

Social Sciences Research Grant

Enhancing Attention to and Recall of Doping Prevention Messages by Testing the Influence of Adolescent Athletes' Perceived Vulnerability to Doping

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Executive Summary

Doping is a worldwide problem that compromises the health of athletes and the integrity of sport, and occurs among athletes of all levels and types of sports. Researchers have reported that doping often begins during adolescence, with some athletes doping as young as 10 years old. The World Anti-Doping Agency emphasizes the need for educational anti-doping programs targeting young people, given adolescence is a developmental period during which attitudes, values, and decision-making skills are forming. The anti-doping programs should inform adolescents about the risks of doping and motivate them to avoid it. One strategy for informing and motivating adolescents about doping is with health promotion messages, which has been previously shown to be effective in our research. However, the impact of current doping-prevention messages is limited and WADA has identified a particular need to determine the most effective methods of education on supplements, including the best way to communicate messages.

Our previous research shows that many adolescents do not consider doping to be relevant enough in their age group or competition level to attract their attention to messages. Therefore, there is a distinct need to increase adolescents' awareness of their personal risk (or susceptibility) to doping to increase the personal relevance and effectiveness of doping-prevention messages.

The initial goal of this two-phase study was to improve the effectiveness of doping-prevention messages by testing a new strategy for increasing the perceived relevance of the messages among adolescent athletes aged 13 to 16 years. In phase 1, we initially planned to conduct a series of six focus groups to discuss adolescents' perceptions of doping among athletes their age. These discussions would help refine the brief susceptibility intervention to enhance their perceived personal relevance of the issue of doping. In phase 2, we planned to conduct a

randomized trial with 88 adolescent athletes to determine the impact of the susceptibility intervention and doping prevention message compared to doping prevention message alone on attention to and recall of the messages (primary outcomes), using state-of-the-art eye tracking technology to assess whether enhancing adolescents' perceived susceptibility to doping increases their attention to prevention messages. We would also assess whether this susceptibility intervention could influence adolescents recall of doping-prevention messages and effectiveness of the messages for improving motivational factors related to doping prevention (secondary outcomes).

Due to research constraints related to in-person research during the COVID-19 pandemic (e.g., focus groups, eye-tracking), modifications were made to both phases of the study to allow for the research to be carried out online. Across two studies, we explored perceived susceptibility to initiate doping and factors associated with those perceptions among adolescent athletes aged 13-16 years. Data for both studies were collected online via Qualtrics survey system and participant panel recruitment. In Study 1, participants (N = 263) viewed a series of vignettes depicting common risk scenarios for doping initiation (initially created for the focus group discussion), and rated the likelihood of those situations occurring to them or their peers. Participant ratings suggest the topic of overcoming physical adversity as most relevant to the adolescent experience in sports. In addition, participants consistently rated other athletes, teammates, or friends as more likely to exhibit doping behaviors than themselves. The participants also expressed misconceptions about doping that may inform future education interventions. In Study 2, we used the findings from Study 1 to build two brief interventions and tested their effects, alone or in combination, on the perceived susceptibility to doping among adolescent athletes (N = 309). Neither intervention affected perceived susceptibility to doping,

however the findings corroborate and add to the findings from Study 1. Exploratory analysis using data from Study 2 revealed that perceived likelihood of becoming a professional or Olympic-level athlete (over and above an athlete's current competitive level) was a predictor of both perceived susceptibility to doping as well as attitudes toward doping. In addition, use of nutritional supplements significantly predicted perceived susceptibility to doping. Determining the predictors of perceived susceptibility to doping may help us identify factors on which to tailor future doping prevention interventions.

Overall, findings from both studies highlight situations and doping-related factors that are most relevant to adolescent athletes, and reflect the need for doping-prevention interventions that are informative, engaging, and easy to disseminate. The findings from this research can be used by WADA and their stakeholders to make anti-doping messages more effective by being relevant to adolescent athletes, with the view of reducing favorable attitudes and susceptibility towards using PEDs and thus reduce the prevalence of doping among young people.

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Introduction

Doping is a worldwide problem that compromises fair play and integrity in sport. Researchers have estimated that 14–39% of current adult elite athletes intentionally engaged in doping (De Hon, Kuipers, & Bottenburg, 2015); however, doping is a problem at the sub-elite level of competition and among younger athletes as well. Athletes competing in sport at the university and high school levels also feel the pressure to dope (Duncan et al. 2018; Hallward & Duncan, 2019) and up to 60% of high school-aged athletes have reported the abuse of some legal performance-enhancing substance (Backhouse et al., 2013). Additionally, athletes are being exposed to licit or illicit performance-enhancing substances at earlier ages than previous decades (Calfee & Fadale, 2006), with athletes as young as 10 years old reporting doping (Nicholls et al., 2017). One issue that has exacerbated the problem of doping in sport is the culture of supplementation that has evolved in sport. Supplement use among athletes is widespread with estimated prevalence ranging between 40–70% of athletes and varying by gender, age, sport type, time of the season (Knapick et al., 2016). Recent research has indicated that supplement use is a major risk factor for doping, serving as a gateway toward the use of banned substances (Hurst et al., 2019; Petroczi, 2013). Taken together, these data indicate a need to address the problem of doping, including the normalization of supplement use, among young athletes.

Recognizing the importance of adolescence as a key developmental period for instilling attitudes that protect against doping, the World Anti-Doping Code (WADA, 2021) emphasizes that anti-doping education should target youth. Researchers have documented, however, that adolescent athletes may not be exposed to adequate anti-doping education (e.g., Duncan & Hallward, 2019; Hallward & Duncan, 2019) and do not feel susceptible to ever initiating doping (Rebner et al., 2015). In a qualitative study, Hallward and Duncan (2019) interviewed 21 current

or recently retired varsity athletes about the anti-doping education they received as adolescents. The athletes indicated they had very little anti-doping education during the adolescent period. The athletes also indicated that during their adolescence they had very low perceived susceptibility to doping and, therefore, they did not feel the messages included in their limited anti-doping education were relevant to them, or athletes in their sport (Hallward & Duncan, 2019).

Comprehensive primary prevention interventions have been developed, tested, and shown to have potential to help prevent the initiation of doping in adolescent athletes (Elliot et al., 2004; Goldberg et al., 2000). These interventions, however, require substantial resources with respect to time and specialized training of program facilitators and peer leaders, which limits their widespread implementation (Duncan and Hallward, 2019). When resources to deliver more extensive programming are limited, doping-prevention messages may play an important role in instilling healthy attitudes toward doping prevention (Duncan & Hallward, 2019; Horcajo & De la Vega, 2014; Horcajo & Luttrell, 2016). The Elaboration Likelihood Model (ELM) has been frequently employed as a guiding framework for creating effective attitude change through messaging (Petty & Cacioppo, 1986). According to the ELM, higher levels of cognitive elaboration on a message leads to increased attitude change toward the topic of interest, which can be facilitated by designing a message to be personally relevant to the recipient. Although unique to each individual, common determinants of personal relevance are the perceived reward of the threat (e.g., improved strength or endurance through doping), the severity of the outcomes of the threat (e.g., athletic sanctions, reputational damage, or adverse health outcomes), and perceived susceptibility to the threat (Floyd et al., 2000; Rogers, 1975). Perceived susceptibility,

specifically, appears to be the easiest variable to modify by way of easily administered messages for large populations.

In an anti-doping study, Horcajo and Luttrell (2016) examined the strength of anti-doping attitudes among 72, 18-year-old soccer players assigned to view messages in a high-elaboration condition (in which the personal relevance and personal responsibility were made salient) compared to players who viewed the messages in a lower-elaboration condition. Athletes who viewed messages in the high elaboration condition reported greater attitude-consistent intentions and more change-resistant attitudes than athletes in the lower-elaboration group. These findings reinforce that highlighting the personal relevance of the message to the recipient may help to foster strong anti-doping attitudes.

Following from the tenets of the ELM and findings from the doping prevention literature, optimizing doping prevention messages targeting adolescents requires crafting messages that the adolescents deem personally relevant. Some researchers have identified key risk factors in the initiation of doping among adolescents including age, gender, sport type, and competitive level (Nicholls et al., 2017), that direct the creation of personally relevant messages. However, perceived susceptibility appears to be a practical component of personal relevance that can be targeted in the creation of effective anti-doping messaging for adolescent athletes. Therefore, the overarching purpose of this research was to improve the effectiveness of doping-prevention messaging by enhancing perceived personal susceptibility to doping in adolescent athletes. We conducted two studies to (a) explore the situations and doping-related factors that adolescent athletes feel are relevant to their present participation in sports (Study 1), and (b) test the relative effect of two brief interventions, alone or in combination, on the perceived susceptibility to doping among adolescent athletes (Study 2).

Study 1

The purpose of Study 1 was to explore the situations and doping-related factors that adolescent athletes feel are relevant to their present participation in sports. Based on previous research that has identified a number of factors that may influence doping initiation or the use of sport supplements (e.g., Backhouse et al., 2013; Duncan et al., 2018; Erickson et al., 2017; Nicholls et al., 2017), we created 18 vignettes that depicted common scenarios in which adolescents may contemplate doping. We collected quantitative and qualitative data to ascertain adolescent athletes' reactions to these vignettes with a focus on their perceived relevance. Specifically, we asked: (1) what situations or doping-related factors do adolescent athletes find to be most personally relevant? (2) are there differences in perceived relevance of doping-related situations and factors for athletes of different genders, sport types, competitive levels, and level of exposure to anti-doping education?

Study 1 Methods

Participants

Athletes were eligible to participate in the survey if they (a) were between the ages of 13 and 16 years, (b) had parental consent, and (c) had participated in organized sports at the school level or higher in the past year.

Procedures and Measures

Ethical approval for this study was obtained from the authors' University Research Ethics Board. Adolescent athletes were recruited through Qualtrics online survey software (2020) that draws from 20 online research panels containing full psycho-demographic profiles for thousands

of users. Based on these profiles, Qualtrics sent an email invitation to parents who were likely to have children who met our survey criteria. The email indicated that the survey was being conducted for research purposes and consent (from a parent) and assent (from the adolescent participant) were obtained through the survey system before directing the participants to complete the demographic and sport history questionnaire, and the vignette activity.

Demographic and Sport History Information

Participants indicated their age, gender, and race as well as information about their participation in sport including their primary and secondary sports, frequency of participation (training and competition), and level of competition. Participants also reported on their past experiences with doping education and testing.

Vignettes

Each participant was randomly assigned to see five of eighteen vignettes created for this study. Each vignette featured an athlete experiencing a common scenario that might lead an athlete to contemplate doping, as summarized in Table 1. Some of the vignettes culminated in explicit use of a banned substance and others only inferred the use or abuse of banned substances or nutritional supplements. Providing some ambiguity in the vignettes allowed for a wide range of responses from the participants regarding the relatability of the vignette to their own experience. The vignettes had an average length of 104 words and were written in first-person language. After reading each vignette, participants responded to three Likert-scale questions and two open-ended questions. The Likert-scale items included: (1) this scenario, or something similar, could happen to you during your participation in sports rated from 1 (*extremely unlikely*) to 7 (*extremely likely*); (2) this scenario, or something similar, could happen to a friend or

teammate while they participate in sports rated from 1 (*extremely unlikely*) to 7 (*extremely likely*); and (3) If this scenario happened to you, you would use a supplement to help solve the specific problem presented in each scenario rated from (*extremely unlikely*) to (*extremely likely*). The two open-ended questions were (1) what makes this situation realistic to you? And (2) what makes this situation unrealistic to you? A speeding check was added to the survey that removed responses that were completed in less than 8 minutes, resulting in a mean completion time of 19.6 minutes.

Data analysis

Quantitative data were analyzed using the Statistical Package for Social Sciences 26. Means and standard deviations were calculated for each Likert-scale item (self, other, and follow-through). Independent t-tests were used to determine whether there were differences in participant responses by gender, and competition level, and having had previous doping education. Based on our review of the descriptive statistics suggesting a pattern whereby participants consistently rated the situations as more likely to occur to others than to themselves, we also conducted independent t-tests to explore whether these self-other discrepancies were statistically significant. Qualitative data were analyzed using the six steps outlined by Braun and Clark (2006).

Study 1 Results

Participants

Data were collected from 263 adolescent athletes ($n = 126$ females, $n = 132$ males, $n = 1$ non-binary) with a mean age of 14.5 years ($SD = 1.1$). The athletes participated in 29 different sports with basketball ($n = 71$), soccer ($n = 50$), football ($n = 27$), baseball ($n = 18$), and track and

field ($n = 17$) being the most popular primary sports. In many cases ($n = 199$), athletes participated in multiple sports, thus the athletes had a diverse set of experiences. The athletes competed at various levels including 12 at the recreational level, 123 at the school level, 42 at club level (a team within the city or community), 53 at the state-wide level, 28 at the national level, and 5 at the international level. During their participation in sports, 56% of the athletes ($n = 147$) had discussed doping, 60% ($n = 157$) indicated that doping testing takes place at their level of competition, and 27% ($n = 70$) had a doping testing experience.

Quantitative Results

The mean ratings for the likelihood the situation would happen to oneself, to others, and that the participants would follow through with an explicit use of performance enhancing substances are reported in Table 2. On average, participants rated, vignettes 4 (trainer recommended supplement for recovery), 13 (use of cold medicine before a tournament), 14 (dulling pain to obtain the role of team captain), and 18 (perceived pressure to make parents proud) as the most likely to occur. Vignettes 4, 14, and 18 all include external pressure from members of the entourage, whereas vignette 13 depicted an athlete with insufficient knowledge of prohibited substances.

Using independent t-tests we compared the likelihood ratings for each vignette across genders, competitive level, sport type (team vs individual), and previous doping education (yes vs no). For gender, the mean scores indicate that male athletes had a tendency to rate the vignettes as more likely to occur when compared to their female counterparts; however, the differences were only significant for vignette 3 (unwillingness to raise ingredient concerns to parent; $t(72) = 2.38, p = 0.02$), vignette 4 (trainer recommended supplement for recovery; $t(72) = 2.95, p = 0.004$) and vignette 16 (explicit use of a performance enhancing substance; $t(75) =$

3.28, $p = 0.002$). Though non-significant, female athletes rated vignette 1 (fitness “influencer” promotes supplement on social media), vignette 2 (avoid multi-sport burnout and unwanted attention from coach), vignette 7 (supplement use to alter sport-relevant body composition), and 9 (use of a THC vape pen at a party) as more likely to occur to them than male athletes. For competitive level, we categorized participants as either high competitive level (those who competed at the state level or higher), or low competitive level (those who competed at recreational, school, and club levels). The independent t-tests showed no significant differences in likelihood ratings for participants who competed at higher, as compared to lower, competitive levels. For sport type, analyses showed significant differences between individual and team sport athletes on two vignettes with team sport athletes rating vignette 10 (perceived parental pressure to obtain an athletic scholarship) as more likely to occur than individual sport athletes ($t(76) = 2.08, p = 0.04$), and individual sport athletes rating vignette 15 (use of Adderall to improve academic performance) as more likely to occur than team sport athletes ($t(36) = 2.12, p = 0.04$). We did not observe any other significant differences between team and individual sport athletes. For previous doping education, the data showed a consistent trend whereby participants who had received previous doping education rated 13/18 vignettes as significantly more likely to occur than participants who had not received previous doping education. There were no instances where participants who had not received previous doping education provided higher likelihood ratings than those who had received doping education. Results from independent t-tests indicated that participants perceived the scenarios in 12/18 vignettes (3, 4, 6, 9, 10, 11, 12, 13, 15, 16, 17 and 18) to be significantly more likely to occur to a friend or teammate than to themselves ($ps < .05$).

Qualitative Results

The data collected from the two qualitative questions revealed six themes that furthered our understanding of the quantitative findings (see Table 3). One theme reinforced the quantitative findings: adolescents described the scenarios as being more likely to occur to someone else than to themselves. The remaining four themes provided information not otherwise seen in the quantitative results. First, the athletes reported having trust in their entourage (e.g., parents and coaches) to make good health and safety decisions on their behalf. Second, was a play for fun versus play to win theme. Although our quantitative data show no significant trend in competition level, this qualitative theme shows that athletes who feel they only play for fun perceived the scenarios in the vignettes as less likely to occur to them. Third, the data show a misconception that products prohibited in sport are illegal to purchase outside of sport, thus they are unlikely to encounter banned substances. Fourth, some participants indicated that substances prohibited in sport are most often stand-alone products, rather than ingredients within a product.

Study 1 Discussion

The purpose of Study 1 was to explore the situations and doping-related factors that adolescent athletes find most personally relevant to their participation in sports. Of the 18 vignettes created for this study, vignettes 4, 13, 14, and 18 were rated as the most likely to occur. The common feature between vignettes 4, 13, and 14 was a focus on overcoming physical adversity. The participants related well to situations that involved athletes being injured and the pressures they face to return to sport and to perform at their best. It should be noted that in this study we did not assess the frequency with which participants had been injured in the past and the nature of those injuries, which may have provided deeper insight into the relatability of these vignettes. One possible implication from this finding is that doping prevention interventions

should highlight healthy ways to overcome exceptional physical adversity (e.g., rest, proper treatment and return to sport protocols) without the use of banned substances.

Both the quantitative and qualitative findings reflect a belief amongst the participants that other athletes, teammates, or friends were more likely to participate in doping behavior than themselves. This is consistent with self-affirmation theory (Steele, 1988) and previous research in a doping context (Barkoukis et al., 2015) that suggests athletes are motivated to maintain a positive self-image and will respond defensively to anything that threatens that positive image (i.e., the suggestion that they may engage in doping). Our findings provide an extension to this research, suggesting that anti-doping related self-serving beliefs are a natural tendency, even early in an athlete's sport development. Although the participants reported optimistic beliefs about their likelihood of avoiding doping, research demonstrates the actual risk of initiating doping may be greater than they predict (Nicholls et al., 2017; Ntoumanis et al., 2014). Our data show that the perceived likelihood of each doping-related scenario occurring to oneself was greater for participants who had previously engaged in anti-doping education. This finding suggests that education may be one way to help adolescents better connect their perceived risk with their actual risk. More research exploring how to strengthen this connection is needed.

One of the themes seen in the qualitative data suggested that athletes who play for fun perceived the vignettes to be less likely to occur than those who play to win. The quantitative results, however, showed that the level at which an athlete is competing had no significant impact on the perceived likelihood of encountering pressure to dope. This discrepancy may be explained by other moderating factors that contribute to the level of competition. For example, a 16-year-old adolescent athlete is more likely to play at a higher competitive level than a 13-year-old, but may perceive their participation in sport to be recreational and not a main focus. An

analysis of athletic aspirations may aide the identification of athletes who may be more susceptible to doping and to increase the awareness of doping in athletes who do not plan to “go pro” during their athletic careers.

A general lack of doping-related knowledge has been reported in the literature (e.g., Backhouse et al., 2007; Hallward & Duncan, 2019). This is supported by two common misconceptions found in our qualitative findings: 1) a prohibited substance in sports are standalone products, rather than ingredients within a product, and 2) they are illegal to purchase, so are not likely to be encountered without explicit intention. This general lack of knowledge in combination with low perceived susceptibility to doping and the high reported prevalence of doping among adolescent athletes warrants the creation of an intervention that increases knowledge and awareness of the prevalence of prohibited substance in daily life.

Study 2

The findings from Study 1 showed that adolescent athletes are resistant to admit to their susceptibility to doping, especially in relation to others. Although research in other fields has documented that positive, self-affirming beliefs are very difficult to change (Barkoukis et al., 2015; Barkoukis et al., 2020; Briñol & Petty, 2006; Steele, 1988), there is some evidence to suggest that these beliefs may be influenced by a message that has a surprising or unexpected aspect, presents arguments from multiple different sources, and relates to some aspect of the recipient's self (Briñol & Petty, 2006; Horcajo & de la Vega, 2014; Horcajo & Luttrell, 2016; Petty & Cacioppo, 1986). Therefore, we hypothesized that when adolescent athletes are made aware that products they use or ingest frequently may contain banned ingredients, their perceived susceptibility to doping may increase. To test this hypothesis, we created a 'common products intervention' that aimed to show adolescent athletes that they may be more likely to use or ingest products that contain banned ingredients than they think. The purpose of this experimental study was to test the relative effect of this intervention compared to a vignette-based intervention, the two interventions in combination, or a control condition, on the perceived susceptibility to doping among adolescent athletes. We also explored whether gender, competitive level, aspirations to become a professional or Olympic athlete, and previous doping education moderate the effects of the intervention.

Study 2 Methods

Participants

Athletes were eligible to participate in the survey if the (a) were between the ages of 13 and 16 years, (b) had parental consent, and (c) had participated in organized sports at the school level or higher in the past year.

Procedure

The recruitment, consent, and enrolment processes were the same as detailed in Study 1. In Study 2, each participant was randomly assigned to one of four groups: 1) vignette intervention, 2) common product intervention, 3) combined vignette and common product intervention, or 4) control. Assessments were taken immediately before and immediately after the intervention. Following a pilot release of the survey, a speeding check was added to the survey that removed responses that were completed in less than 8 minutes, resulting in a mean completion time of 12.0 minutes.

Study Conditions

Vignette Intervention. The four vignettes from Study 1 that were rated by participants as most likely to occur were retained for Study 2. These vignettes were edited and switched to second person language (e.g., “you decide to take a supplement”) because this has been shown to increase personal involvement and processing of messages (Briñol & Petty, 2006) and the authors felt this could potentially decrease the defensiveness among participants to the idea that they may be susceptible to initiating doping. Three of the four vignettes were shown to each participant in this intervention group (selection of the three vignettes was made at random).

Common Product Intervention. We generated a list of items that our participants were likely to use or consume, that may contain banned ingredients. Items were considered to have the possibility of causing a positive result on a doping test if; 1) an ingredient was classified as a

performance enhancing drug by the World Anti-Doping Agency (WADA; 2020), United States Anti-Doping Agency (USADA; 2019), or National Collegiate Athletic Association (NCAA; 2020), and 2) the product had been shown to contain the ingredient of interest or had warnings suggesting athletes avoid consumption of the product near competition by the WADA, USADA, NCAA, or otherwise. This led to the inclusion of eight items: poppy seeds on a bagel (morphine; ElSohly et al., 1990; USADA, 2014), cold and sinus medicine (pseudoephedrine; USADA, 2019), nutritional supplements (e.g., Baume et al., 2006; Martínez-Sanz et al., 2017), energy drinks (caffeine; NCAA, 2020), foreign beef products (growth hormones; USADA, 2016), marijuana (WADA, 2020; NCAA, 2020), and skin care products (Spironolactone; WADA, 2020). In addition to these, anabolic steroids or erythropoietin were included as substances that would clearly constitute doping, as well as fruits and vegetables that are safe and healthy foods for consumption. An image of each of these items was presented, along with text labelling the item. Participants were asked to select all the items they had used or consumed within the past year. Upon selection of any of the items that may contain a banned ingredient the participant received a warning that read, “Some of the products you selected may contain ingredients that are banned in sports.” The following page presented information about the performance-enhancing ingredients that could be present in the items they had selected.

Combined Vignette and Common Product Intervention. The combined intervention delivered the common product intervention followed by the vignette intervention as described above.

Control Condition. The control condition was designed to closely match the common products intervention in terms of style, length, and verbiage. We generated a list of nine obscure sports (e.g., chess boxing, bossaball, headis) and invited participants to select at least three

interesting sounding sports from the list. Following selection, the participants were provided with a short description of the sport without mention of performance enhancing substances or the act of doping.

Measures

Demographic and Sport History Information. We collected demographic, sport participation, and doping education history information, as outlined in Study 1. In Study 2 we also asked “How likely do you think it is that you will become a professional and/or Olympic athlete in your sport?” on a scale ranging from 1 (*extremely unlikely*) to 7 (*extremely likely*).

Perceived Susceptibility. The susceptibility subscale of the Adolescent Sport Drug Inventory (ASDI; Nicholls et al., 2019) was used to assess participants’ perceived susceptibility to doping. This scale included statements such as “I would be tempted to take PEDs if I had a bad injury” and “I would be tempted to take PEDs if my coach tells me to.” All of the items from were measured on a scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*).

Attitudes Toward Doping. We used the four-item attitudes subscale from the ASDI to assess participant’s attitudes toward doping (Nicholls et al., 2019). Items were rated on a scale ranging 1 (*strongly disagree*) to 7 (*strongly agree*) and included statements such as: “In order to be successful in my sport, I need to take PEDs” and “Making PEDs legal would improve sport”.

Planned Data Analysis

We conducted one-way ANOVAs (for continuous variables) and chi-square analyses (for categorical variables) to determine whether there were any significant differences between groups on demographic or sport history variables at baseline (i.e., to ensure randomization was successful). We then explored correlations between the demographic variables (age, total hours

per week playing sports, and perceived likelihood of “going pro” to identify variables to be included as covariates in the main analysis. The main analysis involved mixed between within subjects ANCOVAs to determine whether there were differential changes in the dependent variables of perceived susceptibility and attitudes for participants assigned to the four study conditions.

Study 2 Results

Participants

Data were collected from 309 adolescent athletes ($n = 142$ females, $n = 155$ males, $n = 4$ non-binary, $n = 1$ transgender male, $n = 7$ other) with a mean age of 15.0 years ($SD = 1.07$). The athletes participated in 32 different sports with basketball ($n = 52$), soccer ($n = 46$), volleyball ($n = 31$), baseball ($n = 23$), football ($n = 22$), and track and field ($n = 21$) being the most popular primary sports. In many cases ($n = 244$), athletes participated in multiple sports, thus the athletes had a diverse set of experiences. The athletes competed at various levels of sport including 14 at the recreational level, 128 at the school level, 71 at club level (a team within the city or community), 64 at the state-wide level, 31 at the national level, and 3 at the international level. With regard to the perceived likelihood of participants becoming an Olympic or professional athlete the mean score was 3.21, $SD = .92$). During their participation in sports, 46% of the athletes ($n = 143$) had discussed doping, 41% ($n = 129$) were aware that doping testing takes place at their level of competition, and 14% ($n = 43$) had a doping testing experience.

Group Allocation

We conducted one-way ANOVAs (for continuous variables) and chi-square analyses (for categorical variables) to determine whether there were any significant differences between

groups on demographic, sport history, or previous doping education variables at baseline. The analyses revealed no significant between-groups differences ($p > .05$) indicating that the randomization was successful.

Substance Use

Participants who were assigned to the common products intervention ($n = 77$) and the combined (common products + vignette) intervention ($n = 82$) were asked to indicate if they had used a variety of common products, including products that can include prohibited ingredients (e.g., nutritional supplements, energy drinks) and products that do not include prohibited ingredients (e.g., dairy products) in the past year. Among the participants in these 2 groups, 69 participants (42.8%) indicated that they had used nutritional supplements, 13 participants (8.2%) indicated they had used marijuana, 86 participants (54.1%) indicated they had consumed energy drinks, 100 participants (62.9%) indicated they had used cold medications, and 3 participants (1.9%) indicated they had used performance-enhancing drugs.

Main Analysis

We explored correlations between the demographic variables (age, total hours per week playing sports, and perceived likelihood of “going pro” to identify variables to be included as covariates in the main analysis. Perceived likelihood of going pro was significantly correlated with both dependent variables: (a) susceptibility ($r = .237, p < .001$) and (b) attitudes ($r = .303, p < .001$). Therefore, likelihood of going pro was included as a covariate in the main analysis. Two separate repeated measures ANCOVAs were conducted to determine if there were differential changes in: (1) perceived susceptibility and (2) attitudes towards doping, from pre to post intervention. The analyses revealed no significant, differential, between-groups changes on either

of the dependent variables ($p > .05$). Descriptive statistics for each study group and the sample as a whole are presented in Table 4.

Exploratory Analysis

Predictors of Susceptibility. We conducted a follow-up, exploratory analysis to determine whether any demographic, sport history, or doping education variables predicted perceived susceptibility or attitudes toward doping. We conducted two separate linear regression analyses in which the dependent variables (perceived susceptibility, attitudes) were regressed on age, gender, hours of sports participation per week, years playing their main sport, level of competition, perceived likelihood of going pro, previous doping education, and previous discussions about doping. Given that our sample size was $N = 309$ and Tabachnick and Fidell (2007, p. 123) suggest that an adequate sample size would be $N > 50 + 8m$, where m = the number of independent variables, we were sufficiently powered to conduct this exploratory analysis. For susceptibility, the only unique predictor was the perceived likelihood of going pro, which explained 7.6% of the variance ($\beta = .223, p < .001$). Similarly, for attitudes, only unique predictor was the perceived likelihood of going pro, which explained 12.1% of the variance ($\beta = .320, p < .001$).

Among the participants who were assigned to the common products intervention or the combined (common products + vignette) intervention ($n = 159$) and reported on the use of common products, 69 indicated they had used nutritional supplements. Given research evidence that supplements are a gateway to doping, we explored how supplement use was related to other key study variables. We repeated the regression analysis described above, with only the 159 participants who had the opportunity to report nutritional supplement use, and we added nutritional supplement use (yes/no) to the regression analysis predicting susceptibility toward

doping. For perceived susceptibility, both perceived likelihood of going pro ($\beta = .216$, $p = .011$) and nutritional supplement use ($\beta = .231$, $p = .005$) were significant, unique predictors, accounting for a total of 13.2% of the variance in perceived susceptibility to doping. Nutritional supplement use did not contribute to the prediction of attitudes toward doping.

Who uses sport supplements? Among the participants who were asked to indicate nutritional supplement use, we compare those who reported yes, they have used nutritional supplements in the past year, to those who did not indicate supplement use on demographic, sport history, and doping education variables. We conducted independent samples t-tests to compare those who reported supplement use versus those who did not on age, total hours of sport participation per week, number of years playing their main sport, and the perceived likelihood of going pro. There were no significant between-groups differences for age or perceived likelihood of going pro ($ps > .05$). Participants who indicated nutritional supplement use within the past year reported significantly more hours of sport participation per week ($M = 11.62$, $SD = 7.91$) compared to those who did not indicate supplement use ($M = 8.96$, $SD = 6.74$). We conducted chi-square tests to determine if there were significant differences between participants who reported supplement use and those who did not on doping education variables and there were no significant between groups differences in whether they had previously engaged in doping prevention education or discussed doping with important others.

Study 2 Discussion

The purpose of Study 2 was to test the relative effect of two brief interventions alone or in combination on the perceived susceptibility to doping among adolescent athletes. The ELM formed the theoretical basis for both the common product and vignette interventions, which were created for adolescent athletes with presumably low motivation (i.e., low perceived personal

relevance) to interact with doping-prevention messaging. Neither the vignette nor common product intervention led to significant changes in perceived susceptibility to doping. Though the common products intervention was designed to help athletes learn that anti-doping rule violations can still be committed with or without an intention to dope, it appears the athletes in our study still believed their susceptibility to being tested and then receiving a positive test was unlikely. Only a small portion of our sample (11%) competed at the national level or higher and, therefore, many athletes do not have testing as a part of their sport experience. Perhaps among athletes who are part of a registered testing pool, in which there is a risk of a positive test resulting from the unintentional use or consumption of a product that includes banned ingredients, the intervention would be more efficacious. Given the misconceptions identified in the qualitative findings of study 1 that (a) it is a substance or food item as a whole, not only an ingredient within it, that is banned and that (b) prohibited substances are illegal, more research exploring how to correct these misconceptions, which may include identifying how to help athletes realize their susceptibility toward doping, are needed.

Though neither intervention led to a change in perceived susceptibility to doping, the results of our exploratory analyses do shed some light on the predictors of perceived susceptibility to doping. The athletes who felt they had a high likelihood of “going pro” were found to have higher perceived susceptibility and more favourable attitudes toward doping in sport. This finding is consistent with findings from our previous research that indicates adolescent athletes believe doping is a problem for older athletes at the highest competitive levels (e.g., Hallward & Duncan, 2019). This is the first indication from our own body research that regarding what factors may contribute to an athletes own perceive susceptibility to doping. Tailoring doping prevention education based on adolescent athletes’ aspirations for the future

may enhance the efficacy of doping prevention messages or interventions. This approach has yet to be tested.

Our exploratory analyses indicated that athletes who used supplements trained more hours per week than athletes who do not use supplements. Given the “slippery slope” hypothesis that supplement use could lead to the more explicit use of prohibited substances (Mallick et al., 2023), as athletes’ training hours increase perhaps more education on healthy ways to optimize performance and recovery, without the use of supplements, would help to prevent doping in sport.

Limitations

Despite the value added from this work, there are some notable limitations. Given the design and online administration of the study, the post-intervention assessment had to be administered immediately. The ELM states that for an attitude change to be likely, the participant must elaborate on ideas presented in the message. Due to the immediacy of the assessment, the adolescent athletes may not have enough time to elaborate on what was being presented in the interventions. A similar challenge is presented in controlling intervention exposure in an online format. Without any oversight, the adolescent athletes may have failed to self-administer a great enough dose to the intervention to create the desired effect.

Conclusions

This set of studies explored the situations and doping-related factors relevant to adolescent athletes and tested brief doping-prevention interventions focused on increasing perceived susceptibility to doping. The results from Study 1 highlighted four vignettes that were rated by the adolescent athletes as most likely to occur: vignette 4 (trainer recommended supplement for recovery), 13 (use of cold medicine before a tournament), 14 (dulling pain to obtain team captain position), and 18 (perceived pressure to make parents proud). These four vignettes highlight the important role that the athletic entourage plays in adolescent athletes' health-related decisions, as well as the need to ensure the athlete and their entourage is equipped with the knowledge to make healthy decisions when presented with pressure to initiate doping.

The findings from this study reflect the need for doping-prevention interventions that are informative, engaging, and easy to disseminate. The ELM (Petty & Cacioppo, 1986) describes numerous factors that could aid in creating effective messaging, which includes increasing personal relevance that has been lacking in doping-prevention interventions amongst adolescent athletes (Hallward & Duncan, 2019). The findings from Study 1 suggest vignettes focused on overcoming physical adversity (i.e., fatigue), to be the most relevant to the adolescent experience in sports. In addition to selecting the most relevant vignettes, the athletes in Study 1 displayed a self-other discrepancy consistent with self-affirmation theory (Steele, 1988) where other athletes, teammates, or friends were rated as more likely to exhibit doping behaviours than themselves. As such, interventions that focus on personal relevance and perceived susceptibility may prove to be effective in creating favourable attitudes toward doping from early in the adolescent years.

The adolescent period represents a vulnerable phase for the formation of attitudes towards doping (Nicholls et al., 2017). Both the quantitative and qualitative findings of Study 1

corroborate many of the well-known doping-related risk factors, including influence from gender, sport participation, and sport type (e.g., Nicholls et al., 2017). The athletes also described an inherent trust that their entourage will make the good health-related decisions on their behalf. This finding is not new and continues to be an area of concern, especially with continual findings that show the entourage possesses inadequate knowledge to make such decisions (e.g., Blackhouse et al., 2016; Hallward & Duncan, 2019; Nicholls et al., 2017). As such, research and the associated policies should continue to target the entire entourage to provide athletes with an environment suited to protect the spirit of sport.

The qualitative findings from Study 1 also revealed two notable misconceptions about performance enhancing drugs that could be of interest for future research. First is the idea that a substance banned for use in competitive sports must also be illegal, or at least challenging to purchase. To provide an example of the prevalence of banned substances, Baume et al. (2006) found 18% of the 103 over-the-counter nutritional supplements tested contained unlabeled contaminant substances that were banned by the WADA. The general lack of awareness of the likelihood of encountering such substances in sub-elite athletics, provides insight into the uncertainty surrounding doping practices faced by adolescent athletes. The second misconception was that a performance enhancing drug is a stand-alone product, rather than an ingredient within a product. Although this may be the case for “stereotypical” methods of doping, such as the use of anabolic steroids, banned substances are more often found as ingredients that are present in many everyday items (e.g., Yonamine et al., 2004). While these findings are not sufficient to determine causality, it is possible that these misconceptions arise, at least in part, from the general lack of knowledge amongst athletes and their entourage (e.g., Blackhouse et al., 2016).

Unintentional doping was of particular interest in the creation of Study 2, as high levels of awareness and motivation to avoid banned substances is required to habitually avoid accidental consumption (Chan et al., 2020). In a study of 410 young athletes (mean age = 17.7 years), Chan et al. (2014) found only 16% of the participants read the food label when casually offered an unknown food item before completing a survey. This finding has strong face validity in that young athletes are either unmotivated or unaware of the importance of checking food labels. It is important that adolescent athletes are provided with an accurate representation of banned substances, as well as the knowledge and skills to make autonomous decisions regarding doping-avoidance in day-to-day life.

The common products activity created for Study 2 made an explicit connection between otherwise healthy items and the possible presence of banned substances. Although we were unable to create a significant change in perceived susceptibility with this brief intervention, findings from our exploratory analysis do add to the doping-prevention literature. The findings from Study 2 show that adolescent athletes with an aspiration to compete at the professional or Olympic level had a higher perceived susceptibility and more favourable attitudes toward doping. Future research should explore whether or not aspirations could be used to identify adolescent athletes who may be at greater risk for initiating doping behaviours. Despite this step forward, adolescent athletes may still feel doping is not a relevant topic of discussion (Hallward & Duncan, 2019), so continued attempts to create interventions that increase personal relevance is of importance in ensuring these new educational programs have lasting effect on the clean sport movement.

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Tables

Table 1. *Summary of the Vignettes with the Prominent Themes Included*

Vignette	Summary	Prominent Themes
1	A fitness influencer, who plays the same sport as the reader, is promoting a supplement over through social media.	<ul style="list-style-type: none"> • Supplement use as a gateway to doping • Pressure from peers
2	Competitive athlete seeking a faster recovery to prevent burnout from playing multiple sports and to avoid negative attention from the coach.	<ul style="list-style-type: none"> • Avoiding burnout/exhaustion • Desire to have fun in sports • Pressure from sport staff
3	Mom bought protein supplements that the athlete thinks may contain a banned substance. Athlete does not want to add stress their mom out.	<ul style="list-style-type: none"> • Lack of anti-doping knowledge among parents
4	The team trainer recommends a supplement to increase recovery speed during pre-season bootcamp.	<ul style="list-style-type: none"> • Supplement use as a gateway to doping • Avoiding burnout/exhaustion • Pressure from sport staff
5	Coach tells the athlete to “bulk up” during the off-season. After forgetting their pre-workout, the athlete’s close friend offers theirs.	<ul style="list-style-type: none"> • Supplement use as a gateway to doping • Desire for physical improvement • Pressure from peers and sport staff
6	After moving up an age group, the athlete worries that their current physique will be insufficient to prove themselves to the coach and team.	<ul style="list-style-type: none"> • Desire for physical improvement • Pressure from peers and sport staff
7	The athlete is in a sport where body composition and weight is important. The athlete feels they need a supplement to drop weight faster.	<ul style="list-style-type: none"> • Supplement use as a gateway to doping • Desire for physical improvement • Pressure from sport staff

8	The athlete is dealing with bad acne and a doctor prescribes medication without consideration for banned substances in their sport.	<ul style="list-style-type: none"> • Desire for physical improvement • Lack of knowledge about anti-doping rules
9	The athlete attends a party to enjoy a weekend off from sport. They use a THC vape pen because they do not feel they are at risk of being tested.	<ul style="list-style-type: none"> • Pressure from peers • Lack of knowledge about anti-doping rules
10	The athlete feels like they owe it to their parents to get an athletic scholarship. Worried about their grades, they seek a way to improve.	<ul style="list-style-type: none"> • Pressure from parents • Desire for physical improvement • Balancing academic and athletic stress
11	A targeted advertisement appears for an athlete-specific supplement website. There are pictures of athletes and good reviews for the product.	<ul style="list-style-type: none"> • Lack of knowledge about anti-doping rules • Desire for physical improvement
12	Consumption of energy drinks to meet academic and athletic demands, to avoid disappointing parents, teachers, and coaches.	<ul style="list-style-type: none"> • Pressure from parents • Desire for physical improvement • Balancing academic and athletic stress
13	The athlete is sick right before a big tournament. They must play to proceed to the next stage of competition, so they take cold medicine without checking the ingredients.	<ul style="list-style-type: none"> • Lack of knowledge about anti-doping rules
14	Seeking the role as team captain, the athlete is worried their sore wrist could lead to poor performance... they need a way to dull the pain.	<ul style="list-style-type: none"> • Pressure from sport staff • Avoiding burnout/exhaustion
15	Worried about failing a test, the athlete takes their friend's Adderall to improve focus. It is worth it to pass and not have to take summer school.	<ul style="list-style-type: none"> • Pressure from sport staff • Balancing academic and athletic stress
16	The athlete wants to get an athletic scholarship but lacks athletic ability. They dope intentionally to improve their performance.	<ul style="list-style-type: none"> • Explicit doping • Balancing academic and athletic stress

17	Dad bought some new protein supplements. Discouraged by the complexity of the ingredient list, the athlete gives up and tries the supplement anyway.	<ul style="list-style-type: none">• Lack of knowledge about anti-doping rules
18	The athlete feels a need to make their parents proud by focusing on optimal performance, at any cost.	<ul style="list-style-type: none">• Pressure from parents

Table 2. *Descriptive Statistics for Self, Other, and Follow-Through Ratings*

Vignette	Topic	Likelihood Self M (SD)	Likelihood Others M (SD)	Likelihood of Follow-through M (SD)
1	Fitness influencer promoting supplement on social media	4.41 (0.24)	4.69 (0.21)	3.62 (0.25)
2	Seeking faster recovery from multi-sport training	4.72 (0.25)	4.96 (0.22)	4.04 (0.26)
3	Uses nutritional supplement with unknown ingredients	4.13 (0.23)	4.65 (0.19)*	3.69 (0.23)
4	Team trainer recommends supplement for faster recovery	5.16 (0.20)	5.49 (0.16)*	4.73 (0.22)
5	Using a friends supplements without knowing ingredients	4.81 (0.25)	4.99 (0.22)	4.09 (0.29)
6	Athlete worried about their smaller stature	4.81 (0.21)	5.15 (0.19)*	3.96 (0.24)
7	Considers using a supplement to try to cut weight fast	4.49 (0.24)	4.55 (0.23)	3.82 (0.26)
8	Athlete uses acne medication without a TUE	4.42 (0.24)	4.54 (0.23)	4.39 (0.24)
9	Athlete uses a THC vape pen at a party	3.36 (0.29)	4.08 (0.25)*	3.13 (0.27)
10	Athlete looking for an edge to secure an athletic scholarship	4.46 (0.25)	5.31 (0.19)*	3.90 (0.270)
11	Athlete targeted by advertisements for sport supplements	4.49 (0.26)	4.94 (0.21)*	3.59 (0.28)
12	Consumption of energy drinks	4.63 (0.25)	5.28 (0.18)*	3.69 (0.25)
13	Using cold medication without checking ingredients	5.12 (0.24)	5.39 (0.18)*	5.01 (0.24)
14	Athlete needs to dull the pain of a wrist injury	5.30 (0.22)	5.62 (0.17)	4.32 (0.27)
15	Athlete takes a friend's Adderall to improve academic focus	4.70 (0.24)	5.04 (0.20)*	3.58 (0.26)
16	Athlete explicitly doping to improve sport performance	4.25 (0.25)	5.14 (0.18)*	3.54 (0.25)
17	Uses protein supplement without knowing ingredients	3.97 (0.25)	4.40 (0.22)*	4.41 (0.23)
18	Athlete faces pressure to make parents proud	5.79 (0.19)	6.14 (0.12)*	4.42 (0.28)

Note. All items were rated from 1 (extremely unlikely) to 7 (extremely likely) such that a higher score indicates a higher likelihood of doping. * indicates a significant ($p < .05$) self-other discrepancy (i.e., the participant rated the scenario to be significantly less likely to occur to them than to a friend or teammate). TUE = therapeutic use exemption.

Table 3. *Summary of Qualitative Themes and Sample Excerpts from the Data*

Theme	Description	Examples from Data
Self-Other Discrepancy	A large number of the comments reflected that the scenario would be less likely to occur to oneself and more likely to occur to a friend or teammate. This finding mirrored our quantitative findings.	<ul style="list-style-type: none"> • It's easy for my teammates to take things like that, but I would never. • I know someone who might, but I would never.
Trust in the Entourage	Vignettes 3, 4, 5, 8, 14, and 17 contained some pressure from a member of the athlete's entourage. When presented with these vignettes, athletes described the inherent trust that is present between themselves and their parents, peers, trainers, coaches, and physicians.	<ul style="list-style-type: none"> • If my trainer suggests a supplement, I'd consider it safe. • The coaches all know just how to help with that, if you just trust them. • I keep my parents involved with everything I do and I am sure they will make the right decision for me.
Play for Fun vs. Play to Win	Comments regarding competition level suggest athletes who see their participation in sports to be recreational or mainly for fun have very low perceived susceptibility to doping.	<ul style="list-style-type: none"> • My mom doesn't care if I am good and I really don't either. I play to have fun. • I guess that's more likely to happen like in college
The Entire Product is Banned	Comments describing why the vignettes were unrealistic show a misconception that an entire product (rather than an ingredient within it) is the banned substance.	<ul style="list-style-type: none"> • Acne meds are not banned in sport. That's ridiculous. • [My mom] buys almost all of our snacks from Costco and their food isn't banned
Banned in Sport vs.	A few comments provided insight into adolescents' understanding of how readily available some substances can be. There was a	<ul style="list-style-type: none"> • I would think that if protein powders contained substances that are illegal, they would not be so readily available for sale in stores.

Illegal	general belief that if a substance is banned for sport, it must be illegal to sell and purchase to everyday consumers.	<ul style="list-style-type: none">• I can't imagine that an athlete would advertise something with a banned substance. Usually those things are done in secret.
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Table 4. *Descriptive Statistics for the Dependent Variables Tested in Study 2*

Variable	Whole sample M (SD)	Common Products M (SD)	Vignette M (SD)	Combined M (SD)	Control M (SD)
Perceived Susceptibility					
Pre-intervention	2.49 (1.62)	2.39 (1.51)	2.30 (1.57)	2.61 (1.65)	2.67 (1.77)
Post-intervention	2.52 (1.68)	2.36 (1.67)	2.40 (1.66)	2.72 (1.64)	2.60 (1.78)
Attitudes					
Pre-intervention	2.04 (1.50)	2.08 (1.39)	1.94 (1.61)	2.04 (1.33)	2.11 (1.64)
Post-intervention	2.07 (1.57)	2.05 (1.50)	2.07 (1.78)	2.16 (1.44)	2.03 (1.56)

Note. All items were rated from 1 (*strongly disagree*) to 7 (*strongly agree*) such that higher scores indicate a higher level of perceived susceptibility or more positive attitudes.