

Predictors of the Use of Performance-Enhancing Substances by Young Athletes

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Objectives: To document the use of performance-enhancing substances (PES) by young athletes and to identify associated factors.

Design: Retrospective survey.

Setting: Self-reported anonymous questionnaire.

Participants: Three thousand five hundred seventy-three athletes (mean age, 15.5 years) from Quebec provincial teams run by organizations recognized by the Government of Quebec.

Interventions: All subjects filled out a validated questionnaire on factors associated with the use of and the intention to use PES.

Main Outcome Measures: The use of and intention to use PES.

Results: In the 12 months before filling out the questionnaire, 25.8% of respondents admitted having attempted to improve their athletic performance by using 1 or more of 15 substances that were entirely prohibited or restricted by the International Olympic Committee. Multiple regression analyses showed that behavioral intention ($\beta = 0.34$) was the main predictor of athletes' use of PES. Attitude ($\beta = 0.09$), subjective norm ($\beta = 0.13$), perceived facilitating factors ($\beta = 0.40$), perceived moral obligation ($\beta = -0.18$), and pressure from the athlete's entourage to gain weight ($\beta = 0.10$) were positively associated with athletes' behavioral intention to use PES.

Conclusions: This study provides evidence that supports the predicting value of the theory of planned behavior. Results suggest that the athlete's psychosocial environment has a significant impact on the decision to use PES and support the need to integrate this factor into the development and implementation of prevention interventions.

Key Words: doping, performance-enhancing substance, ergogenic aid, sports, theory of planned behavior

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INTRODUCTION

Although the problem of doping in sports is mainly associated with athletes who compete at high levels, the problem seems to be spreading to lower levels.^{1–6} It therefore seems important to implement prevention programs targeting young athletes.⁷ However, for these prevention programs to be effective, they must be based on a conceptual model that predicts human behavior.^{8,9}

It seems that simply communicating knowledge about health-conscious behavior is not enough to induce significant behavioral changes in a population.^{10,11} In other words, communicating reliable information is a necessary but insufficient prerequisite for behavioral change. However, certain psychosocial factors, such as attitude, perceived subjective norm, and perceived behavioral control, seem to be significant factors in determining the probability of adopting or rejecting a healthy behavior. Thus, before designing a program to prevent use of performance-enhancing substances (PES), it is important to first identify the main psychosocial factors that determine whether young athletes will adopt this behavior. Certain social psychology theories, including the theory of planned behavior (TPB),^{12–14} could be particularly useful in implementing this first essential step in health education.^{15–18}

The use of PES seems to involve a set of essentially volitional behaviors. That is, engaging in doping practices is determined largely by personal choice. Ajzen's TPB^{12–14} seems to be suitable for identifying predictors of PES use and intention to use. Numerous studies on health behaviors have demonstrated the predictive value of TPB for both behavioral intention and the behavior itself.^{19–29} More specifically, TPB has shown good predictive value for participation in a physical activity.^{30–33}

TPB (Figure 1) attempts to predict volitional and nonvolitional behaviors by considering a perceived behavioral control variable.^{12–14,34} This variable can be influential in 2 ways. When the behavior is purely volitional, perceived behavioral control can influence intention in the same way that attitude and subjective norm do. However, perceived behavioral control can directly predict behavior in the same way as intention when the behavior is only partially or not at all under the individual's voluntary control or when this perception reflects a real constraint on control in the behavioral

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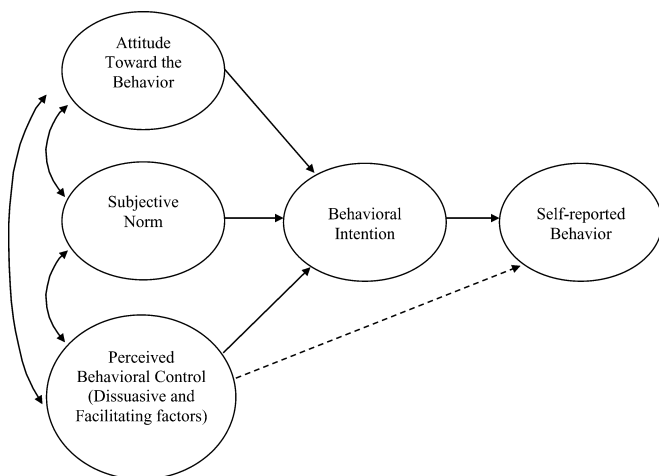


FIGURE 1. Illustration of the theory of planned behavior.

situation.^{12–14,35} Moreover, the external variables in TPB^{12–14} do not directly influence the theory's predictive value. The influence of these variables (eg, perception of moral obligation, level of sportspersonship) is filtered through attitude and other elements of the model.

The main objectives of this study were to document PES use by young athletes in the province of Quebec, Canada, to improve athletic performance, and to identify, from the perspective of TPB,^{12–14} predictors of such behavior.

METHODS

Participants

Participants ($n = 3573$) were members of teams representing the province of Quebec in a variety of sports (eg, baseball, gymnastics, swimming, basketball, hockey, skiing, athletics, soccer, speed skating) or athletes who took part in 1 or more sports in civic or school leagues run by organizations recognized by the Government of Quebec. The mean age of participants was 15.5 years ($SD = 2.4$ years), ranging from 10 (1 athlete) to 20 years and older (216 athletes); 44% were women. On average, participants practiced 5 to 6 times a week for an average of 12 hours weekly ($SD = 7.4$).

Questionnaire

The questionnaire included items designed to evaluate the concepts of TPB and included additional sections addressing external variables to the model.

Concepts of the Theory of Planned Behavior

Performance-Enhancing Substance Use (Behavior)

This scale measured athletes' use of 29 different substances specifically to improve their athletic performance in the past 12 months (Table 1). It was measured with a 5-point Likert scale ranging from 0 (No) to 4 (Yes, I use it regularly). Of the 29 different substances, 15 were banned by the International Olympic Committee (IOC) at the time of the study. The behavior score was obtained by averaging the answers on the 15 IOC-banned substances (Table 1). The internal

consistency coefficient (Cronbach alpha or α) for this scale was 0.90.

Intention

Three items (eg, "Next year, you intend to use PES to improve your athletic performance") were used to measure subjects' intention to use PES in the coming year ($\alpha = 0.83$). Subjects had to respond using a 6-point Likert scale ranging from 1 (completely agree) to 6 (completely disagree).

Attitude

Attitude toward a behavior is based on beliefs about the consequences associated with engaging in it and the value attributed to these consequences.^{12–14} Subjects were asked 2 questions for each of the 7 consequences associated with PES use ($\alpha = 0.63$). First, subjects had to indicate on a 4-point scale (1, not at all; 2, a little; 3, somewhat; and 4, a lot) if they believed that using PES in the coming year would (1) improve their athletic performance, (2) have a harmful effect on their health, (3) increase their chances of winning a competition, (4) make them feel guilty, (5) help them earn a living as a professional athlete, (6) improve their physical appearance, or (7) brand them as a cheater. Subjects were also asked to evaluate each of these 7 consequences on a 4-point scale ranging from -2 (extremely undesirable) to $+2$ (extremely desirable). An indirect measure of attitude was then obtained using a multiplicative scale in which total scores for beliefs and their anticipated consequences were summed.

Subjective Norm

The subjective norm is a function of an individual's beliefs that persons or groups of persons expect a given behavior and that individual's motivation to comply with these expectations.^{12–14} However, we considered only normative beliefs. This decision was supported by studies that demonstrate that measuring normative beliefs alone is a valid indicator of the subjective norm.³⁶

Subjects were asked to rate 5 items on a 4-point scale ranging from 1 (very much for) to 4 (very much against) ($\alpha = 0.85$). After the question, "Do you believe that the following people would be for or against your using PES the next year to improve your athletic performance?", the following 5 items were presented: (1) Your regular doctor, (2) Your coach(es), (3) Your teammates or training partners, (4) Your friends, and (5) Your immediate family (parents, brothers, sisters). The scores of the 5 items were averaged to obtain the subjective norm score.

Perceived Behavioral Control

This was measured by both the perceived dissuasive factors and the perceived facilitating factors associated with PES use. Questions were as follows: "Do you believe that it is likely or unlikely that the following factors (eg, It would ensure you a spot on the national team) will prevent you from using PES to improve your athletic performance next year?" and "Do you believe that it is likely or unlikely that the following situations (eg, the high cost of PES) will encourage you to use PES to improve your athletic performance next year?" Subjects rated their responses on a 6-point Likert scale

TABLE 1. Performance-Enhancing Substances and Methods Use in Young Quebec Athletes (n = 3573)

| Substance and Method | No, % | Yes, %* | Yes, But I Have Stopped Using It, % | Yes, But I Rarely Use It, % | Yes, I Use It Occasionally, % | Yes, I Use It Regularly, % | Missing Data, % |
|--|-------|---------|-------------------------------------|-----------------------------|-------------------------------|----------------------------|-----------------|
| Alcohol | 88.0 | 11.4 | 1.1 | 3.7 | 5.0 | 1.6 | 0.6 |
| Amphetamines† | 97.7 | 1.4 | 0.3 | 0.7 | 0.3 | 0.1 | 0.9 |
| Anabolic steroids† | 98.2 | 1.0 | 0.3 | 0.3 | 0.1 | 0.3 | 0.8 |
| Analgesics | 95.2 | 3.9 | 0.7 | 1.7 | 1.1 | 0.4 | 0.9 |
| Antihistamine medications: Hismanal or Reactine | 96.0 | 3.3 | 0.9 | 1.3 | 0.6 | 0.5 | 0.7 |
| Aspirin tablets | 83.1 | 16.0 | 1.8 | 8.5 | 4.7 | 1.0 | 0.9 |
| Asthma inhaler† | 91.1 | 8.0 | 1.7 | 2.2 | 1.9 | 2.2 | 0.9 |
| Beta-blockers† | 96.7 | 1.4 | 0.3 | 0.3 | 0.3 | 0.5 | 1.9 |
| Blood transfusions or red blood cell transfusions† | 98.2 | 0.9 | 0.3 | 0.3 | 0.1 | 0.2 | 0.9 |
| Caffeine tablets†‡ | 95.2 | 4.0 | 1.3 | 1.3 | 0.9 | 0.5 | 0.8 |
| Chocolate | 65.0 | 34.1 | 2.2 | 8.6 | 13.6 | 9.7 | 0.9 |
| Cocaine† | 97.0 | 2.2 | 0.6 | 0.5 | 0.6 | 0.5 | 0.8 |
| Coffee | 83.1 | 16.1 | 1.5 | 6.8 | 5.0 | 2.8 | 0.8 |
| Creatine, protein supplements | 87.7 | 11.5 | 3.2 | 2.7 | 2.6 | 3.0 | 0.8 |
| Decongestant medication: Sudafed† | 92.8 | 6.4 | 2.0 | 2.8 | 1.2 | 0.4 | 0.8 |
| Diuretics† | 98.0 | 1.1 | 0.4 | 0.3 | 0.2 | 0.2 | 0.9 |
| Erythropoietin† | 98.3 | 0.8 | 0.3 | 0.3 | 0.1 | 0.1 | 0.9 |
| Growth hormones† | 98.0 | 1.2 | 0.4 | 0.4 | 0.1 | 0.3 | 0.8 |
| Local anesthetics | 97.4 | 1.7 | 0.4 | 0.7 | 0.2 | 0.4 | 0.9 |
| Marijuana, cannabis, pot | 91.6 | 7.6 | 2.2 | 1.8 | 1.7 | 1.9 | 0.8 |
| Masking products† | 98.4 | 0.8 | 0.4 | 0.2 | 0.1 | 0.1 | 0.8 |
| Narcotic analgesics† | 97.8 | 1.1 | 0.4 | 0.2 | 0.2 | 0.3 | 1.1 |
| Recovery drinks | 49.7 | 49.4 | 1.2 | 9.4 | 18.8 | 20.0 | 0.9 |
| Regular Atasol tablets | 94.8 | 4.3 | 0.8 | 2.0 | 1.0 | 0.5 | 0.9 |
| Regular Tylenol tablets | 80.3 | 18.8 | 1.8 | 9.7 | 5.9 | 1.4 | 0.9 |
| Soft drinks | 73.1 | 25.9 | 1.1 | 4.8 | 8.8 | 11.2 | 1.0 |
| Stimulants† | 96.9 | 2.3 | 1.0 | 0.6 | 0.3 | 0.4 | 0.8 |
| Urine manipulation† | 98.4 | 0.9 | 0.2 | 0.2 | 0.2 | 0.3 | 0.7 |
| Vitamin supplements | 72.8 | 26.6 | 3.0 | 5.8 | 7.2 | 10.6 | 0.6 |

*Proportion of subjects who used PES in the past 12 months (sum of 4 consumption levels).

†Substances or methods used to operationalize PES use (behavior).

‡Prohibited by the IOC at the time of the study but currently included in the IOC's 2009 Monitoring Program.

ranging from 1 (extremely unlikely) to 6 (extremely likely). Scores on the first series of responses were summed to obtain the measure of perceived dissuasive factors ($\alpha = 0.88$) and on the second series of responses to obtain the measure of perceived facilitating factors ($\alpha = 0.92$).

External Variables of the Theory of Planned Behavior

These questions covered knowledge of IOC-prohibited substances, knowledge of products containing IOC-prohibited substances, and a feeling of moral obligation ($\alpha = 0.62$). Competitiveness of the coach ($\alpha = 0.61$) and the athlete ($\alpha = 0.89$) was measured using an adapted version of the questionnaire developed by Vallerand and Losier.³⁷ A short version of the questionnaire by Vallerand et al.³⁸ was used to measure sportspersonship ($\alpha = 0.91$). Three subscales from the Sport Motivation Scale³⁹ ($\alpha = 0.71$) were used to assess athletes' intrinsic and extrinsic motivation and amotivation. Questions addressing negative comments that the athlete received concerning weight ($\alpha = 0.82$) and perceived pressure to lose ($\alpha = 0.86$) or gain weight ($\alpha = 0.90$) were taken from

a population-based health and social behavior study conducted by Aubin et al.⁴⁰

Demographic Variables

Participants also completed a demographic section containing questions on age, gender, and number of weekly practice sessions.

Procedure

Participation in this survey was voluntary, and all athletes signed an informed consent form. Parental approval was obtained for participants who were 13 years and younger. These procedures met the ethical requirements of the Quebec Ministry of Education, Leisure, and Sport. Questionnaires were sent by mail to the sports organizations, which were in charge of data collection according to a specific pretested standardized procedure. The mean time to complete the questionnaire was 40 minutes, and the return rate was 57.5%.

Data Analysis

Multiple regression analyses were performed to estimate the relative contribution of the TPB variables and external variables to predict PES use and intention to use. All multiple regression models were constructed using SAS version 8.02 (SAS Institute Inc, Cary, North Carolina).⁴¹

RESULTS

Use of Performance-Enhancing Substances

In the 12 months before filling out the questionnaire, 25.8% of participants reported having used 1 or more of the 15 substances that were entirely prohibited or restricted by the IOC to improve their athletic performance. Table 1 shows that only 2 of the 15 substances were used by more than 5% of participants: 6.4% and 8.0% of participants admitted having used the decongestant drug Sudafed or asthma inhaler medications, respectively. Nevertheless, only 0.4% of those who used Sudafed stated that they did so on a regular basis. Of the 283 athletes who used asthma inhaler medications, 2.2% reported using them regularly. For anabolic steroids, growth hormones, and erythropoietin, 1.0%, 1.2%, and 0.8% of subjects reported using these substances, respectively. Data on other popular substances and products showed that those most often used to improve athletic performance were recovery drinks (49.4%), chocolate (34.1%), vitamin supplements (26.5%), coffee (16.0%), creatine (11.5%), alcohol (11.4%), and marijuana (7.7%).

Prediction of the Use of and the Intention to Use Performance-Enhancing Substances

The regression of the variables associated with TPB (use or nonuse of PES) was significant ($R^2 = 0.12$; $P < 0.0001$). Results indicated that the intention to use PES ($\beta = 0.34$; $P < 0.0001$) was the most predictive variable. Introducing external variables into the model increased the predicted variance from 12% to 16%. Analysis of the regression coefficients revealed that in addition to their intention ($\beta = 0.31$; $P < 0.0001$), athletes' level of sportspersonship ($\beta = -0.09$; $P < 0.0001$) and pressure by athletes' entourage to lose weight ($\beta = 0.09$; $P < 0.0001$) were also significantly associated with use behavior (results not presented in the tables).

All TPB variables were positively associated with the intention to use PES (Table 2). These variables predicted 39% of the variance in intention. Examination of the regression coefficients indicated that the facilitating factors ($\beta = 0.48$; $P < 0.0001$) and the subjective norm—or athletes' perception of how significant people in their entourage viewed the use of PES ($\beta = 0.17$; $P < 0.0001$)—were most closely related to the intention to engage in the behavior.

Introducing external variables to the model significantly increased the explained variance of the intention to use PES, with R^2 values increasing from 0.39 to 0.44 (Table 3). The facilitating factors ($\beta = 0.40$; $P < 0.0001$) and the subjective norm ($\beta = 0.13$; $P < 0.0001$) remained the 2 variables that were most closely associated with intention to use PES. Otherwise, perceived moral obligation to not use PES was significantly related to intention to use ($\beta = -0.18$; $P <$

TABLE 2. Results of the Multiple Regression Analysis of the Variables of the Theory of Planned Behavior on Self-Reported Intention to Use Performance-Enhancing Substances by Young Quebec Athletes

| Variable | Unstandardized β | Standard Error | <i>t</i> | <i>P</i> | Standardized β |
|----------------------|------------------------|----------------|----------|----------|----------------------|
| Constant | 0.26 | 0.06 | 4.67 | 0.0001 | — |
| Attitude | 0.09 | 0.01 | 8.27 | 0.0001 | 0.12 |
| Subjective norm | 0.27 | 0.02 | 11.65 | 0.0001 | 0.17 |
| Dissuasive factors | -0.06 | 0.01 | -6.33 | 0.0001 | -0.09 |
| Facilitating factors | 0.43 | 0.01 | 32.99 | 0.0001 | 0.48 |

$R^2 = 0.39$; $P < 0.0001$.

0.0001). In other words, the more uncomfortable subjects were with the idea of using prohibited substances, the less likely they were to intend to use them. Finally, the subjects' attitude toward PES use ($\beta = 0.09$; $P < 0.0001$) and pressure by their entourage to gain weight ($\beta = 0.10$; $P < 0.0001$) were significantly associated with behavioral intention (Table 3).

DISCUSSION

Results show that in the 12 months before taking part in the survey, 25.8% of subjects had used 1 or more of the 15 prohibited substances listed in the questionnaire to improve their athletic performance. These results differ greatly from those of Laberge and Thibault,⁴² who reported that only 2.4% of the 2296 young Quebec athletes they questioned "...admitted to having used banned substances." However, the methods differ between the 2 studies, making comparison difficult. Laberge and Thibault⁴² measured overall consumption of banned substances. Supplementary analysis (not reported here) indicates that less than 3% of athletes used 12 of the 15 PES at least once in the past 12 months. These findings are similar to those of several large-scale surveys,^{1,43,44} at least for the substances examined. Moreover, our results suggest that in the past 12 months, a nonnegligible proportion of young athletes (11%–49%) had used recovery drinks, chocolate, vitamin supplements, soft drinks, creatine, or alcohol to improve their athletic performance. These findings are similar to those of several large-scale surveys.^{1,2,43,44}

Our results show a significant relationship between PES use and intention to use. This suggests that the intention to use PES could predict PES use fairly accurately. Therefore, PES use can be described as a volitive self-determined behavior. In other words, the decision to use PES is based on personal beliefs and not some type of automatic behavior.

Facilitating factors have the strongest relationship with the intention to use PES. This suggests that athletes who think that PES will increase their chances to compete on a level playing field with their opponents and make it to an elite team will be inclined to develop the intention to use them. It should be noted that dissuasive factors in PES use (eg, high cost of

TABLE 3. Results of the Multiple Regression Analysis of the Study Variables on Self-Reported Intention to Use Performance-Enhancing Substances by Young Quebec Athletes

| Variable | Unstandardized β | Standard Error | <i>t</i> | <i>P</i> | Standardized β |
|--|------------------------|----------------|----------|----------|----------------------|
| Constant | 0.71 | 0.17 | 4.22 | 0.0001 | — |
| Attitude | 0.07 | 0.01 | 6.41 | 0.0001 | 0.09 |
| Subjective norm | 0.22 | 0.02 | 8.93 | 0.0001 | 0.13 |
| Dissuasive factors | -0.03 | 0.01 | -3.39 | 0.0007 | -0.05 |
| Facilitating factors | 0.35 | 0.01 | 25.15 | 0.0001 | 0.40 |
| Knowledge of IOC-prohibited substances | -0.00 | 0.00 | -0.01 | 0.9922 | -0.00 |
| Knowledge of products containing IOC-prohibited substances | 0.01 | 0.01 | 0.86 | 0.3921 | 0.02 |
| Feeling of moral obligation | -0.17 | 0.01 | -11.96 | 0.0001 | -0.18 |
| Coach's competitiveness | 0.04 | 0.03 | 1.15 | 0.2504 | 0.02 |
| Athlete's competitiveness | 0.04 | 0.02 | 1.75 | 0.0796 | 0.03 |
| Sportspersonship | -0.04 | 0.02 | -2.07 | 0.0386 | -0.03 |
| Intrinsic motivation | -0.00 | 0.02 | -0.10 | 0.9202 | -0.00 |
| Extrinsic motivation | 0.02 | 0.02 | 1.04 | 0.3005 | 0.02 |
| Amotivation | 0.03 | 0.02 | 1.57 | 0.1166 | 0.02 |
| Negative comments regarding body weight | -0.06 | 0.03 | -1.97 | 0.0492 | -0.04 |
| Pressure to lose weight | 0.13 | 0.04 | 3.59 | 0.0003 | 0.06 |
| Pressure to gain weight | 0.17 | 0.03 | 6.44 | 0.0001 | 0.10 |

$R^2 = 0.44$; $P < 0.0001$.

PES, effectiveness of detection tests) have only a moderate influence on athletes' intention to use them.

Our results show that individuals who are close and important to the athletes (eg, doctors, coaches, teammates, friends) can have a significant influence on the intention to use or abstain from using PES.⁴⁵ The importance of the subjective norm is also illustrated by the fact that pressure from the athlete's entourage to gain weight is significantly related to the intention to use PES. From a clinical perspective, this finding underscores the importance of involving people who are close to the athletes in preventing PES use.

We also found a positive relationship between athletes' attitude and their intention to use PES. The more that athletes perceive the advantages and the less they perceive the disadvantages of using PES, the more likely they are to develop strong intention to use them; the reverse is also true.

In addition to the model's variables, the feeling of moral obligation to not use PES has a significant influence on athletes. In this respect, Gorsuch and Ortberg⁴⁶ mentioned that, faced with a moral choice, some individuals will decide to act in accordance with socially approved moral principles, even if they are tempted to do otherwise. This suggests that prevention measures should be morally persuasive.

Limitations

This study has some limitations. First, because the participants were volunteers, we cannot assume that our findings represent Quebec athletes as a whole, who may have responded to our questionnaire differently. Second, this is a retrospective study in which the behavior and the predictive variables were measured at the same time, which could artificially inflate the predictive value of the theoretical model. An experimental design would be needed to make causal inferences. Third, PES use was assessed with self-report

scales, which may have resulted in response bias. For example, some athletes may have reported that they used some PES to improve their athletic performance when in fact they were using them for medical purposes only. Moreover, no experimenter was present during testing. Thus, we had no control over the conditions under which the athletes completed the questionnaire. Although this methodological strategy may have affected the data, it should be noted that the questionnaires were completely anonymous. Furthermore, the fact that participants were not observed while completing the questionnaire may have encouraged more honest responses. Future research should replicate the present findings using actual behavior or blood analyses to more objectively assess PES use.

CONCLUSIONS

This study suggests that the use of PES is a substantial problem, given that 1 of 4 young athletes reported using them. The results provide evidence supporting the predictive value of the TPB for the use of and intention to use PES. They also show that the athlete's attitude should not be considered the sole factor influencing the intention to use these substances. The athlete's psychosocial environment, measured by factors such as the subjective norm and facilitating factors, also seems to have a significant impact on the decision to use PES. Our findings therefore underscore the importance of integrating these factors in the development and implementation of prevention interventions.

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