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Gateway to doping? Supplement use in the context of preferred competitive situations, doping attitude, beliefs and norms

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Abstract

Nutritional supplement (NS) use is widespread in sport. This study applied an integrated social cognitive approach to examine doping attitudes, beliefs and self-reported doping use behaviour across NS users (n=96) and non-users (n=116). Following ethical approval, 212 competitive athletes (age mean=21.4, s=4.5; 137 males) completed self-reported measures of doping-related social cognitions and behaviours, presented in an online format where completion implied consent. Significantly more NS users (22.9%) reported doping compared with non-users (6.0%; $U= 4628.0$, $p < 0.05$). NS users presented significantly more positive attitudes towards doping ($U= 3152.0$, $p < 0.05$) and expressed a significantly greater belief that doping is effective ($U= 3152.0$, $p < 0.05$). When presented with the scenario that performance enhancing substances are effective and increase the possibility of winning, NS users were significantly more in favour of competing in situations which allow doping ($U= 3504.5$, $p < 0.05$). In sum, doping use is three and a half times more prevalent in NS users compared to non-users. This finding is accompanied by significant differences in doping attitudes, norms and beliefs. Thus, this paper offers support for the gateway hypothesis; athletes who engage in legal performance enhancement practices appear to embody an 'at risk' group for transition towards doping. Education should be appropriately targeted.

Key words: nutritional supplements, anti-doping, nutrition education, integrated social cognitive approach, performance-enhancing substances, gateway theory

Introduction

The use of legal and illegal performance enhancing substances (PES) permeates sport at all levels (Peretti-Watel et al. 2004). Indeed, athletes in their quest to be the strongest and fastest consume unproven, potentially harmful or even banned substances. The recent BALCO scandal involving the global elite in track and field and baseball illuminates this trend at the systematic level (Fainaru-Wada & Williams 2006). Thus, although athletes face huge consequences if they are caught doping, some feel that it is worth the risk if the benefits outweigh the costs (Strelan & Boeckmann 2006).

Despite developments in the field, risk factors for doping behaviour are largely undetermined and this hinders prevention efforts (Backhouse et al. 2007). Furthermore, doping is no longer restricted to elite sport - athletes of all ages and levels have reported legal and illegal performance enhancement practices (Lippi et al. 2008). Doping use is assumed to be a deliberate action that is planned and requires considerable commitment (Petroczi & Aidman 2009). According to the Theory of Reasoned Action (Ajzen & Fishbein 1980), attitudes are known to influence planned behaviours. Hence, assessing attitudes towards drug use in sport may play an important role in furthering our understanding of this illicit behaviour and help advance prevention programming. Moreover, attitudes influence behaviour through the mediator of intention. Indeed, guided by Ajzen & Fishbein's Theory of Reasoned Action and Planned Behaviour (TPB) (Ajzen & Madden, 1986), a number of studies (Lucidi, et al., 2008; Wiefferink, Detmar, Coumans, Vogels, & Paulussen, 2008) have examined doping attitudes alongside proxy measures of intention and behaviour (e.g., subjective norms and perceived behavioural control). These studies have noted the predictive utility of proxy behaviours like subjective norms.

However, traditional tests of the TPB involve an examination of the perceived approval of a given behaviour by significant others but this construct may not accurately

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reflect the range of normative influences on behaviour (Hagger & Chatzisarantis, 2005). Instead, descriptive norms (subjective beliefs about what is happening) offer an alternative for the examination of normative influence. In the case of doping in sport, such beliefs can be assessed via social projections of the perceived behaviour of significant others. Past research has examined descriptive norms (Petróczi, Aidman, & Nepusz, 2008) and proposed a False Consensus Effect as doping users tended to overestimate doping use in other athletes. Therefore, in line with previous research (e.g., Wiefferink et al. 2008, Petróczi, Aidman et al. 2008) this study utilises variables derived from the TPB and complements them with additional measures such as descriptive norms, willingness to use artificial means to achieve a desirable outcome (e.g., change appearance) and situational temptation (e.g., perceived pressure to dope). Similar to substances abuse, where experimentation has shown greater influence on future drug use than any other vulnerability factor (Boys et al., 1999; 2001; Ridenour et al., 2003), it is assumed that doping use in sport grows out of habitual engagement in performance enhancing practices (Petróczi & Aidman, 2008), potentially from experimentation with nutritional supplements possessing ergogenic properties.

This may be particularly applicable for young athletes who could become accustomed to using chemical substances to enhance performance and wellbeing from a young age (Braun et al. 2009; Petróczi et al. 2008b). The use of prohibited substances, as a consequence of gradual involvement in assisted performance enhancement, places the emphasis on substances that may be used before and leading up to doping, such as over-the-counter medication and nutritional supplements. Causality has not been unequivocally established owing to the fact that, to date, the relationship between supplement use and doping use is only based on epidemiological data (de Hon & Coumans 2007). However, early research suggests that supplements may well be gateway substances to doping. The gateway theory (Kandel 2002) suggests that substance use is sequential, with illegal substance use following

the use of legal substance use because of the positive relationship between the two. Although the existence of a causal relationship between drug types and their progressive use has been debated with inconclusive results (e.g., Choo, Roh, & Robinson, 2008; Fergusson, Boden, & Horwood, 2006; Mayet, Legleye, Chau, & Falissard; Wells & McGee, 2008), a recent meta-analysis has advanced the gateway theory by suggesting that drug use patterns may not be so much influenced by a deterministic sequence but rather, partially influenced by common causes (Degenhardt, et al., 2010). Therefore, looking beyond NS use itself and incorporating social cognition underlying NS use is critical to successful prevention. As such, NS use, along with behavioural intention and attitudes toward NS use and doping, may be important in highlighting those most at risk of developing a doping habit. To date, little attention has been paid to the social cognitive aspect of athletes' NS use in sport; even though studies document high usage rates across age, sports and attainment levels (Erdman 2006; Froiland et al. 2004; Kujala et al. 2003; Maughan et al. 2007; Striegel et al. 2006; Tsitsimpikou et al. 2009a; Tsitsimpikou et al. 2009b).

Within the literature, NS usage rates have been documented. With a focus on an individual sport, Nieper (2005) examined NS use in junior track and field athletes, finding 62% of respondents to use NS. Similarly, a recent analysis of the doping control forms completed between 2003 and 2007 (covering 12 athletic indoor and outdoor World Championships) also revealed high prevalence of NS use (Tscholl et al. 2010). Amongst figure skaters, 65% of males and 76% of females reported supplement use (Ziegler et al. 2003). University athletes have also been surveyed with one study documenting 88% of students using one or more NS (Burns et al. 2004). Moreover, Hoffman et al. (2008) found 71% of adolescents reported NS use, whereas Scofield and Unruh (2006) only found 22% of high school athletes to use NS. Declarations made by athletes selected for doping control at the Summer Olympics in Sydney and Athens show that approximately half of the high

performing athletes reported dietary supplement and vitamin intake prior to the competition (Corrigan & Kazlauskas 2000; Tsitsimpikou et al. 2009b). National statistics show an even higher rate, of around 70%, for Canadian athletes participating in the Atlanta and Sydney Olympic Games (Huang, Johnson & Pipe, 2006), 60% among Serbian elite athletes (Suzic Lazic et al. 2009), 83% among Italian athletes (Taioli 2007) and over 90% among Sri Lankan national level athletes (de Silva et al. 2010). An equally high rate of NS use was recorded among professional football players at the FIFA World Cups (Tscholl et al. 2008).

Investigations of NS use present a patchwork quilt of prevalence statistics. However, a simple conclusion emerges – athletes continue to use supplements in sport in order to satisfy their belief in their performance and health enhancing effects. They often do so without consulting physicians (Waddington et al. 2005) or having a clear rationale behind their choices (Petróczi et al. 2007; Petróczi et al. 2008b). This trend is of particular concern given that products on the nutritional (dietary) supplement market are considered foodstuffs and not medicines in most countries. As such, the supplement industry lacks the rigour in regulation and enforcement associated with medicines (Cohen 2009; Collins & Kalman 2009; Petróczi et al. 2011).

In sum, this project adopts an integrated social cognitive approach to examining NS use and doping in sport. This approach assumes that intention to dope and actual engagement in doping practices are the outcomes of the interplay between reasons, motives and current practices, such as experimentation with non-prohibited substances with known or putative performance enhancing effects. This integrated framework may prove useful in developing our understanding of the interaction between various performance enhancing practices, doping attitudes and behaviour.

NS use has been propagated as a potential factor for doping use (Dodge & Jaccard 2006; Goldberg 2000; Lucidi et al. 2008; Mazanov et al. 2008; Yussman et al. 2006) and

doping use tends to co-occur with the use of NS (Calfee & Fadale 2006; Lucidi, Zelli 2008). Indeed, Papadopoulos and colleagues (2006) found that athletes were four times more likely to dope if they used legal supplements. Although investigating whether NS is a gateway to using prohibited drugs was mainly limited to the NS – steroid connection, accumulated results provide valuable insight into athletes' behaviour seeking benefits from some form of chemical assistance. Specifically, an effect of NS use on future steroid use has been shown in closed direct questions and hypothetical scenarios among high school students involved in fitness exercise regime, where substances are used to maximise the cosmetic effect (Rees et al. 2008). Literature evidence suggests that in the context of multiple influencing factors, attitude, subjective norms and behavioural intention play significant roles in using NS (Bartee et al. 2004; Dunn et al. 2001; Perko 1999) with a potential gradual progression from NS to 'harder' drugs (Perko et al. 2000). Another possible risk factor worthy of further investigation is gender. German research (Wichstrom, 2006) has noted that gender predicts anabolic androgenic steroid use and Papadopoulos and colleagues (2006) concluded that males are at a higher risk of doping than females following their survey of doping use which spanned six developed countries.

Complementing intention, past use of relevant NS (e.g., creatine) and knowing steroid users have been shown to be additional influencing factors for forming behavioural intention to use steroids (Dunn et al. 2009). The clear link between creatine and anabolic steroid use provides support for the theory of gradual involvement and NS potentially being a gateway to doping. The use of an acceptable method (creatine) for 6 months, most likely coupled with experiencing some positive effects, predicted intention to use a more potent drug, anabolic steroids. In a recent study among elite athletes involved in a variety of sports, outcome expectancy (i.e. perceived performance enhancing effect) influenced athletes' decision to use NS despite the belief that NS is not needed with a balanced diet and the recognition of the

consequences of inadvertent doping violations (Dascombe et al. 2010). Given that social cognitions regarding assisted performance enhancement play a significant role in the decision making process, the purpose of the present study is to address gaps in the literature by examining doping attitudes, norms, beliefs and self-reported doping use behaviour across NS users and non-users in a sample of competitive athletes. Based on previous research, the hypotheses of the study were as follows. Firstly, we expected NS users to report more positive attitudes towards doping in sport. Secondly, NS users were expected to demonstrate a greater willingness to use a substance to change appearance and to project higher rates of doping use in their sport. Thirdly, differences in doping attitudes and beliefs between males and females were predicted.

Methods

Participants

The study population consisted of 212 competitive athletes with a mean age of 21.4 ± 4.5 years. The sample comprised 65% males and a spectrum of 32 sports was surveyed. In terms of competitive level, 34% competed at club/University level, 42% competed at regional level and 24% at national/international level. A convenience sample was used in order to explore the objectives of the study with athletes being continuously invited to participate in the study until a reasonable sample size was reached. Participants were made aware of the purpose of the study, that their participation was completely voluntary and that all data collected was completely anonymous with confidentiality assured. Ethical approval was gained from the research ethics committee of the Carnegie Faculty, Leeds Metropolitan University. Participants were notified that by completing the online question, consent was implied.

Measures

The online questionnaire consisted of several parts including demographics, doping and nutritional supplement scenarios, preferred competitive situation [based on Breivik (1992) doping scenarios], the Performance Enhancement Attitude Scale [PEAS;(Petróczi & Aidman 2009)] questionnaire and questions related to athletes' beliefs about NS and doping, norms regarding NS use and doping and willingness to use substances to change appearance¹. For clarity, doping is the use of a substance or method prohibited (banned) by the World Anti-Doping Agency (WADA) or some other sports authority. In contrast, NS are deemed to be preparations that can be bought over the counter and are not prohibited by the WADA (e.g., sports drinks, vitamins and creatine). PES is used as a collective term for NS and doping.

Scenarios

Participants were asked to respond to nine scenarios related to nutritional supplements with either a yes or no answer. Participants also had to indicate the percentage of others they thought would take nutritional supplements in that particular situation. The scenarios involved:

- a) Significant others (coach, medical doctor, family member, fellow athlete); “you are preparing for a competition and your coach suggests that you use a nutritional supplement to enhance your performance”

¹ A copy of the questionnaire can be obtained by contacting the first author.

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- b) Associated side effects (minor, major, no side effects); “if a nutritional supplement was available and effective, would you take the substance if there were only minor side effects associated with its use?”
- c) The opportunity to win (lead to a win, level the playing field); “if an effective nutritional supplement was available, would you take the substance if you thought that its use would level the playing field for you to win?”

Participants also responded to nine scenarios related to doping. These scenarios took the same form as the nutritional supplements, whereby the term nutritional supplements was substituted for banned method. For example; “you are preparing for a competition and your medical doctor suggests you use a banned method to improve your recovery rate”.

Performance Enhancement Attitude Scale (PEAS)

The PEAS is a uni-dimensional self-report instrument that measures general doping attitudes. It consists of 17 items measured on a Likert-type scale from strongly disagree through to strongly agree. This was measured on six points rather than seven so that there was no neutral answer. Participants therefore had to choose either agree or disagree. All 17 statements were scored in the same direction, with statements such as “doping is necessary to be competitive” and “doping is an unavoidable part of the competitive sport”. A high score indicates a positive attitude towards doping, whereas a low score indicates a negative attitude. The PEAS total score ranges from 17 to 102, giving a theoretical middle-point of 59.5 (Petróczi & Aidman 2009). Previous use of this scale indicates that it is reliable in measuring self-declared attitudes towards doping, with Cronbach’s alpha values ranging from .71 to .91 (Petróczi & Aidman 2009). The Cronbach alpha coefficient for the current study was .89, indicating a good internal consistency.

Athletes' beliefs

Seven questions relating to athletes' beliefs were also included in the questionnaire. This section was designed to gain more in depth knowledge related to various aspects of nutritional supplements and doping. For example, participants were asked to answer questions such as "do you believe that prohibited performance enhancing substances are effective?" (1 = *not at all effective*, 5 = *extremely effective*) and "if performance enhancing drugs were effective and increased the possibility to win, which situation would you rather compete in?" (0 = *no one uses drugs*, 1 = *you use drugs and your opponent does not*, 2 = *your opponent uses drugs and you do not* 3 = *you use drugs, so does your opponent*). In addition to this, participants also indicated whether or not they had ever used nutritional supplements or banned substances.

Descriptive Norms

Participants' social projection of NS use and doping in sport was also examined in this study. For example, participants were asked "what % of others in your sport are using nutritional supplements"? and "what % of others in your sport have used a banned substance"? In addition, perceived pressure (as a subjective norm) was assessed. Specifically, participants were asked "how much pressure do you feel to use banned substances? If zero % means no pressure at all and 100% represents maximum pressure, what is the percentage that describes the pressure you feel"?

Willingness to change appearance

Finally, participants were asked to consider if they would be willing to change their physical appearance by some substance or method. More specifically, willingness to take a substance to give them a more athletic body, change weight in the desirable direction, have a tattoo, have a piercing and undertake plastic surgery were assessed. All five items were scored on a scale from 1 to 6 (1 = *definitely not*, 6 = *definitely yes*).

Statistical analysis

The Statistical Package for Social Sciences 17.0 for Windows was used for data entry and analysis (SPSS Inc., Chicago). Descriptive data are reported as $M \pm SD$ or frequencies or percentages. Data were analysed using univariate nonparametric (Mann-Whitney U) statistics in order to compare differences in variables between participants. The level of significance was set at $\alpha = 0.05$.

Results

Performance enhancing substance use

Nearly half (45.3%) of the athletes surveyed reported some form of performance enhancing substance (PES) use. Specifically, 35% reported NS use only, 10% indicated combined NS and doping use, and 3% specified doping use only. Significantly more NS users (22.9%) reported doping compared with non-users (6.0%; $U = 4628.0, p < 0.001$).

NS attitudes and beliefs

Over three quarters of respondents (76%) said they would take a nutritional supplement if it was going to guarantee a win. NS users reported a greater willingness (85%) to take the NS in this winning scenario compared to non-users (68%; $U = 4604.0, p < 0.05$). Significant

differences also emerged between NS users (83%) and non-users (65%) when asked if they would take a supplement that would even the playing field ($U=4528, p<0.05$). A belief that NS were a good, healthy substitute for illegal PES was declared by 64% with no differences noted across NS and non-users. Yet, only 16% would take a NS if use was accompanied by a major side effect.

Doping attitudes and beliefs

NS users presented significantly more positive attitudes towards doping ($U= 4206.5, p <.05$) (Table 1) compared to non-users, as indicated by the total PEAS score. These differences hold for NS and doping users as well as NS users alone. Doping beliefs are reflected through the athlete's perceived effectiveness of doping and NS users expressed a significantly greater belief that doping is effective ($U= 4158.0, p <.001$) compared to non-users (Table 1). NS users were significantly more in favour of competing in competitive situations which allow doping compared to non-users ($U= 3504.5, p <.05$) (Table 1). This pattern was confirmed by the statistically significant chi-square value ($9.270, p <.05$). Whilst the overwhelming majority among both NS users and non-users indicated that they prefer a situation in which doping is not present (78% and 91%, respectively), 13.5% of the NS users would prefer a situation in which both parties (the athlete and the opponent) use PES, compared to 3.5% among non-users.

Table 1. Variable means for NS users and non-users

	NS user	Non-user	Min – Max Scores
Doping attitude	38.9 ± 12.8	34.9 ± 14.6	17 – 102*
Beliefs - Doping effectiveness	3.6 ± 1.1	3.1 ± 1.1	1 – 5*
Beliefs - Competition situation	0.5 ± 1.1	0.2 ± 0.7	0 – 3*
Willingness to change appearance: Athletic body	3.8 ± 1.5	3.0 ± 1.7	1 – 6*
Willingness to change appearance: Weight change	3.6 ± 1.6	3.1 ± 1.6	1 – 6*
Norms - Pressure to dope (%)	12.3 ± 22.0	4.9 ± 12.6	0-100%
Norms - Social projection (NS use)	67.6 ± 25.8	37.4 ± 24.8	0-100%
Norms - Social projection (doping)	23.0 ± 23.8	17.3 ± 22.0	0-100%

*The reader is referred to the methods section for a reminder of the scale anchors.

Willingness to change appearance

Compared to non-users, NS users were significantly more willing to take a substance to give them a more athletic body ($U=4028, p <.001$) and change their weight in the desirable direction (lose or gain weight) ($U=4532, p <.05$) (Table 1).

Descriptive Norms

Compared to non-users, NS users perceived there to be a greater percentage of doping users ($U = 4688.0, p < .05$) and NS users ($U = 2258.0, p <.001$) in their sport. Moreover, NS users perceived there to be a greater pressure to dope ($U= 4764.0, p <0.05$). Means and standard deviations are shown in Table 1.

Gender effect

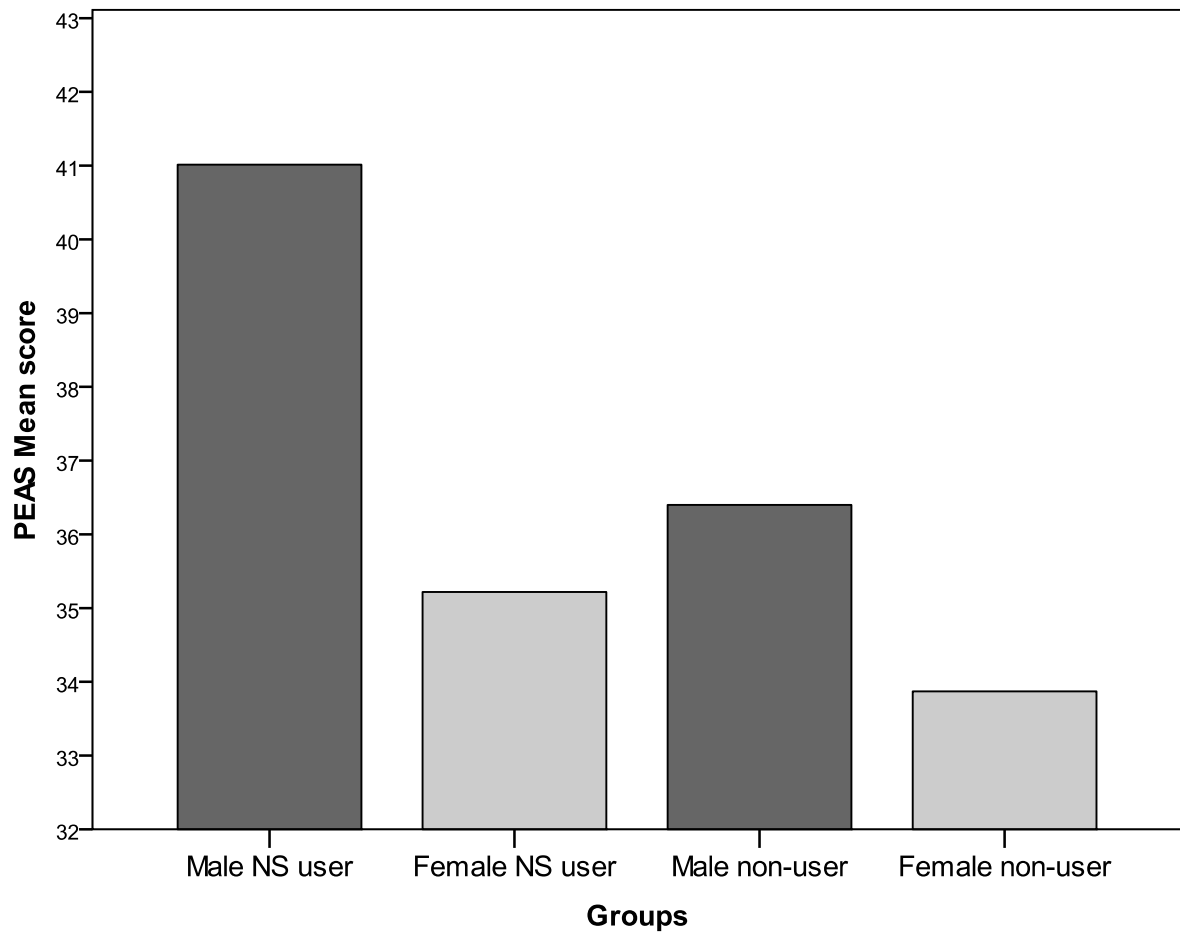
Among those who admitted using doping, more were male ($U=4470.0, p <0.01$) and males perceived there to be a greater percentage of dopers ($U=3882.0, p <0.01$) and NS users ($U=3530.0, p <0.01$) in their sport. Compared to females, males reported a greater pressure to dope ($U=4172.5, p <0.01$) and less certainty that you can win without doping ($U=4583.5, p <0.05$). Males also presented more positive attitudes towards doping ($U=3686.0, p <0.01$) (Figure 1) and expressed a greater belief that doping is effective ($U=3233.0, p <0.01$). In terms of physical appearance, males were more likely to take a substance to give them a more athletic body ($U=3321.0, p <0.01$). Means and standard deviations are shown in Table 2.

Table 2. Variable means by gender

	Male	Female	Min – Max Scores
Doping attitude	38.6 ± 14.2	33.3 ± 13.0	17 – 102*
Beliefs - Doping effectiveness	3.6 ± 1.0	2.8 ± 1.1	1 – 5*
Beliefs - Competition situation	0.43 ± 1.0	0.21 ± 0.7	0 – 3*
Willingness to change appearance: Athletic body	3.8 ± 1.6	2.7 ± 1.6	1 – 6*
Norms - Pressure to dope (%)	10.4 ± 19.7	4.4 ± 13.0	0-100%
Norms - Social projection (NS use)	56.7 ± 28.5	40.9 ± 28.2	0-100%
Norms - Social projection (doping)	22.4 ± 24.1	15.2 ± 20.2	0-100%

*The reader is referred to the methods section for a reminder of the scale anchors.

Figure 1. Differences in attitudes towards doping between NS users and non-users by gender



Discussion

Doping use was three and a half times more prevalent in NS users compared to non-users in this sample of competitive athletes. This finding was accompanied by significant differences in doping attitudes and beliefs between NS users and non-users. Guided by an integrated social cognitive approach, the PEAS was administered as a measure of explicit doping attitudes. Scores indicated that NS users have a more positive attitude towards this risk behaviour, compared to non-users. Thus, athletes who engage in legal performance enhancement practices appear to embody an 'at risk' group for transition towards doping. This significant difference in doping attitude further substantiates the positive relationship already noted between NS use and doping behaviour (Dodge & Jaccard 2006; Goldberg 2000; Molinero & Marquez 2009; Yussman, Wilson 2006).

NS users expressed a belief that doping was more effective than non-users and it is reasonable to propose that this conviction may have developed from the experience of using NS as a way of 'legally' enhancing performance. Moreover, this common practice may lead to a greater willingness to engage in doping behaviour if athletes perceive the benefits of using NS have been fully realised and believe that doping is an effective enhancement method. Indeed, current use of PES has been associated with an increased willingness to use a new and potentially dangerous performance enhancing drug (Dodge & Jaccard 2006). This finding aligns with the gateway theory (Kandel 2002) which predicts that illegal substance use sequentially follows the use of legal substance use owing to the existence of a positive relationship between the two behaviours. However, although a positive relationship has been found to exist between legal supplements and illegal substances, the existence of a chronological pattern has been questioned (Dodge & Jaccard 2006). In order to further explore this relationship, future research may consider alternative cognitive theories in order to account for the fact that a lack of experience of doping situations may mean that doping

attitudes do not reflect actual dispositions. Dual processing models which assume that behaviour is volitional but not intentional or planned (implying a reaction to risk-inducive situations) and focus more on willingness, rather than reasoned decision making (Gerrard et al. 2008), may prove informative. Nevertheless, the findings of the present study support the proposition that NS use is a gateway to doping.

In the present study, NS users were significantly more in favour of competing in competitive situations which allow doping compared to non-users. This result implies that the driving force behind PES use may not necessarily be gaining competitive advantage but maximising one's performance. The latter is assumed to motivate athletes to use NS, hence engaging in performance enhancing practices that involves taking licit substances may be the first step toward doping. This is not to imply that the route from NS to doping is deterministic, but according to the gateway theory, the likelihood of one doping is higher if there is precedence for some substance use. Coupled with this preference was the declaration by NS users of a significantly greater pressure to dope than non-users. Hoffman et al. (2008) found athletes reliance on NS increased during adolescence, therefore although the athletes in this study were relatively young, it is reasonable to assume that they may have already developed a habit for supplement use. Habitual practice of supplement use may then lead to the development of illegal PES use, particularly if there is pressure from others (Petróczi & Aidman 2008). This study highlights that the perceived pressure to engage in this risk behaviour differs between NS user and non-users and therefore further research is warranted to explore this social pressure in greater detail.

Previous research (Backhouse et al. 2007) has highlighted that projected doping use is typically higher (range, 6% - 34%) than the World Anti-Doping Agency's adverse analytical finding log (~ 2%) would suggest. Therefore, it was interesting to note that NS users projected significantly higher prevalence estimates of others in their sport using NS or

banned substances. This descriptive norm finding supports previous research that has examined the relationships between projected use, self-reported behaviour and attitudes to PED use (Petróczi et al. 2008a; Uvacsek et al. 2009). As such, NS users' higher estimation of NS and doping use in their sport is in line with the False Consensus Effect (Petróczi, et al. 2008a). Given that previous results show a relationship between descriptive norms and willingness to dope (Bloodworth & McNamee 2010), these findings are noteworthy. Together with the finding that NS users have significantly more lenient attitudes towards doping in sport, these results add valuable knowledge to the ongoing research effort to understand doping in sport.

Most scientific reviews conclude that NS use is not necessary unless individuals have a specific need or deficiency (Burke 2007; Manore et al. 2000). Incorrect use of supplements can be harmful and athletes are susceptible to supplement overuse as they think the more they take the more effective they will be at enhancing performance (Van Thuyne et al. 2006). Yet, in a recent study by Dascombe and colleagues (2010), a large proportion of athletes reported NS use despite the fact that half of the respondents believed that supplementation was not needed with a balanced diet. A comparable 64% of athletes in the present study declared a belief that nutritional supplements were a good, healthy substitute for banned substances. However, when athletes were presented with a hypothetical scenario indicating that use of NS would be accompanied by major side effects the percentage of athletes indicating a willingness to use fell considerably (16%).

Based upon the results of this study, raising athletes' awareness of the health risks associated with NS use appears warranted as it may help to prevent overuse of illegitimate NS. Targeted education is particularly important given the fact that the supplement industry is largely unregulated and contamination with substances that could lead to a positive dope test has been repeatedly reported (Geyer et al. 2008; Baume et al. 2006). Consequently, any anti-

doping programme should incorporate information regarding the risks of using nutritional supplements –to health and to eliciting positive dope tests. Having said this, future prevention programmes could also take into account the potential for ‘decision myopia’ (Loewenstein et al. 2001); this relates to the fact that young people and adolescents do not typically consider the long-term risks of their health behaviours. As such, more immediate risks to health and sporting practice should be emphasised.

Furthermore, this study develops the evidence base on gender and doping use by highlighting significant differences in doping attitudes and beliefs between males and females. Male vulnerability to doping in sport should be recognised when planning and executing primary prevention and further research is required to explore more fully the risk and protective factors pertaining to illegal performance enhancement. The observed gender difference in athletes’ willingness to use substance for body modification is in keeping with previous results showing that males are more likely to use substance that is associated with athletic performance whereas use among females were more likely to be motivated by appearance (Breivik et al. 2009).

Although this study and previous research supports the hypothesis of a gateway between NS use and doping, it does not explain exactly why some athletes take the step towards the use of illegal substance and methods. In saying this, it is useful to reflect on the fact that some PES are right on the border between acceptable and banned substances (such as creatine). Consequently, the question of whether such substances should be on the banned list or not has been raised (Honour 2004). Having these ‘in-between substances’ actually helps to blur the border between acceptable and non-acceptable substances, which is in line with the gateway hypothesis. Future research should consider this more carefully in order to identify risk factors for developing a doping habit from previous supplement use. The identification of these risk factors would enable more effective anti-doping programmes to be designed in the

future, with those most at risk of doping being the target of evidence-based interventions. Furthermore, understanding the culture of supplement use within sports appears warranted.

Perspectives

The use of legal and illegal performance enhancing substances permeates sport at all levels. Despite developments in the anti-doping field, risk factors for doping behaviour are largely undetermined and this hinders prevention efforts. Early research suggests that supplements may be gateway substances to doping. Yet, little attention has been paid to the social cognitive aspect of athletes' NS use in sport; even though studies document high usage rates across age, sports and attainment levels. As such, this study examines the social cognitive aspects of athletes' NS use in sport and considers the subsequent differences between NS users and non-users in relation to doping attitudes and beliefs. Doping use was three and a half times more prevalent in NS users compared to non-users in this sample of competitive athletes. This finding was accompanied by significant differences in doping attitudes and beliefs between NS users and non-users. Thus, athletes who engage in legal performance enhancement practices appear to embody an 'at risk' group for transition towards doping. This study further substantiates the positive relationship already noted between NS use and doping behaviour and anti-doping education should be targeted with these findings in mind.

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