. 2011; **12**: 83-92.
- Chan DKC, Hardcastle S, Dimmock JA, Lentillon-Kaestner V, Donovan RJ, Burgin M, Hagger MS. Modal salient belief and social cognitive variables of anti-doping behaviors in sport: Examining an extended model of the theory of planned behavior. *Psychol Sport Exerc*. 2014: **Advanced online publication**.

- Chan DKC, Hardcastle S, Lentillon-Kaestner V, Donovan RJ, Dimmock JA, Hagger MS. Athletes' beliefs about and attitudes towards taking banned performance-enhancing substances: A qualitative study. *Sport Exerc Perform Psychol.* in press.
- Chan DKC, Lonsdale C, Ho PY, Yung PSH, Chan KM. Patient motivation and adherence to post-surgery rehabilitation exercise recommendations: The influence of physiotherapists' autonomy supportive behaviors. *Arch Phys Med Rehabil.* 2009; **90**: 1977-1982.
- Chen CY, Yang HCP, Chen CW, Chen TH. Diagnosing and revising logistic regression models - Effect on internal solitary wave propagation. *Eng Computation.* 2008; **25**: 121-139.
- Deci EL, Ryan RM. *Intrinsic motivation and self-determination in human behavior.* New York: Plenum 1985.
- Deci EL, Ryan RM. Facilitating optimal motivation and psychological well-being across life's domains. *Can Psychol.* 2008; **49**: 14-23.
- Fishbein M, Ajzen I. Predicting and changing behavior: The reasoned action approach. New York: Psychology Press, 2010.
- Geyer H, Parr MK, Koehler K, Mareck U, Schanzer W, Thevis M. Nutritional supplements cross-contaminated and faked with doping substances. *J Mass Spectrom.* 2008; **43**: 892-902.
- Gucciardi DF, Jalleh G, Donovan RJ. Does social desirability influence the relationship between doping attitudes and doping susceptibility in athletes? *Psychol Sport Exerc.* 2010; **11**: 479-486.
- Gucciardi DF, Jalleh G, Donovan RJ. An examination of the Sport Drug Control Model with elite Australian athletes. *J Sci Med Sport.* 2011; **14**: 469-476.
- Hagger MS, Chatzisarantis NLD. Causality orientations moderate the undermining effect of rewards on intrinsic motivation. *J Exp Soc Psychol.* 2011; **47**: 485-489.
- Hagger MS, Chatzisarantis NLD. An integrated behavior-change model for physical activity. *Exerc Sport Sci Rev.* 2014; **42**: 62-69.
- Hagger MS, Hardcastle SJ. Interpersonal style should be included in taxonomies of behaviour change techniques. *Front Psychol.* 2014; **5**.
- Hagger MS, Keatley DA, Chan DKC, Chatzisarantis NLD, Dimmock JA, Jackson BJ, Ntoumanis N. The goose is (half) cooked: A consideration of the mechanisms and

- interpersonal context is needed to elucidate the effects of personal financial incentives on health behaviour. *Int J Behav Med*. 2014; **21**: 197-201.
- Hagger MS, Wood CW, Stiff C, Chatzisarantis NLD. Self-regulation and self-control in exercise: the strength-energy model. *Int Rev Sport Exerc Psychol*. 2010; **3**: 62 - 86.
- Hodge K, Hargreaves EA, Gerrard D, Lonsdale C. Psychological mechanisms underlying doping attitudes in sport: Motivation and moral disengagement. *J Sport Exerc Psychol*. 2013; **35**: 419-432.
- Hoff D. Doping, risk and abuse: An interview study of elite athletes with a history of steroid use. *Perform Enhancement Health*. 2012: **Advanced online publication**.
- Jalleh G, Donovan RJ, Jobling I. Predicting attitude towards performance enhancing substance use: A comprehensive test of the Sport Drug Control Model with elite Australian athletes. *J Sci Med Sport*. 2013: **Advanced online publication**.
- Keith TZ. *Multiple regression and beyond*. Boston: Pearson 2005.
- Lamont-Mills A, Christensen S. "I have never taken performance enhancing drugs and I never will": drug discourse in the Shane Warne case. *Scand J Med Sci Sports*. 2008; **18**: 250-258.
- Laure P, Binsinger C. Doping prevalence among preadolescent athletes: a 4-year follow-up. *Br J Sports Med*. 2007; **41**: 660-663.
- Laure P, Lecerf T, Friser A, Binsinger C. Drugs, recreational drug use and attitudes towards doping of high school athletes. *Int J Sports Med*. 2004; **25**: 133-138.
- Lens W, Simons J, Dewitte S. From duty to desire: The role of students' future time perspective and instrumentality perceptions for study motivation and self-regulation. In: Pajares F, Urdan T, eds. *Academic motivation of adolescents*. Greenwich, CT: Information Age, 2002:221-245.
- Lentillon-Kaestner V. The development of doping use in high-level cycling: From team-organized doping to advances in the fight against doping. *Scand J Med Sci Sports*. 2013; **23**: 189-197.
- Lentillon-Kaestner V, Carstairs C. Doping use among young elite cyclists: a qualitative psychosociological approach. *Scand J Med Sci Sports*. 2010; **20**: 336-345.
- Lentillon-Kaestner V, Hagger MS, Hardcastle S. Health and doping in elite-level cycling. *Scand J Med Sci Sports*. 2012; **22**: 596-606.

- Lucidi F, Grano C, Leone L, Lombardo C, Pesce C. Determinants of the intention to use do in substances: An empirical contribution in a sample Italian adolescents. *Int J Sport Psychol.* 2004; **35**: 133-148.
- Lucidi F, Zelli A, Mallia L, Grano C, Russo PM, Violani C. The social-cognitive mechanisms regulating adolescents' use of doping substances. *J Sports Sci.* 2008; **26**: 447-456.
- Michie S, Johnston M, Francis J, Hardeman W, Eccles M. From theory to intervention: Mapping theoretically derived behavioural determinants to behaviour change techniques. *Appl Psychol.* 2008; **57**: 660-680.
- Moore MJ, Werch CEC. Sport and physical activity participation and substance use among adolescents. *J Adolesc Health.* 2005; **36**: 486-493.
- Ntoumanis N, Ng JYY, Barkoukis V, Backhouse SH. A statistical synthesis of the literature on personal and situational variables that predict doping in physical activity settings. Technical report to World Anti-Doping Agency. Montreal, Canada, 2013.
- Ntoumanis N, Ng JYY, Barkoukis V, Backhouse SH. Personal and psychosocial predictors of doping use in physical activity settings: A meta-analysis. *Sports Med.* 2014: **Advanced online publication.**
- Petroczi A. Attitudes and doping: a structural equation analysis of the relationship between athletes' attitudes, sport orientation and doping behaviour. *Subst Abuse Treat Prev Policy.* 2007; **2**.
- Petroczi A, Aidman E. Psychological drivers in doping: The life-cycle model of performance enhancement. *Subst Abuse Treat Prev Policy.* 2008; **3**.
- Ratelle CF, Guay F, Vallerand RJ, Larose S, Senecal C. Autonomous, controlled, and amotivated types of academic motivation: A person-oriented analysis. *J Educ Psychol.* 2007; **99**: 734-746.
- Roth PL. Missing Data: A conceptual review for applied psychologists. *Pers Psychol.* 1994; **47**: 537-560.
- Ryan RM, Connell JP. Perceived locus of causality and internalization - Examining reasons for acting in 2 domains. *J Pers Soc Psychol.* 1989; **57**: 749-761.
- Sebire SJ, Standage M, Vansteenkiste M. Examining intrinsic versus extrinsic exercise goals: Cognitive, affective, and behavioral outcomes. *J Sport Exerc Psychol.* 2009; **31**: 189-210.
- Stewart B, Smith ACT. Drug use in sport. *J Sport Soc Issues.* 2008; **32**: 278-298.

- Vansteenkiste M, Lens W. Intrinsic versus extrinsic goal contents in self-determination theory: Another look at the quality of academic motivation. *Educ Psychol*. 2006; **41**: 19-31.
- Wiefferink CH, Detmar SB, Coumans B, Vogels T, Paulussen TGW. Social psychological determinants of the use of performance-enhancing drugs by gym users. *Health Educ Res*. 2008; **23**: 70-80.
- Williams GC, McGregor HA, Sharp D, Levesque C, Kouides RW, Ryan RM, Deci EL. Testing a self-determination theory intervention for motivating tobacco cessation: Supporting autonomy and competence in a clinical trial. *Health Psychol*. 2006; **25**: 91-101.
- World Anti-Doping Agency. 2012 Anti-Doping Testing Figures Report. 2012.
- World Anti-Doping Agency. The 2014 prohibited list. 2013.
- Zelli A, Mallia L, Lucidi F. The contribution of interpersonal appraisals to a social-cognitive analysis of adolescents' doping use. *Psychol Sport Exerc*. 2010; **11**: 304-311.