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Journal of Issues in **Intercollegiate Athletics**

Individual and Social Predictors of Performance-Enhancing and Dietary Supplement Use Among Male NCAA Division III Athletes

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Supplement use among athletes is predictive of later doping (Backhouse, Whitaker, & Petroczi, 2011; Lucidi, Zelli, Mallia, Gramo, Russo, & Violani, 2008). Thus, understanding predictors of legal supplement use in sports can be useful for potentially reducing later use of illegal, performance-enhancing substances. The purposes of the present study were to examine (1) the frequency of use and main reasons for use and (2) the individual (task and ego orientation) and social (motivational climate and team norms) predictors of use for six substances separately. Male collegiate athletes (N = 141) from four sports completed questionnaires assessing substance use, goal orientation, motivational climate, and team norms regarding use of each substance. Frequency of use as well as main reasons for use varied among the six substances. Team norm approving of the substance was the strongest and most consistent predictor of substance use, predicting higher use of protein powder, caffeine, glutamine, and multivitamins. Higher task orientation predicted lower use of multivitamins, while greater ego orientation and lower performance climate predicted higher use of protein powder. Results emphasize the important role teammates play in predicting athletes' supplement use. In addition, as results varied from substance to substance, future research should consider substances independently rather than as groups in analyses.

Nutritional supplements, alongside proper training and diet, may be a common way to enhance athletic performance. The popularity of supplement use is increasing with the supplement industry reaching \$30 billion in sales in 2011 (Considering a post-DHSEA world, 2012). Sport nutrition supplements (i.e., powders, pills, bars, gels, and drinks) represented \$21.4 billion spent in this sector, and from 2010 to 2011 demand for sport nutrition supplements grew at over two times the rate of the overall supplement industry growth (Lane, 2012). While these supplements are indisputably popular, there are possible adverse effects of their consumption. Although most nutritional supplements taken to enhance performance are considered safe, recent research suggests that the use of nutritional supplements relates to greater perceived effectiveness and use of illegal performance-enhancing substances (Backhouse, Whitaker, & Petroczi, 2011; Lucidi, Grano, Leone, Lombardo, & Pesce, 2004; Lucidi, Zelli, Mallia, Gramo, Russo, & Violani, 2008). In particular, male collegiate athletes who reported using performance enhancing drugs (PEDs) also used permissible and impermissible dietary substances (Buckman, Farris, & Yusko, 2013). This increasing body of work indicates that for some individuals, nutritional supplements may serve as gateways or precursors to illicit PEDs for athletes.

College athletes' use of nutritional supplements has been estimated to range from about 28% to 46% across a broad cross-section of National Collegiate Athletic Association (NCAA) athletes (DeHass, 2006), with maleness (Bartee et al., 2004; Godo, Graves, O'Kroy, & Hecht, 2006; Grossbard, Hummer, LaBrie, Pederson, & Neighbors, 2009; Pesce et al., 2004) and older age contributing to increased use (Bartee et al.).

Several conceptual models have been forwarded to aid in making sense of performance-enhancing substance use in sports (Donovan, Egger, Kapernick, & Mendoza, 2002; Strelan & Boeckmann, 2003). Factors that influence use of substances include characteristics of the substance itself, including availability; affordability; potential legal, social, or self-imposed sanctions; and health concerns. These substances differ in the specific effects they have on the body and how they enhance performance. Some substances are thought to enhance performance by helping to build muscle mass and aiding in recovery from tough workouts or injury (e.g., anabolic steroids, protein powder, creatine, glutamine). Other substances help enhance energy (e.g., caffeine), general health (e.g., multivitamins), or even weight loss (e.g., diuretics); athletes may take some of these substances daily without giving much thought to possible performance-enhancement effects.

In addition to different ways of enhancing performance, these substances also differ in terms of how they are controlled (i.e., legal, regulated, banned). The National Collegiate Athletic Association (NCAA) has banned use of certain substances by athletes, including anabolic steroids and diuretics (NCAA, 2013); restricted the allowable dosage of some substances (levels of caffeine above 15 micrograms/ml in urine are not permitted, NCAA, 2013); and restricted who can provide certain substances (NCAA bylaw 16.5.2.g prevented athletic departments from providing athletes with muscle-building supplements, including creatine, protein powders, and amino acids; NCAA, 2005). NCAA warnings to athletes abound regarding use of any nutritional or dietary supplement, in part because supplements are not well regulated and may contain banned substances not included on the label (NCAA, 2013). Substances also differ in how they are acquired (e.g., legally purchased from stores, illegally obtained either on-line or with a doctor's prescription). Thus, perceived risks of taking some performance-enhancing substances may be higher than others (e.g., risks for steroid use include health risks,

NCAA sanctions, trouble with police, social shunning; Donovan et al., 2002; Strelan & Boeckmann, 2003).

Clearly, substances differ dramatically on these characteristics, and the frequency of use for these substances likely differs as well. However, many studies on performance-enhancing substance or supplement use (Bartee et al., 2004; Dunn, Eddy, Perko & Bartee, 2001; Dunn, Eddy, Wang, Nagy, Perko & Bartee, 2001; DeHass, 2006; Godo et al., 2006; NCAA, 2001; Perko, Bartee, Dunn, Wang & Eddy, 2000) asked participants to respond generally across multiple substances, making it very difficult to understand whether and how substance use and the predictors of use varies between substances. An understanding of differences in substance use and predictors of such use for a broad variety of potentially performance-enhancing substances ranging from banned substances (e.g., anabolic steroids) to substances with restricted sources (e.g., creatine, protein power, glutamine) and amounts (e.g., caffeine) to unregulated substances (e.g., multivitamins) remains to be determined.

In addition to the characteristics of the substances themselves, these conceptual models describe psychological and social factors that should influence use of both legal nutritional supplements and illicit PEDs, including perceived legitimacy, personal morality, and the reference group's opinion about using a specific substance (Donovan, et al., 2002; Strelan & Boeckmann, 2003). The relations among these predicting factors are often complex and indicate a broad variety of factors encouraging substance use (e.g., material, social, individual benefits) and a broad variety of factors discouraging substance use (e.g., social, legal, self-imposed sanctions and health concerns). For example, although some might assume that steroid use is higher among Division I athletes than among Division III athletes based on the different divisional philosophies (with Division III more focused more on academics and integration with the larger student body than Division I, NCAA, n.d.), it appears that the greater frequency of year-round drug testing in Division I compared to championships-only testing in Division III tempers the influence of divisional philosophy; in 2009, the rates of use were strikingly similar with 0.4% of Division I athletes using steroids and 0.5% of Division III athletes using steroids (Bracken, 2012). In addition to the variety of factors incorporated into the substance use in sport models (Donovan et al., Strelan & Boeckmann), additional psychological and social factors are also relevant to decisions surrounding substance use in sport, including achievement goal theory constructs and team norms.

Achievement Goal Theory – Goal Orientations and Motivational Climate

Achievement goal theory (Nicholls, 1984, 1989), which describes how differences in the ways individuals define success relate to different affect, cognitions, and behaviors in sports, is applicable for understanding a broad variety of moral decisions in sport, including performance-enhancing substance use. Goal orientations refer to how an individual generally defines success. Highly task oriented individuals define success and competence in terms of improving over past performances and trying hard, while highly ego oriented individuals define success and competence in terms of outperforming others and winning. Due to highly valuing the effort- and learning-involved processes in reaching sport goals, highly task oriented individuals are less likely to believe unsportsmanlike actions such as cheating, disrespecting opponents, or aggression are acceptable and are less likely to intend to use such actions, while highly ego oriented individuals, who value the end-result more than the process, may be more likely to accept and use any means to outperform others, including more unsportsmanlike play (Duda,

Olson, & Templin, 1991; Dunn & Dunn, 1999; Stuntz & Weiss, 2003). Similarly, Lemyre, Roberts, and Ommundsen (2002) documented that higher task and lower ego orientations were related to greater sportspersonship, including respect for social conventions, rules, officials, and opponents. The task-oriented mindset that values the process, not just the outcome, also implies that higher task orientation should predict lower use of performance-enhancing substances (regardless of legality of the substance), while higher ego orientation, with a greater focus on the outcome of outperforming others, should predict increased performance-enhancing substance use. Pesce et al. (2004) examined how athletes' level of training and task and ego orientations together predicted creatine use and amino acid use. Among athletes who trained four or more hours per week, lower task orientation and higher ego orientation predicted greater creatine and amino acid use. These results demonstrated the usefulness of achievement goal theory in predicting substance use among highly trained athletes.

While task and ego goal orientations are predictive of a variety of beliefs and behaviors, including substance use (Duda et al., 1991; Dunn & Dunn, 1999; Lemyre et al., 2002; Pesce et al., 2004; Stuntz & Weiss, 2003), another achievement goal construct – motivational climate – may be predictive of substance use as well. While goal orientations describe how individuals define success or competence, motivational climate refers instead to the types of goal-reward structures significant others use in a social context (Ames, 1992). In a mastery motivational climate coaches emphasize and reward learning, mastery, and improvement. In a performance motivational climate coaches emphasize the importance of winning and provide rewards only to the best athletes. Several studies have demonstrated that perceptions of a mastery motivational climate (or parent and peer emphasis on learning) predicted enhanced sportspersonship beliefs and behaviors, respect, and higher levels of moral reasoning (d'Arripe-Longueville, Panteleon, & Smith, 2006; Fry & Newton, 2003; Gano-Overway, Guivernau, Magyar, Waldron, & Ewing, 2005; Miller, Roberts, & Ommundsen, 2005; Ommundsen, Roberts, Lemyre, & Treasure, 2003; Stornes & Ommundsen, 2004). Greater perceptions of a performance climate (or coach's ego orientation) predicted greater intention for aggression, lower sportspersonship beliefs and behaviors, less respect, and more unsportspersonlike play (Fry & Newton, 2003; Ommundsen et al., 2003; Stephens, 2000; Stephens & Bredemeier, 1996; Stornes & Ommundsen, 2004). While past research has not examined the influence of motivational climate on substance use in sport, greater perceptions of a performance climate and lower perceptions of a mastery climate were hypothesized to also predict higher levels of performance-enhancing substance use in sport.

Team Norms

While motivational climate encouraged by the coach predicts beliefs and behaviors, peers are also strong influences in sport (Weiss & Stuntz, 2004). As a result of sustained interactions within a team, that team's shared culture and mutual understandings of what behaviors are appropriate and inappropriate influence how athletes interpret situations, decide what behaviors are the most moral choice, and whether they choose to enact the most moral choice or not (Power, Higgins, & Kohlberg, 1989). This suggests that peers' beliefs and behaviors regarding performance-enhancing substance use are important to consider alongside coach influences as predictors of athletes' substance use choices.

Research supports that a team's collective definition regarding acceptability of behaviors consistently predicts moral beliefs and decisions in sport. For example, believing that teammates approve of or use unsportspersonlike play and aggression predicted athletes' own intention to use

those behaviors and to believe that they are legitimate (Guivernau & Duda, 2002; Stephens, 2001; Stephens & Bredemeier, 1996). Grossbard, Hummer, LaBrie, Pederson, and Neighbors (2009) demonstrated that team norms for alcohol and marijuana use predicted athletes' own patterns of drug use: participants who believed a *typical* athlete drank more alcohol (or consumed more marijuana) drank more alcohol (or consumed more marijuana) themselves. Wiefferink, Detmar, Coumans, Vogels, and Paulussen (2008) similarly showed that gym users who believed that others took PEDs had higher intention to use PEDs themselves in the future. Research testing the theory of reasoned action has consistently shown that both significant others' positive attitudes towards substance use and subjective norms encouraging substance use predicted athletes' own substance intention and/or use (Bartee et al., 2004; Dunn, Eddy, Wang, Nagy et al., 2001; Godo et al., 2006; Lucidi et al., 2004, 2008). Thus, in addition to achievement goal theory predictors, athletes' perceptions of team norms supportive of performance-enhancing substance use may also predict athletes' own likelihood of substance use.

Purpose and Hypotheses

In sum, a variety of different factors, including characteristics of (a) the substance itself, (b) the individual athletes, and (c) the social sport context, could predict performance-enhancing substance use in sport. The first purpose of the present study was to describe the frequency of and reasons for use for a variety of substances ranging in legality, restrictions, and perceived benefits of use (i.e., anabolic steroids, caffeine, creatine, glutamine, protein powder, and multivitamins). Due to the large number of substance characteristics theorized to influence substance use (Donovan et al., 2002; Strelan & Boeckmann, 2003), both the frequency of use and general reason for using different drugs and supplements were hypothesized to vary by substance. Specifically, multivitamins were hypothesized to have the highest frequency of use whereas anabolic steroids would have the lowest. Some substances were hypothesized to be taken more for non-sport reasons (including caffeine and multivitamins) and others were hypothesized to be taken more often for performance-enhancing reasons (including creatine, protein powder, glutamine, and anabolic steroids).

The second purpose of the present study was to examine individual predictors (i.e., year in school, goal orientations) and social predictors (i.e., motivational climate, team norms) of use for each substance separately. Although differences in frequency of and perceived reasons for use were hypothesized, we also hypothesized that demographic, psychological, and social factors should predict substance use consistently. Regardless of the actual mean level of use for each substance, older year in school, higher ego orientation, higher performance climate, and team norms approving of substance use were hypothesized to predict higher relative use for that substance (Bartee et al., 2004; Dunn & Dunn, 1999; Miller, Roberts, & Ommundsen, 2005; Stephens, 2000, 2001, 2004). This study built on past substance research by examining the predictors of a broad variety of different substances separately and by incorporating motivational climate as a predictor alongside year in school, goal orientations, and team norm. Understanding the predictors of both legal and illegal substances in sport is important as nutritional supplement use precedes harder drug use (Backhouse et al., 2011; Lucidi et al., 2004, 2008).

Method

Participants

Division III, male, collegiate athletes ($N = 141$) from a northeastern university between the ages of 18 and 23 ($M = 20.0$, $SD = 1.29$) participated in the study. Four team sports were represented: football ($n = 67$), lacrosse ($n = 41$), baseball ($n = 22$), and basketball ($n = 11$). The majority of participants were White (80.3%), with Black or African-American (14.6%), Hispanic or Latino (4.4%), and American Indian or Alaskan Native (0.7%) athletes also represented. Male athletes from single-sex sports were chosen because research consistently shows that males are more likely than females to use dietary supplements and other drugs (Bartee et al., 2004; Godo et al., 2006; Grossbard et al., 2009; Lucidi et al., 2004; Pesce et al., 2004); the use of male athletes as participants should therefore enhance the variability in substance usage rates and increase the predictive power of the regression analyses.

Measures

Participants completed a questionnaire that included task and ego orientation scales, mastery and performance motivational climate measures, and questions regarding demographic information, frequency of substance use, main reason for using, and team norm regarding substance use.

Task and ego orientations. Participants completed the 13-item Task and Ego Orientation in Sport Questionnaire (Duda, 1989; Duda & Nicholls, 1992). All items were answered using a 5-point Likert-type scale (1 = *strongly disagree*, 5 = *strongly agree*) and were preceded by the stem, "When playing sport, I feel most successful when...". The seven task orientation items assessed the degree to which participants felt successful when trying hard and improving (e.g., "I learn a new skill and it makes me want to practice more."). Six items representing ego orientation assessed how successful participants felt when outperforming others and winning (e.g., "I'm the only one who can do the play or skill."). Past research has demonstrated adequate validity and reliability (Duda, 1989; Li, Harmer, & Acock, 1996; Li et al., 1998). In the current study, task and ego orientations displayed good reliability, $\alpha = .76$ and $.79$, respectively.

Mastery and performance climates. Participants completed two of the six original subscales from the Perceived Motivational Climate in Sport Questionnaire-2 (Newton, Duda, & Yin, 2000). The 8-item "effort/improvement" subscale was used to assess mastery motivational climate (e.g., "On this team, trying hard is rewarded."), and the 7-item "unequal recognition" subscale was used to assess performance motivational climate (e.g., "On this team, only top players 'get noticed' by the coach."), with a 5 point Likert-type scale for responses (1 = *strongly disagree*, 5 = *strongly agree*). Past research with youth and college participants has demonstrated good validity regarding the hierarchical nature of the full scale as well as independence of the six subscales and good reliability for both the full scale and the two subscales included (Newton et al.). These two subscales were selected because they tapped the aspects of motivational climate that were believed to be most strongly related to substance use. In the current study, performance climate (unequal recognition) displayed good reliability ($\alpha = .81$) and was included in regression analyses, while mastery climate (effort/improvement) displayed marginal reliability ($\alpha = .68$) and was excluded from further analyses.

Team norms for substance use. Based on the validated and reliable wording used in past research (Miller et al., 2005; Stephens, 2000, 2001, 2004; Stephens & Bredemeier, 1996; Stephens, Bredemeier, & Shields, 1997), athletes' perceptions regarding how approving teammates were of substance use was assessed for each substance separately. The team norm item asked, "Realistically, how many people on your team would use the following substances to help the team win?" with separate responses ranging from 1 (*none of the players*) to 5 (*everyone on the team*) for each substance. Reliability of perceived team norms for substance use across the six substances was relatively high, $\alpha = .79$, indicating relative consistency in perceived teammates' approval of substance use across the six substances examined.

Frequency of and reasons for substance use. Wording from the NCAA 2008-2009 National Study of Substance Use Habits of College Student-Athletes questionnaire (Bracken, 2012) was used to assess frequency of use and reasons for use, with the specific substances inquired about changed from alcohol, tobacco, and illicit drugs to protein powder, caffeine, anabolic steroids, creatine, glutamine, and multivitamins. Items were answered separately for each substance. Frequency of use was addressed with the item, "Within the last 12 months, about how often have you used the following substances?" with responses of 1 = *never used*, 2 = *not used in past 12 months*, 3 = *less than once a month*, 4 = *less than once a week*, 5 = *1 - 2 days per week*, 6 = *3 - 4 days per week*, 7 = *5 - 6 days per week*, and 8 = *every day of the week*. To examine reasons for use, each participant also completed the item, "Please indicate the MAIN REASON you use(d) the following substances" for each substance with the following categorical response options: "never used," "to improve athletics performance," "for sports related injuries," and "reasons not related to sports."

Procedure

After gaining approval from the Institutional Review Board, coaches of selected sports were contacted. Once coaches approved the study, a time either before or after a scheduled practice was selected to introduce athletes to the study. Athletes who consented to participate completed the survey in a group setting without the coach present. In addition to allowing athletes to opt out of any items they did not want to answer, athletes were informed verbally and in writing that no identifying information was required, they should not write their names anywhere on the survey, and their responses would remain confidential. A researcher was present to distribute and collect the surveys as well as to answer any questions.

Results

Frequency of Use and General Reason by Substance

Descriptive analyses were conducted first to examine frequency of use and reasons for use for each of the substances. Use varied from substance to substance, with a low .7% of participants responding that they had taken anabolic steroids, to a high of 69% of participants indicating that they had used protein powder in the past 12 months (see Table 1). A majority of participants also indicated using caffeine (59%) and multivitamins (57%) in the past 12 months. Less than half of participants had used creatine (22%) or glutamine (16%) within the past 12 months. Correlations between the frequency of use for the six substances varied from .01 (steroids – creatine) to .44 (protein powder - glutamine), indicating weak to moderate

relationships between using different substances. Descriptive statistics for mean frequency of use across the sample indicated that, *on average*, participants used protein powder most often (about 1 time per week), followed by multivitamins (less than once a week), caffeine (less than once a week), creatine (not used in the past 12 months), glutamine (not used in past 12 months), and anabolic steroids (never used), with interpretations based on the response scale.

In addition, the general reasons why participants chose to use a specific substance varied (see Table 1). While 100% of participants who indicated taking anabolic steroids did so to improve their athletic performance, only 26% of those participants who took multivitamins did so to improve athletic performance. Caffeine and multivitamins were most often taken for reasons not related to sports (88% and 66% respectively), while anabolic steroids, creatine, glutamine, and protein powder were more often taken for sport-related reasons (100%, 88%, 74%, 95%, respectively). These descriptive statistics clearly indicated that both the frequency of use and the reasons for use varied among the six substances examined.

Individual and Social Predictors of Substance Use

A series of six hierarchical regression analyses examining individual and social predictors of substance use were performed, with a separate analysis for each substance (see Table 2). With the addition of each block, the change in R^2 indicates the amount of additional variance in substance use explained by the new variable(s) above and beyond variance explained by the previous block(s) of variables. In the first block, year in school was entered. In the second block, individual psychological predictors (i.e., task and ego orientations) were added. In the third block, the social predictors (i.e., performance climate-unequal recognition and team norm for that substance) were added. Due to the six independent analyses, a Bonferroni correction ($\alpha = .05/6 = .008$) was used to help protect against the family-wise error rate in the overall regression analyses.

Multi-vitamins. The overall model with all five predictor variables was statistically significant, $F(5, 126) = 7.65, p < .001, R^2 = .23$. The first block (year in school) did not significantly predict multivitamin use; however, upon entry of the second (individual psychological predictors) and the third (social predictors) blocks, an additional 5% and 17%, respectively, of the variance in multivitamin use was explained. With all variables included, task orientation ($b = -.89, S. E. = .50, p < .05$) and team norm ($b = .90, S. E. = .17, p < .001$) were the only significant predictor variables. Participants' beliefs that more players on their team would use multivitamins to help the team win predicted more frequent multivitamin use by participants. Defining success in terms of learning, effort, and mastery predicted less frequent multivitamin use.

Caffeine. While the overall model with all five predictor variables included was statistically significant, $F(5, 124) = 6.17, p < .001, R^2 = .20$, the first and second blocks did not significantly predict caffeine use. Upon entry of the third block with the social predictors, an additional 16% of the variance in caffeine use was explained. With all variables included, team norm was the only significant predictor variable ($b = .81, S. E. = .16, p < .001$). Participants' beliefs that more players on their team would use caffeine to help the team win predicted more frequent caffeine use by participants.

Glutamine. The overall model with all five predictor variables included was statistically significant, $F(5, 125) = 4.72, p < .001, R^2 = .16$. The first, second, and third blocks each significantly predicted glutamine use, $\Delta R^2 = .03, .05$, and $.08$, respectively. Year in school ($b =$

.33, S. E. = .14, $p < .05$), ego orientation ($b = .43$, S. E. = .20, $p < .05$), and team norm ($b = .51$, S. E. = .15, $p = .001$) predicted glutamine use by participants. Greater participant use of glutamine was predicted by older year in school, defining success in terms of outperforming others, and believing that more teammates would take glutamine to help the team win.

Protein powder. Again, the overall model with all five predictor variables included was statistically significant, $F(5,127) = 4.61$, $p < .001$, $R^2 = .15$. As with caffeine, however, the first and second blocks did not significantly predict protein powder use. Upon entry of the third block with the social predictor variables, an additional 13% of the variance in protein powder use was explained. With all variables included, team norm ($b = .87$, S. E. = .21, $p < .001$) and performance climate (unequal recognition) ($b = -.67$, S. E. = .31, $p < .05$), were significant predictors of protein powder use. Participants' beliefs that more players on their team would use protein powder to help the team win predicted more frequent protein powder use by participants. Having a coach that was more likely to treat athletes unequally predicted lower protein powder use.

Creatine and anabolic steroids. Neither of the overall analyses predicting creatine use, $F(5,124) = 1.26$, $p > 0.05$, $R^2 = .05$, nor steroid use, $F(5, 125) = .58$, $p > .05$, $R^2 = .02$, reached statistical significance. Thus, year in school, goal orientations, performance climate (unequal recognition), and team norm were unable to predict use of creatine and anabolic steroids for this sample.

Discussion

While substance use is prevalent in sport, understanding how the rates of use and the predictors of use vary depending upon the specific substance may provide important knowledge for changing potentially harmful substance use by athletes. As such, the purposes of the present study were (a) to describe the frequency and reasons for use for different substances and (b) to examine individual and social predictors of frequency of use for each substance. A variety of substances were examined, ranging from banned substances (i.e., anabolic steroids) to supplement use (i.e., protein powder, creatine, glutamine) to substances not always thought of as performance-enhancing but that may have a performance-enhancing effect in sport (i.e., multivitamins, caffeine) to determine consistency in use, reasons for use, and predictors of use across various substances. Given the established relationship between supplement use and later doping (Backhouse et al., 2011), understanding what predicts use of a range of substances is important.

Frequency of and General Reasons for Substance Use

The results demonstrated that usage patterns and general reasons for use varied depending upon the specific substance examined, with low to moderate relationships between the usage rates of different substances. Athletes were most likely to have used protein powder, multivitamins, and caffeine and were least likely to have used anabolic steroids, glutamine, and creatine. Thus, common measurement techniques that collapse across multiple substances (Bartee, et al., 2004; DeHass, 2006; Dunn, Eddy, Wang, et al., 2001; Dunn, Eddy, Perko & Bartee, 2001; Godo et al., 2006; NCAA, 2001; Perko et al., 2000) may not be good at predicting use of any specific substance. Given the number of factors known or hypothesized to influence substance use in sport (Donovan et al., 2002; Strelan & Boeckmann, 2003), it logically follows

that use varies by substance and that substances should be considered individually rather than collectively.

Frequencies of substance use (i.e., use within the past year) in the current sample of athletes are comparable to past research by the NCAA with similar populations (Bracken, 2012; DeHass, 2006; NCAA, 2001). Across Division III athletes, frequencies of steroid use were very similar across each of the three examined samples (1.4% of 2001 NCAA sample, 1.0% of 2005 NCAA sample, 0.5% of the 2009 NCAA sample, and 0.7% of the current sample had used anabolic steroids within the past 12 months). Similarly, 39.8% and 28.1% of NCAA Division III athletes indicated taking nutritional supplements (considered as a collective group in the survey) in 2001 and 2005, respectively. While percentages varied depending upon the specific supplement examined in the current study, the frequencies for use of glutamine (16.4%) and creatine (22.0%) were below the NCAA grouped frequency and protein powder (68.8%), caffeine (58.9%), and multivitamins (57.4%) were above the NCAA grouped frequency. Methods of data collection were similar between the procedures used in this study and the NCAA survey administration procedures. In both studies, surveys were administered in person by an individual who was not a member of the coaching staff, confidentiality was stressed, and athletes were told repeatedly that coaches would not have access to responses. While all teams in this sample were from a single institution, the NCAA randomly selected two or three teams from each institution to complete surveys.

Reasons for substance use were also in line with NCAA findings from 2005 and 2001 (DeHass, 2006; NCAA, 2001). While the only student who took anabolic steroids in the last 12 months in the current sample did so to enhance performance, the NCAA surveys demonstrated that 42.7% of athletes who took anabolic steroids in 2001 and 51.0% in 2005 did so to improve athletic performance. With regards to nutritional supplements, the NCAA data from 2001 and 2005 indicated that 27.3% and 39.7% of athletes, respectively, took supplements to enhance athletic performance. The NCAA question, however, asked athletes to consider “all nutritional supplements” while this study’s survey asked athletes to respond for each supplement separately. The results indicated that the majority of athletes who had taken protein powder (94.6%), creatine (87.8%), and glutamine (74.2%) did so to improve performance, while the majority of athletes who took caffeine (88.1%) and multivitamins (65.9%) took these substances for reasons not related to sports, suggesting that athletes think differently about the roles these substances fulfill. While usage rates in this sample and the NCAA samples are similar, the differences in frequency of use and reasons for use by substance *within* this sample illustrate the need to consider each specific substance separately. These differences in rates and reasons for using different substances strongly demonstrates that the common practice of examining groups of substances together in questionnaires should be terminated.

Individual and Social Predictors of Substance Use

Models of substance use describe a broad variety of different factors influencing use, including the nature of the product and how it is viewed by the individual and by the social context (Donovan et al., 2002; Strelan & Boeckmann, 2003). While frequency of use was expected to vary from substance to substance, the demographic, psychological, and social predictors of use (that is, the non-substance-specific predictors) were predicted to be more consistent. While older year in school, higher ego orientation, higher performance climate (unequal recognition), and team norm approving of substance use were hypothesized to predict

greater frequency of substance use (Bartee et al., 2004; Dunn & Dunn, 1999; Miller et al., 2005; Stephens, 2000, 2001, 2004), results only partially supported hypotheses. In general, these individual and social psychological predictors of substance use were only able to significantly predict use of protein powder, caffeine, glutamine, and multivitamins. The analyses predicting anabolic steroids and creatine use were not significant. Failure to predict use of anabolic steroids and creatine use probably stemmed from the lower usage rates for these substances, which would also lower variability within this sample and limit the effectiveness of regression analyses.

Social predictors. Within the four analyses that were significant, social influences, especially team norm, played a strong role in predicting substance use. Adding the two social variables of team norm and performance climate (unequal recognition) to the analyses increased the percentage of variance in substance use explained above and beyond the variance explained by individual-level variables by 8% for glutamine, 13% for protein powder, 17% for multivitamins, and 16% for caffeine. In these analyses, team norm positively predicted substance use, meaning that athletes who believed a greater percentage of their teammates would take the substance to help their team win were more likely to take that substance themselves. These findings align with past research that emphasized the importance of team norms when predicting moral beliefs and behaviors (Grossbard et al., 2009; Stephens, 2004; Stephens & Bredemeier, 1996; Wiefferink et al., 2008).

While team norm was a fairly consistent predictor of substance use, the other social contextual variable included in the analyses - performance motivational climate (unequal recognition) - was only a predictor of protein powder use. However, the relationship between performance climate (unequal recognition) and protein powder use was in the opposite direction as hypothesized. While these findings run counter to findings regarding performance climate and a host of moral decisions and substance use (d'Arripe-Longueville et al., 2006; Gano-Overway et al., 2005; Miller et al., 2005), perhaps the use of only one subscale of the performance climate measure was problematic. Another possible explanation of the small influence of motivational climate on substance use is that substance use most likely occurs outside of the competitive arena, unlike many of the other moral beliefs and behaviors tapped by past research (e.g., aggression, sportspersonship) which are often visible to coaches, teammates, and/or spectators. This physical removal in time and space from the coach may have lessened the coach's influence on substance use while also making an athlete's substance use invisible to the coach. Because teammates may be more likely to be around other athletes when they buy, take, or discuss use of these substances, the influence of peer beliefs and practices may be more influential than coach beliefs.

Individual predictors. Despite past research that showed age as a predictor of substance use (Bartee et al., 2004), year in school was a significant predictor of use for only glutamine. Perhaps these differences in the role that year in school and/or age played arose from differences in the age of study populations, with past work utilizing adolescents and the current study examining college students. College athletes may be less likely to consume nutritional supplements than high school athletes due to NCAA restrictions, more frequent drug testing at the college level, and increased awareness that off-label, banned compounds sometimes appear in supplements (NCAA, 2013; Schmidt & Singer, 2009).

Contrary to hypotheses and research by Pesce et al. (2004), goal orientations were not strong predictors of substance use. Task orientation did not significantly predict use of any of the six substances. Similar to Pesce et al., ego orientation, or defining success in terms of outperforming others and winning, predicted more frequent use of glutamine (an amino acid).

However, unlike Pesce et al., in the regression analyses predicting the other substances, ego orientation failed to predict substance use. While these findings were unexpected, they are in line with several studies that suggest that social influences on moral decisions may be stronger than some individual predictors such as goal orientations (d'Arripe-Longueville et al., 2006; Shields, LaVoi, Bredemeier, & Power, 2007; Stephens, 2000, 2001; Stephens & Bredemeier, 1996). For example, d'Arripe-Longueville et al. showed that once social relationship variables (peer and parent climates, peer acceptance) were added to the analysis, task orientation no longer predicted sportspersonship. In addition, Shields et al. found that social factors (team norm, coach behavior, spectator behavior, parent norm, coach norm) were stronger predictors of poor sport behavior than athletes' own beliefs about whether or not poor sport actions were acceptable.

There are many possible explanations regarding why team norms are strong predictors of individual athlete's beliefs and behaviors. Higgins, Power, and Kohlberg (1984) emphasize that moral decisions are not a clear indicator of an individual's own beliefs and behaviors; instead, the moral atmosphere of that context also influences an individual's beliefs and behaviors. Moral atmosphere refers to the shared norms and definitions about what behaviors are most appropriate within a specific team or group. As such, different groups will have different shared definitions about which behaviors are most appropriate. Moral decisions concerning substance use will depend upon both what the individual believes and the shared definitions of acceptable behavior within that group.

Taking on the beliefs and behaviors of the group can emerge from both implicit and explicit pressures to conform (Gilovich, Keltner, & Nisbett, 2006). Conformity involves matching an individual's behavior to the behavior of the majority within a group. At times, conformity happens without conscious awareness. However, some individuals conform to group norms in a conscious effort to enhance affiliation or social approval from others on the team, as failure to conform to group norms can result in social rejection. At other times, individuals comply with a group's norms because they assume that others in the group must know something more about the situation than they do (i.e., they assume the group's interpretations of the best course of action are more accurate than their own). In addition, individuals are more likely to conform to group norms if membership in that group is central to their sense of identity. Others conform as a sign of obedience to the stated wishes of an authority figure, which on sport teams may include coaches and team captains. Regardless of the specific reason why, conformity to others' beliefs and behaviors is common across a variety of settings and can help explain why team norms are a strong predictor of substance use across a variety of substances.

Limitations

Several aspects of this study limit the generalizability of the findings, including the low usage rates for some substances, inclusion of only male athletes, and inclusion of only team sports. While the substances chosen for survey were known to the researchers, descriptions of each class of substances were not provided and it is possible that some athletes did not know all of the substances. In addition, the specific sports examined could also alter which substances are considered performance-enhancing as well as beliefs of individuals in the sport context regarding how many teammates are willing to take a substance. For example, sports vary regarding the amount of speed, strength, endurance, and accuracy needed for high-level performance. As a result, a drug that might be perceived as performance-enhancing to football players may not be

perceived as performance-enhancing to runners on the cross-country team. Some substances may fit athletes' ideas regarding what is appropriate for their specific sports. Athletes may be more willing to share what they are doing with teammates if they perceive their behavior as more sport-appropriate than if their behavior is not perceived as sport-appropriate.

Also, alongside examining potential differences by sport played, future research could also examine the degree of team-specific substance use as well. Substance use, as it is influenced by how often peers use the substance, should vary from team to team. Although this study was not designed to examine differences between sport teams in terms of moral atmosphere or substance use, a cursory examination of the data revealed that moral atmosphere approving of protein powder, creatine, anabolic steroid, and glutamine use differed by sport; football players were more likely to believe that teammates would take substances in comparison to lacrosse and basketball players. Usage rates also varied by sport for protein powder, caffeine, and glutamine use, with baseball and football players more likely to use protein powder than basketball players, lacrosse players more likely to use caffeine than football players, and football players more likely to use glutamine than basketball players.

Future Research

Future research needs to examine sport-specific and/or team-specific substance use within a larger sample. Although female athletes are less likely than male athletes to take substances (Bartee et al., 2004; Godo et al., 2006; Grossbard et al., 2009; Pesce et al., 2004), future research should also examine whether the same patterns regarding substance use and predictors of substance use are representative of female athletes. Despite the precautions taken to keep the results confidential, it is possible that some athletes engaged in social desirability when responding to questions about illegal or banned substances (Zemore, 2012). It is also possible that, given the voluntary nature of participation, athletes who have taken banned or illegal substances may have been less likely to volunteer to participate in the study or less likely to answer honestly about those specific questions. These factors should be taken into consideration when interpreting study findings.

Conclusions

Several conclusions can be made based on the findings. First, research that groups substances together will probably combine substances with different frequencies and predictors of use. Instead of grouping substances together in the wording of questions, the current study's findings recommend that future research target the specific substances of interest individually. Second, team norm appears to be a strong predictor of substance use, stronger than individual athlete's year in school, goal orientation, and the motivational climate established by the coach. For the more frequently used substances, believing that teammates are likely to take a substance to help their team win predicted athletes who themselves are more likely to use a substance. This suggests that interventions targeting substance use at a team level may be more appropriate than interventions focusing on individual athletes. Coaches might also be advised to start conversations about substance use among athletes, with an important distinction made between perceptions of substance use and actual substance use, as athletes often overestimate the percentage of teammates that use substances. Coaches can help educate athletes on the potential dangers of substance use and help change team norms specifically against substance use that is

harmful or banned. Limiting use of legal supplements may also reduce doping later on in athletes' careers.

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Substance Use Among Athletes

Table 1 - Frequency, General Reasons, and Team Norm for Substance Use

| Substance | All participants (users and non-users) | | | | | | | | Only users of each substance | | | | | | | | | |
|-------------------|--|----------------------------|----------------|-------------|-----------------------------|-----------|-----------|-----------|---|----------------------------------|-------------------------------|---------------------------|---------------------------|---------------------------|-------------------------------|----------------------------------|-----------------------------|-------------------------------|
| | General summary of usage | | | | Mean frequency of use score | | Team norm | | Percentage of participants who reported different frequencies of use reported (among those who have used substance) | | | | | | | Reason for use | | |
| | | | | | | | | | | | | | | | | | | |
| | Used (ever) | Used within last 12 months | Never used (1) | No response | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | Used, but not in last 12 months (2) | Use less than once per month (3) | Use less than once a week (4) | Use 1-2 days per week (5) | Use 3-4 days per week (6) | Use 5-6 days per week (7) | Use every day of the week (8) | to improve athletics performance | for sports related injuries | reasons not related to sports |
| Anabolic steroids | 3.60% | 0.70% | 94.30% | 2.10% | 1.06 | 0.52 | 1.49 | 0.67 | 66.70% | | | | | 33.30% | | 100.00% | 0.00% | 0.00% |
| Caffeine | 59.60% | 58.90% | 39.70% | 0.70% | 3.55 | 2.39 | 2.47 | 1.2 | 1.20% | 11.90% | 21.40% | 25.00% | 21.40% | 7.10% | 11.90% | 10.70% | 1.20% | 88.10% |
| Creatine | 34.80% | 22.00% | 63.80% | 1.40% | 2.08 | 1.88 | 2.43 | 0.97 | 35.40% | 12.50% | 8.30% | 6.20% | 29.20% | 4.20% | 4.20% | 87.80% | 2.00% | 10.20% |
| Glutamine | 22.00% | 16.40% | 75.90% | 2.10% | 1.75 | 1.78 | 1.98 | 1 | 17.90% | 21.40% | 10.70% | 7.10% | 21.40% | 3.60% | 17.90% | 74.20% | 16.10% | 9.70% |
| Multivitamins | 60.30% | 57.40% | 39.70% | 0.00% | 3.88 | 2.73 | 3.06 | 1.26 | 8.00% | 12.50% | 8.00% | 17.00% | 18.20% | 9.10% | 27.30% | 25.90% | 8.20% | 65.90% |
| Protein powder | 78.00% | 68.80% | 22.00% | 0.00% | 4.28 | 2.46 | 3.4 | 0.99 | 12.60% | 17.10% | 6.30% | 14.40% | 18.00% | 18.00% | 13.50% | 94.60% | 0.90% | 4.60% |

Note: Numbers in parentheses indicate value used for calculating mean frequency of use score.

Table 2 - Hierarchical Multiple Regression Analyses Predicting Frequency of Substance Use

| Predictor | Multivitamins | | Caffeine | | Glutamine | | Protein powder | | Creatine | | Anabolic steroids | |
|----------------|---------------|------------------|--------------|------------------|--------------|------------------|----------------|------------------|--------------|------------------|-------------------|------------------|
| | ΔR^2 | <i>b</i> (S. E.) | ΔR^2 | <i>b</i> (S. E.) | ΔR^2 | <i>b</i> (S. E.) | ΔR^2 | <i>b</i> (S. E.) | ΔR^2 | <i>b</i> (S. E.) | ΔR^2 | <i>b</i> (S. E.) |
| Step 1 | 0.02 | | 0.02 | | 0.03* | | 0.00 | | 0.00 | | 0.00 | |
| Year in school | | -.29 (.20) | | .20 (.18) | | .33 (.14)* | | .16 (.19) | | -.05 (.16) | | -.02 (.04) |
| Step 2 | 0.05* | | 0.02 | | 0.05* | | 0.02 | | 0.00 | | 0.01 | |
| Task | | -.89 (.50)* | | -.22 (.45) | | .04 (.35) | | -.17 (.39) | | -.17 (.39) | | -.12 (.11) |
| Ego | | .41 (.29) | | .46(.25) | | .43 (.20)* | | .44 (.26) | | .08 (.21) | | .06 (.06) |
| Step 3 | 0.17*** | | 0.16*** | | 0.08** | | 0.13*** | | 0.05* | | 0.01 | |
| Unequal | | -.61 (.33) | | -.30 (.30) | | -.33 (.23) | | -.67 (.31)* | | -.03 (.26) | | .02 (.07) |
| Team norm | | .90 (.17)*** | | .81 (.16)*** | | .51 (.15)*** | | .87 (.21)*** | | .43 (.18)* | | .07 (.07) |
| Total R^2 | 0.23*** | | 0.20*** | | 0.16*** | | 0.15*** | | 0.05 | | 0.02 | |
| <i>F</i> | 7.65 | | 6.17 | | 4.72 | | 4.61 | | 1.26 | | 0.58 | |
| <i>df</i> | 5,126 | | 5,124 | | 5,125 | | 5,127 | | 5,124 | | 5,125 | |

Note: * = $p < .05$, ** = $p < .01$, *** = $p \leq .001$