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Doping and supplementation: the attitudes of talented young athletes

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There is evidence of a small but significant proportion of adolescents engaging in doping practices. Young athletes face very specific pressures to achieve results as they strive for a career at an elite level. This study used an anonymized questionnaire to survey 403 (12–21 years old) talented young athletes' attitudes toward performance-enhancing substances and supplements. Two-thirds of the sample comprised males. Athletes were generally against the use of doping substances to enhance sporting performance. Within this generally unfavorable view, males tended to express a more permissive attitude toward performance-enhancing methods than females. Those convinced of the necessity of supplementation for sporting success were also more likely to express permissive attitudes. When asked whether they would take a "magic" drug that, while undetectable, would significantly enhance performance, the overwhelming majority of athletes said "no," but many thought others would take the substance. Interestingly, there was a significant association between the projected use of the hypothetical drug by competitors and the individual respondent's willingness to take the hypothetically "magic" substance. The study offers an insight into young athletes' attitudes toward specific forms of performance enhancement, and the strength of their beliefs in the face of a tempting hypothetical scenario.

The use of substances to enhance sporting performance is not a new phenomenon. Doping substances in cycling, for example extra caffeine, cocaine and strychnine, were used as far back as in the 1890s and were not banned for the first 60 years of the Tour (Hoberman, 2004). The generalized anti-doping legislation, however, appeared much later. One watershed was the 1965 anti-doping law passed by the Belgian and French Senate (April and June, respectively) and the subsequent establishment of the International Olympic Committee Medical Commission. These are thought to have arisen from deaths in sport associated with substance use (Beckett & Cowan, 1979). More recently, the Tour de France of 1998 provided evidence of a systemic doping problem in sport. The World Anti-Doping Agency (WADA) was established in 1999, providing a centralized body that aimed to harmonize anti-doping strategies across elite sports (Catlin et al., 2008).

According to one widely used official definition, a doping offence occurs when athletes "use prohibited substances or methods to unfairly improve their sporting performance" (UK Sport, 2009). In this paper, "supplement" refers to an overarching name for vitamins, minerals, herbal remedies and other substances (e.g. creatine and protein powders). Supplements, by definition, are not subject to anti-doping regulations. The precise articulation of which substances and methods ought to be prohibited has been a hotly contested affair. [For a debate over the legitimacy of hypoxic air machines, see Spriggs (2005) and related commentaries (Fricker, 2005; Tamburrini, 2005; Tännsjö, 2005). While the debate concerns one method in particular, the questions it raises concern enhancement and technology in sport more generally.] WADA's World Anti-Doping Code considers whether or not to ban a substance on the basis of its fulfilling two of the following three criteria: that it (i) enhances or has the potential to enhance performance; (ii) threatens health or has the potential to do so; and (iii) is "contrary to the spirit of sport" (WADA, 2009: 33); or by acting as a masking agent in relation to a prohibited substance.

The extent to which banned substances are being utilized by elite athletes is difficult to determine. The number of athletes reported as *testing* positive by anti-doping bodies is small, often around 2% (WADA, 2002–2008). Estimates of prevalence derived from athlete surveys, as opposed to actual test results, however, have occasionally been as high as 20% (see Pitsch et al., 2005). (This study with German athletes used a randomized response technique

comprised of one question, basically ''have you ever used doping substances?'' (Or a variation such as ''have you in this season?'') with an additional instruction. The additional instruction required athletes born in the months January to April to answer ''yes'' and those born in other months to answer honestly. Thus, even the researchers could not judge whether the *individual* athlete had taken performance-enhancing drugs in this online survey, but calculated prevalence figures from the ''yes'' and ''no'' responses, and data concerning the frequency of births from January to April.) While the actual extent of doping in sport is disputed, WADA's requirement that athletes be available for randomized testing throughout the year provides an indication of the perceived pervasiveness of the problem.

The issue of doping is generating interest from researchers and policymakers alike. This interest stems not only from the concerns over the spirit of sport and the health of athletes illustrated by the WADA but also from evidence of a spread beyond the athlete population. While anabolic–androgenic steroids (AAS) are the substances causing adverse analytical findings among high-performing athletes (WADA, 2002–2008), use of such substances by those outside of sport is generating increasing public health concerns (Kanayama et al., 2008).

There is also evidence of doping substances being used by young people. One study found evidence of AAS use among high school (American) footballers, starting before the age of 10 (Stilger & Yesalis, 1999; although the mean age for starting AAS use in this population was 14). Review studies (albeit predominantly North American) suggest between 3% and 12% of adolescent males (Yesalis & Bahrke, 2000; Calfee & Fadale, 2006) have reported using AAS at some point. Use by females is reported to be lower, around 1–2% admitting using steroids (Yesalis & Bahrke, 2000). Again, these data are not confined to participants in competitive sports. Of adolescents who reported using AAS, review articles suggest that between 30% and 40% were not engaged in competitive sport (Bahrke et al., 2000; Calfee & Fadale, 2006). Among non-sporting motivations, the desire to increase muscle mass to enhance physical appearance is a dominant one (see, e.g., Field et al., 2005).

With regard to adolescent and child populations, it seems we generally know little about the effect of these substances. Unsurprisingly, there is little to no research on the effects of these substances in the young (Gregory & Fitch, 2007). The American Academy of Pediatrics (2005: 1104) states that ''Virtually no experimental research on either the ergogenic effects or adverse effects of performance-enhancing substances has been conducted in subjects younger than 18 years.'' McNamee (2009) also recognizes that the harms of such substances in adolescents are relatively unknown. This is cited as a significant difference to other medical procedures to which a minor may be judged to offer informed consent, where the potential harms are better understood. Thus, any suggestion that adolescents could be deemed competent to consent to doping, as they might be deemed competent to make other medical decisions, is necessarily flawed. (Thus, in the United Kingdom, the well-known notion of Gillick Consent, where a child may reasonably request or refuse treatment if they can reasonably understand the intervention, its harms and benefits, cannot apply.)

This large-scale survey was conducted to address athletes' attitudes toward doping and supplementation. ''Attitudes'' in this context should be understood as athletes' positive or negative evaluations (Schwartz & Bohner, 2001) of the different methods or possible methods utilized to enhance performance. There is little research concerning young athletes' attitudes toward doping. Yet, critics have noted that the zero-tolerance attitude of anti-doping authorities in sport is at odds with apparent acquiescence toward drug usage elsewhere in society (Kayser & Smith, 2008; Laure, 2009). This study sought to probe the extent to which talented young British athletes have endorsed the anti-doping message. Thus, the study has the potential to assess the effectiveness of anti-doping educational campaigns. More generally, it also provides an insight into athletes' responses to the pressures they face. Effective anti-doping efforts, and educational programs arising from them, must be informed by athletes' attitudes toward performance-enhancing substances.

Materials and methods

Sample

The study sought to assess the attitudes of talented young athletes. Athletes in the United Kingdom may receive support, or funding of some kind, if they are deemed to have reached a designated level of expertise or have high potential expertise. Here, ''talented'' denotes athletes receiving support from the ''Talented Athlete Scholarship Scheme'' (providing services to those athletes in further or higher education); UK Sport's own ''World Class Pathways,'' where funding levels correspond to anticipated success at major international competitions, with particular reference to the Olympic Games; and to those athletes recruited via the national Academy structures (Cricket and Rugby Union); and via the Professional Footballers Association (Football/Soccer). In total, 1674 talented athletes (age range 12–21) were identified via these means. Of 412 questionnaires returned, 403 were within the age range required. The aim was to cover the largest possible range of Olympic and professional sports (see Table 1 for a breakdown of the sample by sport).

Most of the questionnaires were distributed direct to the athlete's home address by mail, advising that completed responses should be returned to the research team. Addresses were provided by the research contractor UK Sport, having

Table 1. Sample characteristics by sports

Sports	*N* (%)	Sports	*N* (%)
Athletics	19 (4.7)	Rugby league	1 (0.2)
Badminton	4 (1.0)	Rugby union	112 (27.8)
Boxing	4 (1.0)	Sailing	2 (0.5)
Canoeing	6 (1.5)	Skiing	3 (0.7)
Cricket	17 (4.2)	Snowboarding	1 (0.2)
Curling	3 (0.7)	Squash	3 (0.7)
Cycling	19 (4.7)	Swimming	27 (6.7)
Diving	8 (2.0)	Synchronized swimming	9 (2.2)
Equestrian	11 (2.7)	Table tennis	14 (3.5)
Fencing	10 (2.5)	Taekwondo	5 (1.2)
Football	56 (13.9)	Tennis	5 (1.2)
Golf	5 (1.2)	Water-polo	7 (1.7)
Hockey	4 (1.0)	Waterskiing	3 (0.7)
Judo	5 (1.2)	Wrestling	2 (0.5)
Modern pentathlon	3 (0.7)	Other	4 (1.0)
Netball	4 (1.0)		
Orienteering	5 (1.2)	Wheelchair rugby	3 (0.7)
Powerlifting	2 (0.5)	Wheelchair basketball	3 (0.7)
Rowing	8 (2.0)	Disability athletics	6 (1.5)

Table 2. Response rates

	Amount sent out	Amount returned	Return rate (%)	Valid questionnaires
TASS	483	138	29	135
WCDA	234	101	43	95
NGB athletes	957	173	18	173
Total	1674	412	25	403

TASS, Talented athlete scholarship scheme; WCDA, World Class Development Athletes; NGB athletes, players recruited via national governing bodies in football, rugby union and cricket.

sought the permission of appropriate clubs, governing and funding bodies. One exception involved questionnaires being distributed by the governing body (again in hard copy by mail, with returns made to the research team). In addition to these means, additional efforts were made to increase the participation rate. Researchers utilized their own contacts at clubs to facilitate the distribution of the questionnaire. Researchers were always careful, however, to ensure that athletes were fully aware that their responses would remain anonymous, and would not be disclosed to clubs, governing bodies or the research contractor UK Sport. The response rate was disappointing (see Table 2), but perhaps unsurprising, bearing in mind that this population is necessarily focused on goals concerning performance enhancement and is likely to be reluctant to involve themselves in additional projects without such an aim.

Over two-thirds of the athletes were between ages 16 and 19 (16.4%, 18.1%, 16.4% and 16.1%, respectively), followed closely by age 20 (12.2%). The remaining age categories (by years) contributed less than 8% each. Two-thirds of the sample comprised males.

Within the sample, 23.6% of athletes were identified as "world class development athletes" (from UK Sport's "World Class Pathways"). Just over half of the sample comprised athletes from Olympic sports, while nearly one half were players from non-Olympic sports or Paralympic athletes. (Athletes from Paralympic sports comprised 2.8% of the sample). The majority of the sample had experience of competition at an international level (Fig. 1).

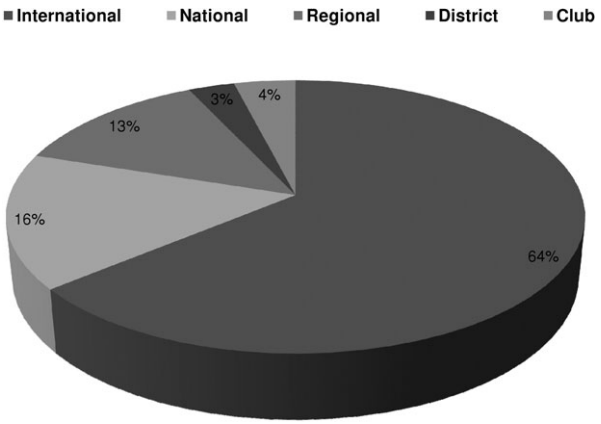

Fig. 1. Sample characteristics by the level of sport involvement ("sport involvement level" is shown in decreasing order, i.e. International corresponds to the highest percentage, national corresponds to the second highest, etc.).

The sample was predominantly (94%) of "white" ethnicity. Athletes had considerable assisted sport experience, with 34.5% training $\geq$ 5 years, 31.8% training $\geq$ 9 years and a further 11.4% training $\geq$ 12 years with a coach. The percentages are cumulative for the lowest category (i.e. 77.7% of the participants received coaching for at least or $>$5 years).

Measures

Athletes completed a modified version of a questionnaire used by UK Sport in its 2005 Drug-Free Sport survey. After piloting, the questionnaire was simplified, in light of the target population (aged 12–21 years). Further modifications included the addition of a set of questions related to the athletes' bodily perception, adapted from a Norwegian study (see Breivik et al., 2009). Research questions were related to beliefs about the necessity of supplementation and supplement use. Questions also addressed body satisfaction, body modification and perceived willingness of competitors to take prohibited performance-enhancing substances. Although athletes were asked whether they would take a hypothetical substance that guaranteed success, they were not asked directly whether they had used or were using doping products. The study was aimed at exploring doping attitudes, rather than behavior. The specific questions addressed in this analysis are stated in "Results."

Analyses

Data characteristics were shown as frequencies, percentages and means with standard deviations. Scale reliability was assessed by Cronbach α coefficient. Group differences we calculated using *t*-test and ANOVA with Tukey's *post hoc* test. Relationships were tested using non-parametric correlation, whereas contingency tables were used for calculating the odds ratios. Statistical analyses, including descriptive statistics, were performed using SPSS 16.0.

Ethical approval

Ethical procedures followed established practices (Jago & Bailey, 2001; McNamee et al., 2006). Ethical approval was granted by the Research Ethics Committee of the School of

Health Science, Swansea University. The questionnaire was distributed toward the end of 2006 and beginning of 2007. Consent forms were completed by all participants (and parents/guardians where appropriate), the forms and project information sheets having been distributed with the questionnaire. In particular, participants were assured that their data would be both anonymized and treated as confidential.

Results

In response to the question "How much do you agree or disagree with the following statement: 'You have to take supplements to be successful in sport'?," the majority of the young athletes disagreed (45.4%) or strongly disagreed (33.0%). Those who thought otherwise were the older (aged 17–20) athletes with ≥ 5 years of coached athletic career. Fifteen percent of the respondents (males: 18%, females: 10%) agreed with the notion that supplement use is necessary to be successful in sport.

Athletes were asked "Which of the following do you believe should be allowed in your sport?" and were provided with seven statements regarding methods for various performance-enhancing purposes (Altitude Chamber to improve your endurance; any substances that will improve your endurance; any substances that will increase the amount of training you can do; any substances that will increase your strength; any substances that will increase your ability to cope with pain; any substances that will improve your concentration; any method to alter your genes, which will enhance your performance). The respondents expressed a strong belief that no substance should be allowed for performance-enhancing purposes. Among the data, the use of any substance to improve concentration was the most acceptable, while gene manipulation was the least (Table 3). One notable exception was the use of hypoxic rooms, whose use was endorsed by many athletes (Fig. 2).

Upon further investigation using principal component analysis with Varimax rotation (KMO = 0.779, Bartlett's test of sphericity = 0.563.55, $P < 0.001$), six of the seven questions formed a scale that we named as "Performance Enhancements Belief Scale (PEBS)." Response options that followed each statements were presented on a three-point scale and anchored as 2 = should be allowed, 1 = within reason or 0 = should not be allowed. One additional question "Altitude chamber, to improve your endurance" in the survey did not contribute to the PEBS, having below the acceptable factor loading (-0.297). Other item loadings, in decreasing order, were as follows: increase strength = 0.798, increase endurance = 0.796, increase the amount of training = 0.738, enhance concentration = 0.685, help coping with pain = 0.498, altering genes = 0.464. Reliability coefficient of the six-item scale was $\alpha = 0.748$.

Within a generally unfavorable view, male athletes ($M = 2.136 \pm 3.05$) expressed a more liberal attitude toward the use of different performance-enhancing methods than females ($M = 1.088 \pm 1.976$). The difference was statistically significant ($t = -3.484$, $P = 0.001$). This more liberal attitude was expressed by those who also believed that supplementation is necessary for sport success. Using agreement level as the grouping variable, we created five independent groups (Table 4). A statistically significant overall difference ($F = 5.216$, $P < 0.001$) and between-group differences for *strongly disagree–disagree* ($P = 0.045$) and *strongly disagree–agree* ($P = 0.003$) pairs. In other words, those who felt strongly about not needing nutritional supplements for achieving success scored the lowest on the PEBS, indicating that using substances for performance-enhancing purposes is not acceptable. This strong opposition differentiated this group of young athletes ($N = 130$) from the rest, with two differences reaching statistical significance. The differences were in the expected direction: those who agreed or strongly agreed with the necessity of nutritional supplements scores above both the theoretical (2.5) and the sample (1.75) mean for this question. Means and standard deviations are presented in Table 4.

Athletes were also asked "Which of the following (if any) describe why you take a supplement or supplements?" Among the selectable options, avoiding sickness, maintaining strength, enhancing endurance, dealing with imbalanced diet, aiding recovery from illness, training longer, overcoming injury and lack of sleep were specified, followed by an option to

Table 3. Items, answer frequencies and item mean scores of the Performance Enhancements Belief Scale (PEBS)

Item	Should not be allowed	Within reason	Should be allowed	Mean ± SD
Any substances that will improve your endurance	337	1	48	0.35 ± 0.662
Any substances that will increase the amount of training you can undergo	323	1	58	0.31 ± 0.719
Any substances that will increase your strength	318	1	66	0.35 ± 0.755
Any substances that will increase your ability to cope with pain	316	1	67	0.35 ± 0.761
Any substances that will improve your concentration	285	1	96	0.51 ± 0.869
Any method to alter your genes, which will enhance your performance	378	0	6	0.03 ± 0.248

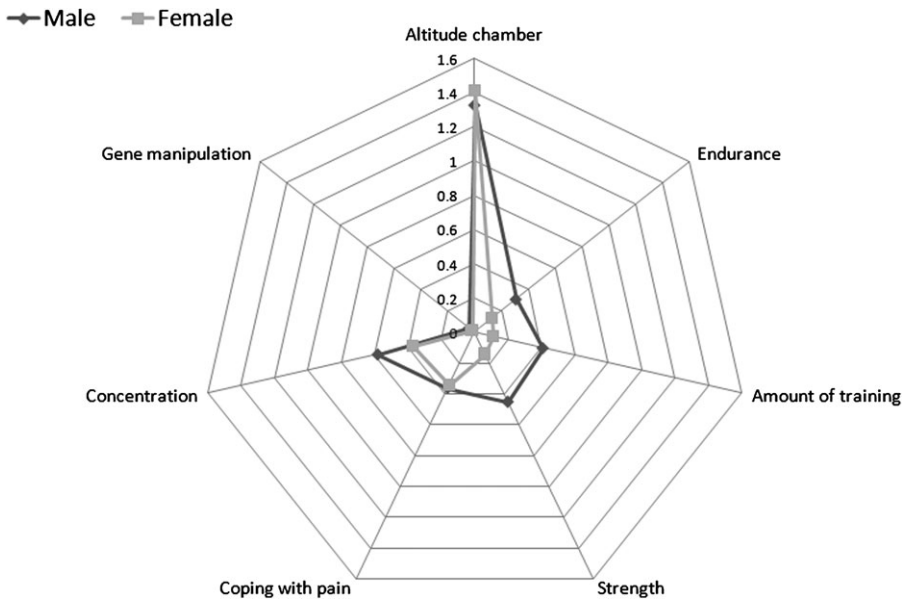

Fig. 2. Athletes' opinions on allowing various performance-enhancing methods in sport, identified by their core function. Scores are mean scores, with a higher score representing a more permissive approach in the group (male vs female athletes).

Table 4. Performance Enhancements Belief Scale (PEBS) item means by agreement that supplements need to be taken to be successful in sport

Groups	*N*	PEBS scale mean	Standard deviation
Do not know	14	1.5714	3.34467
Strongly disagree	130	1.0692	2.05426
Disagree	173	1.9538	2.79496
Agree	48	2.9167	3.57196
Strongly agree	4	4.0000	3.65148

indicate other reason(s) or not knowing the reason. The belief about the necessity of using supplements to be successful recorded the highest association ($\tau = 0.213$, $P < 0.001$) with augment strength as a reason for supplement use. This may be the effect of the predominantly male sample. The relationship was non-significant for females ($\tau = 0.090$, $P = 0.293$) and stronger for males ($\tau = 0.242$, $P < 0.001$) when we analyzed separately.

In questions when hypothetical situations regarding using prohibited substances or methods were presented, athletes were asked to indicate their own willingness to take the substance or method, and estimate the likelihood of other athletes doing the same. The scenario was presented as this: ''Imagine that there is a prohibited (banned) substance or method that would significantly enhance your performance but was completely undetectable. How many of your fellow competitors do you think would take it? (all of them; probably most of them; probably some of them; definitely none of them; don't know). Would you take it? (yes definitely; probably; probably not; no, definitely not; don't know). The two conditions were: (i) not having serious health consequences and (ii) a shortened lifespan.

When athletes were asked whether they would take the ''magic'' drug, < 10% answered affirmatively. When asked whether they would take the drug although it caused a shortened lifespan by 10 years, the willingness to take the drug declined below 1%. Differences between male and female responses to this question were observed. With no harm stipulated ($\chi^2 = 17.732$, $P = 0.001$), more males indicated willingness to use a prohibited substance if it would be undetectable (3/259 yes and 22/259 probably) than females (0 yes and 3/133 probably). The majority of the athletes (130/133 females and 235/259 males) said that they would not use the hypothetical substance if it would reduce lifespan. Only one male said yes and further three said probably under this condition. Female athletes categorically refused the option to take the lifespan-reducing prohibited substance, regardless of its performance-enhancing effect.

There was an observable pattern showing that athletes with more years ''invested'' in their athletic career may be more willing to take the undetectable but banned performance-enhancing substance (with no harm); however, no statistically significant association was found between years in training and willingness ($\chi^2 = 25.854$, $P = 0.171$). The pattern reached significance under the scenario that the substance would reduce lifespan ($\chi^2 = 27.086$, $P = 0.028$). As indicated above, however, the number of athletes expressing willingness under this condition was extremely low.

Despite athletes' self-reported behavioral intention (or the lack of it) in these hypothetical situations,

there was a dramatic increase in the proportion of athletes (72.6%) who believed that at least some other athletes would take the drug if it exerted no harmful effects. Even assuming a shortened lifespan, more than 40% believed that at least some athletes would take the drug. Detailed frequency counts are presented in Table 5.

To calculate odds ratios between projected use and behavioral intention in these hypothetical situations, we grouped the answers into two main categories: Yes and No (see Table 5). In the "no health risk" scenario, there was a statistically significant association between projected use and behavioral intention ($\chi^2 = 6.571$, $P = 0.01$). Odds ratios and risk for those who indicated self-use in the absence of use by others cannot be calculated (the cell had zero frequency). In the "shortened lifespan" scenario, the association was less significant ($\chi^2 = 0.898$, $P = 0.343$). The results indicate that there is a 2.8 times higher risk of using banned performance enhancement if the use in others is assumed. However, in both scenarios, cells contained frequencies <5; hence, interpretation of the results should be made cautiously.

Assuming that there may be a common psychological basis to appearance enhancement and performance enhancement, we asked young athletes "How happy are you with the appearance of your body?" Most young athletes indicated that they were happy with their appearance. Notably, more males (93.4%) than females (80.5%) said that they were quite happy or happy with the way they look. The issue of body satisfaction was further probed by asking whether they would (i) take a substance that gives them a more muscular body; (ii) go on a very low-calorie diet to lose weight; (iii) go on a very high-calorie diet to gain weight; (iv) have a tattoo somewhere on their body; and (v) undergo plastic surgery to change their appearance. [Questions regarding body satisfaction and appearance were adapted from an existing Norwegian survey (see Breivik et al., 2009).]

As expected, the willingness to change appearance by some means (i.e. taking substances for a more muscular body, drastic diet to lose or gain weight, having a tattoo or plastic surgery) was inversely related to the satisfaction with correlation coefficients (Kendall τ) as follows: -0.012 ($P = 0.005$), -0.239 ($P < 0.001$), 0.008 ($P = 0.865$), -0.047 ($P = 0.291$) and -0.158 ($P = 0.001$), respectively. Satisfaction with appearance appears to be independent of the belief regarding using substances to achieve a specific goal [listed in Table 3, Kendall $\tau = -0.019$, $P = 0.677$ for the overall belief (PEBS), with none of correlation with the individual elements reaching $|0.1|$]. On the contrary, there was a small, but significant positive relationship between the belief whether supplement use is necessary to be successful in sport and the expressed willingness to use substances for a more muscular body ($\tau = 0.227$, $P < 0.001$) and adopt a drastic diet to gain weight ($\tau = 0.121$, $P = 0.006$).

Table 5. Hypothetical scenarios on using prohibited substance or method

	No health consequence		Shortened lifespan	
Others	Frequency	%	Frequency	%
Yes				
All of them	12	3.0	1	0.2
Probably most of them	51	12.7	6	1.5
Probably some of them	228	56.6	169	41.9
No				
Definitely none of them	58	14.4	166	41.2
I do not know	52	12.9	60	14.9
Self				
Yes				
Definitely	3	0.7	1	0.2
Probably	26	6.5	3	0.7
No				
Probably not	95	23.6	24	6.0
Definitely not	265	65.8	374	93.0
I do not know	13	3.2	0	0.0

Discussion

Athletes generally expressed strong attitudes against the use of performance-enhancing substances in sport. This is, of course, unsurprising. First, we should acknowledge the highly stigmatized nature of doping in sport and the possibility that these responses are those thought socially desirable by the athletes, even where anonymity is assured. In light of the low response rate, there is also a possibility of self-selection, athletes with more permissive attitudes toward doping being unwilling to return the questionnaire. It is just as feasible, however, that this necessarily narrowly focused population is not generally pre-disposed to research, with no clear performance enhancement benefits. Skepticism regarding the reliability of the responses should not be exaggerated. Literature suggests that adolescent doping is generally not widespread, but confined to a minority. Laure et al.'s (2004) survey of French high school athletes found similar anti-doping responses, with over 90% of athletes stating that doping was against the spirit of sport (94%) and dangerous for health (93%). The methodology used, however, also garnered some less socially desirable responses: 22% of athletes concluding that refusing to dope relinquished all chances of sporting success, while 4% of these athletes admitted to having used doping agents. Laure et al. (2004) used a questionnaire, and, as in this study, assured athletes of the anonymity and confidentiality of responses.

Within the generally anti-doping posture, males expressed more permissive attitudes toward the use of performance-enhancing drugs than females. Alaranta et al.'s (2006) study of elite Finnish athletes provides further evidence that male athletes remain more at risk of doping in the sporting domain. They report that 35% of males and 23% of females stated that they personally knew an athlete doping. The study by Alaranta and colleagues, one of the few that explore doping attitudes, provides further evidence of a gender difference in observing that more males than females would use substances (9.2% vs 7.3%) in the event of their legalization. Prevalence data have also suggested that the use of AAS is greater in males. Kanayama et al. (2007) concur with this, but argue that prevalence studies using self-report questionnaires typically overreport usage. They question the methodology of questionnaires, suggesting that survey questions may have elicited false-positive responses. While there may be legitimate questions over the accuracy of prevalence reports, our finding that males are more likely to express permissive attitudes toward performance-enhancing substances appears to gain international support.

Studies have suggested that those who use supplements (often focusing on supplements deemed ''performance enhancing'' and used for muscle and strength building such as protein, amino acids and creatine) are also more likely to engage in doping practices (see Dodge & Jaccard, 2006; Papadopoulos et al., 2006; Lucidi et al., 2008). In this study, those convinced of the necessity of supplementation for sporting success (often older athletes with greater length of coached career) were more likely to express permissive beliefs regarding performance-enhancing substances. Thus, a minority of the sample was sure of the benefits of supplements and this attitude can be associated with a more permissive attitude toward enhancement more generally. One would expect such an association. Athletes with more favorable attitudes toward doping would also be likely to consider legal forms of supplementation and enhancement. This research, in common with the studies above, does not establish causality. Thus, further research is required to establish whether supplement use and the corresponding perceptions of their benefits *precede* more permissive attitudes toward doping and ultimately doping behavior.

Athletes were generally unwilling to take a ''magic'' undetectable drug that would significantly improve performance. This finding suggests that the athletes were not merely concerned about the potential sanctions associated with doping, but may also be motivated not to dope by ethical reasons. This explanation is supported by the findings of Strelan and Boeckmann (2006) who found that athletes refrain from doping for moral and health reasons, not for the fear of getting caught. This is, no doubt, encouraging to organizations that are responsible for the education of young athletes in relation to anti-doping attitudes. Yet, such results should be interpreted with caution. This direct, albeit hypothetical, line of questioning may have elicited socially desirable responses, those the athletes thought the researchers and indeed the research contractor expected to hear.

This question was a modified version of Goldman et al.'s (1984) frequently cited survey of American world-class athletes (weightlifters and competitors in field athletics). Athletes were asked whether they would take a magic drug that would *guarantee* success (winning every competition) for the next 5 years, but would cause death 5 years after it has been taken. [Goldman's findings regarding these questions are included in his book *Death in the Locker Room* (Goldman et al., 1984). They are the results of polls Goldman himself conducted.] Goldman reports that 52% (103/198) of the athletes stated that they would take the drug. This is certainly a much stronger response, although Goldman offered a guarantee of success rather than the mere significant enhancement suggested in this survey. Goldman also claims that athletes were not deterred by the possibility of death in 5 years. The present sample expressed a considerably more conservative view. Participants were much more concerned with any reduction in lifespan. Less than 1% responded positively under this scenario. The picture of an athlete as a ruthless, single-minded individual, with little concern for the future, perhaps fuelled by the Goldman responses, does not fit with this more cautious group of athletes.

It is worth noting the paradox that while elite sport is often advocated and marketed in health-promoting contexts, it is scarcely conducive to good health (Howe, 2004; Møller, 2008). Elite sportspersons live on the boundaries of illness and injury in their pursuit of perfection. Yet, this did not inform the responses of most athletes in relation to the second hypothetical scenario. This may be attributable either to the crudeness of the lifespan reduction question itself or to their negative perceptions of the use of performance-enhancing substances, whether banned or permitted. Further research should investigate how athletes differentiate between different harms to health. In subsequent focus groups conducted as a following phase to this study, some athletes expressed concern at the ''unknown'' effects of doping, and felt that they were better able to manage any risks associated with their sport.

Less encouraging for anti-doping authorities and educators was the proportion of athletes (72.6% no reduction in lifespan, 40% reduction in lifespan by 10 years) who believed that other athletes would take the ''magic'' drug. Projected figures are difficult to

interpret. First, the response does not provide any greater specificity, the majority of athletes thought that ''probably some'' would take the drug, and indeed the ''probably some'' was one response up from ''none of them'' with the other remaining options: ''all of them,'' ''probably most of them'' and ''don't know.'' Secondly, projected figures often provide higher estimates than answering on one's own behalf. In a Norwegian study utilizing a similar scenario (Gilberg et al., 2006), 10% of young athletes thought others would dope, whereas only 1% said they would take the undetectable substance themselves.

Although we should exercise caution in the interpretation of these particular results, a 2.8 times higher risk of intending to use the hypothetical banned substance was found if use in others was assumed. One possible interpretation of this relationship between projected use in others and intention to use in the hypothetical magic drug scenario may be explained by the phenomenon called ''false consensus effect.'' It has been shown in a doping context that projected use estimation is likely to reflect self-behavior. Petróczi et al. (2008) report that those athletes who admitted using performance-enhancing substances significantly overestimated the same behavior in others compared with those who reportedly refrained from substance use. The results were repeated among Hungarian competitive athletes (Uvacsek et al., 2009), with further evidence that the estimation is domain specific. Those who used doping products and processes gave high estimations of doping use among other athletes but not for the use of social drugs, and vice versa. An equally possible explanation is that projected use may act as a descriptive norm. If athletes believe that a high proportion of fellow athletes and competitors are engaged in doping practices, not wanting to be disadvantaged, this belief could lead to the use of similar means.

The relationship found between body satisfaction and believing that it is necessary to use performance-enhancing substances (typically males) or engage in body modification is in line with the recent findings of Breivik et al. (2009). A survey conducted among Norwegian athletes and the general population found that body satisfaction correlated significantly and positively with enhancements (i.e. the acceptance of using substances to increase physical strength, endurance and sexual ability), whereas negative correlation was found with physical invasion such as corrective surgery (liposuction, stomach clamping) and having a tattoo.

Perspectives

This study sought to assess the extent to which young athletes have ''bought into'' the anti-doping message. Athletes were generally against substances and methods to enhance performance. Many athletes, however, believed that others would take a hypothetical, undetectable drug that would significantly enhance performance. Results indicated a significant association between this projected use and the individual's own behavioral intention to use the substance in this scenario. There is further support for such an association (see Petróczi et al., 2008; Uvacsek et al., 2009). This phenomenon, and whether it acts as a descriptive norm or is used as retrospective justification, requires further investigation. The decision to dope may be influenced by the perceived behavior of friends and competitors. Papadopoulos et al. (2006) found that tertiary education students whose friends doped were greater than seven times more likely to have used doping products at least once themselves. Research examining the doping decision and athletes' attitudes must acknowledge these other influences. While all such studies must recognize the possibility of socially desirable responses, sensitively designed studies that seek to rectify the present dearth of research on athletes' attitudes toward doping have the potential to enhance the efficacy of anti-doping education programs.

Key words: performance-enhancing substances, anti-doping, doping, enhanced appearance.

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