

## **Androgenic anabolic steroid policy and high school sports: results from a policy Delphi study**

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In this article, androgenic anabolic steroid policy targeted at American high school sports is investigated. In recent years several states have instituted androgenic anabolic steroid testing of high school athletes. These programmes have produced few positive tests and subsequently have been heavily criticized. A heterogeneous panel of sixteen experts was invited to debate the issue of steroid use among high school athletes using a policy Delphi method. The panel included executive managers from anti-doping organizations, academic researchers and advocates for steroid legalization. Panellists communicated their response to three rounds of questionnaires via e-mail. The dominant view expressed by the panel is that steroid use among high school athletes is likely underestimated and will increase in the future. Of concern were the quality of steroids consumed and the unintended consumption of steroids via tainted supplements. The panel was in near unanimous agreement that steroid abuse at this level needs to be addressed. However, the panel was divided on the ways in which doping policy should be implemented at the high school level. A small majority favoured the inclusion of drug testing of athletes. Those in favour of drug testing believed that educational efforts, while necessary, are insufficient to address this issue. Panellists stated that educational initiatives should be presented using a balanced approach that covers the positive and negative effects of steroids. Moreover, educational programmes need to emphasize alternative approaches to performance enhancement and include a moral education component. These issues were explored and the implications for policy discussed.

**Keywords:** doping; steroids; student-athletes; adolescents; supplements

### **Introduction**

In May 2007, the largest drug-testing programme in modern history was sanctioned. Yet this programme was intended, not for Olympic, professional or even NCAA athletes, but high school athletes in the State of Texas. Senate Bill 8 (S.B. 8) was passed in the Texas Senate and in the House of Representative with an overwhelming majority of 140–4. With an annual budget of \$3 million, the programme aimed to randomly test 3% of Texas's 742,341 high school athletes, approximately 20,000–25,000 athletes, each academic year – well over six times the number of drugs tests conducted at the Beijing Olympics (CNN 2010). The bill was presented amid concerns that an epidemic of anabolic androgenic steroids (hereafter referred to as, 'steroids') use among high school athletes may be on the horizon (Texas Senate News 2007). This fear was fuelled by extensive coverage of a steroid scandal at a major Texas high school along with the Dallas Morning News' four-part exposé on steroids abuse in high

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school football (Jones and Jacobson 2005). In Texas, high school sports, particularly football, are a central feature of community life. The importance placed on high school football was chronicled in the book *Friday Night Lights* (Bissinger 1990) – the title a reference to a central feature of Texas culture and Friday football games, where the whole community convenes.

The passing of S.B. 8 was also preceded by several other states launching their own, albeit substantially smaller high school testing programmes, incidents of steroid-related scandals in professional sport (e.g., BALCO and Major League Baseball) and the passage of the Anabolic Steroid Control Act of 2004. President Bush also drew attention to steroid abuse in his State of the Union speech in 2004, and specifically addressed concerns of a trickle-down effect from professional sports to high school sports (The Washington Post 2004). S.B. 8 was therefore passed amid media, political and public discourse and concern over steroid abuse in sport and the potential contagion of this abuse to the youth of America.

Early results from the Texas programme seemed to suggest that this crisis had not occurred. By Spring 2009, the programme had conducted 45,193 tests with 19 positive tests, three unresolved tests (where the testosterone : epitestosterone ratio exceeded 6:1), and 137 protocol positives (where the student-athlete violated the steroid-testing protocol by an unexcused absence, or refusal to participate in, or complete the protocol). The low rate of positive tests suggested that the concern over an epidemic of steroid abuse was unwarranted. Criticism of the programme shortly followed and Texas Governor Rick Perry stated that the funding for the programme might have been excessive (Miller 2011). The budget was subsequently slashed to \$1 million the following year, and currently stands at \$750,000 annually. The Texas programme has continued to conduct random drug testing and, based on the last reported results from the University Interscholastic League (the governing body in Texas responsible for administration of the programme), a total of 53,818 drug tests have been conducted, with 22 positive tests, and 154 unresolved or protocol positive tests, yielding less than 0.5% positive or questionable outcomes (UIL 2012). The largest drug-testing programme in the world seemed to provide evidence of a very low rate of steroid abuse among Texas high school athletes and hence the need for drug testing became questionable.

While there was criticism of the results from the programme, criticism also surfaced on the ways in which the programme was implemented. Anti-doping expert Don Catlin noted that the programme tested only for 10 steroids, when there are at least 40 different varieties (Miller 2011), with some of these easily available through reputable online merchants (The Catlin Perspective 2011). Catlin also derided the lack of direct observation of urine sample collection, which provides an opportunity for an athlete to circumvent the test in multiple ways. Furthermore, an effective drug testing system based on deterrence is reliant upon a high volume of tests to be effective (Haugen 2004), an idea that is not considered practical due to the costs of testing methods (Trout and Kazlauskas 2004). Even though the Texas programme seemed immense, it still only had the capacity to test a small percentage of athletes. In sum, it appeared that the testing programme was conducted in a way that would prevent it from establishing an accurate rate of steroid abuse among high school athletes.

Results from the Monitoring the Future (MTF) study (Johnston *et al.* 2011) and the Youth Risk Behavioral Surveillance (YRBS) programme (Eaton *et al.* 2010) both indicated that the self-report rate of steroid use was higher than the results from the Texas programme. The former indicated that annual steroid usage among 12th grade high school students (not specifically athletes) in 2009 was 1.5%, while lifetime prevalence (i.e., having ever used steroids) was 2.2%. The latter programme reported rates of youth steroid use nationally in 2009 at 3.3%, and specifically within Texas, at 2.9%. Moreover, the YRBS reported youth

steroid use as high as 7.2% in some states. Previous research has indicated steroid use among adolescent boys to be between 3% and 12% (Yesalis *et al.* 1997). More recently, Miller *et al.* (2005) reported slightly higher usage rates to the MTF and YRBS studies with usage at 4.1% for boys and 2.0% for girls. Based on these studies, it appears that the Texas programme should have unveiled more positive tests.

Both the MTF and YRBS studies are not without their critics, and some (Kanayama *et al.* 2007) point out that the self-report measures used, and the wording of questions in these studies may inflate the extent of the problem. Furthermore, the MTF and YRBS do not provide specific measures of steroid use among athletes. It is therefore unclear from the Texas programme, the MTF and the YRBS exactly how pervasive steroid abuse is among high school athletes and whether this is a cause for concern.

While the Texas programme was initially promoted as a means to gauge the extent of steroid abuse (Texas Senate News 2007), as results surfaced the rationale for the programme changed. Proponents billed the programme as a deterrent, with a goal of prevention, rather than detection (Assael 2009). The change in objective served to justify the Texas programme as an important contributor towards the war on youth steroid use. It is unknown to what extent this programme has served as a deterrent, and whether this is an effective way to combat steroid abuse among high school athletes. Moreover, one could argue that the role of steroids tests as a deterrent is moot if a problem of steroid abuse among youth is inconsequential. Rather than providing clarity on steroid abuse in high schools, the Texas programme seems to have obfuscated the issues.

### ***Steroid use and adolescents***

Discussions of steroid use are quickly accompanied by concerns over adverse physiological and psychological outcomes. Physiological side effects range from the mainly cosmetic (e.g., acne, gynaecomastia) to more serious outcomes, such as increased levels of low-density lipoproteins, decreased levels of high-density lipoproteins, elevated triglyceride levels, hepatic disease, prostate enlargement, myocardial infraction and increased risk of mortality (Thiblin and Petersson 2004, Trenton and Currier 2006, Casavant *et al.* 2007). Evidence also suggests that adolescents risk premature closing of their growth plates, and subsequently are prevented from reaching their full potential height (Casavant *et al.* 2007).

From a psychological perspective, steroid use has been associated with depression, lower self-esteem, eating disorders and body image concerns, steroid dependency and higher rates of attempted suicide (Irving *et al.* 2002, Thiblin and Petersson 2004). Increased aggression and violent behaviour are also linked with steroid use (Beaver *et al.* 2008), as is the use of illicit drugs (Miller *et al.* 2002, Miller *et al.* 2005, Lorang *et al.* 2011).

Concerns over steroid use among adolescents are magnified by the fact that this is a vulnerable and targeted population. Recent reports demonstrate that drug dealers specifically target this population (Cook 2011). Trafficking of steroids is also considered appealing because of the comparably lower penalties associated with steroid distribution compared to other illicit drugs (United States Drug Enforcement Agency 2012). In addition to being approached by dealers, adolescents may be introduced to steroids via the unsolicited efforts of trusted others (Laure and Binsinger 2005). The initiation of steroid use is more likely to occur during adolescence (Beel *et al.* 1998, Wichstrøm 2006), and multiple studies indicate that the average age of first use is estimated at 15 (Bahrke *et al.* 2000). Athletes are more at risk of being offered steroids (Wichstrøm and Pedersen 2001) and sport participation is associated with higher levels of steroid usage (Lorang *et al.* 2011, Terry-McElrath *et al.* 2011). More worrying is that athletes who start using steroids at a young age attribute

successful performance to their use of steroids (Laure and Binsinger 2007) and these types of early attributions can become ingrained (Haan *et al.* 1985). Similar to other patterns of drug use though, the use of steroids may be experimental in nature, with use declining with age (Wichstrøm 2006, van den Berg *et al.* 2007).

While it may be assumed that in the modern age of information availability, adolescents are knowledgeable about steroid use, this knowledge tends to be general and students have low levels of specific knowledge of the effects of steroids (Wanjek *et al.* 2007). This may make adolescents susceptible to pitches by those who deal with steroids. Moreover, steroid use is associated with poorer knowledge and attitudes towards health (Irving *et al.* 2002), which could potentially lead to adolescents discounting or ignoring health consequences from steroid use. In conjunction with this proposition are reports from the MTF study that show that adolescents' perception of the risks associated with steroid use has declined (Johnston *et al.* 2011).

In sum, steroid use among high school athletes is associated with negative health outcomes and this population is considered at risk for multiple reasons. This has sparked policy makers, legislatures and researchers to recommend measures to curb the use of steroids among this population. Along with Texas, the states of New Jersey, Florida and Illinois, have introduced legislation to mandate drug testing of high school athletes. Similar to the Texas programme, these programmes have reported few, if any, positive results. Some of these programmes have been abandoned as a result. Drug testing is not the only way to combat steroid abuse among the population. Educational programmes have also been implemented with some success.

### ***Steroid intervention programmes***

The most prominent steroid educational programme is ATLAS (Adolescents Training and Learning to Avoid Steroids). ATLAS is described as a team-centred, sex specific, educational programme designed to reduce adolescent athletes' intentions to use steroids and actual use of steroids, along with other illicit drugs (Goldberg *et al.* 2000). The programme is typically delivered by a coach to a small group of six to eight athletes. Students attend eight 45-minute classroom sessions, along with an equal amount spent on exercise instruction. Goldberg *et al.* (2000) report that upon completion of the programme self-report intentions to use, and use of steroids, is lower compared to a control group that only received an educational pamphlet. One year after the programme, intentions to use steroids remained lower than the control group, although steroid use was not significantly different.

The ATLAS programme therefore shows promise as a means to combat steroid abuse among adolescent athletes. However, it should be noted that the questionnaire items used in Goldberg *et al.*'s (2000) work are similar to the MTF, and as identified earlier this wording may be problematic. It may be that the nature of the programme serves to educate students on steroid terminology and thus lead to more valid responses from students, which in turn leads to lower reported levels. Hanson (2009) has also stated that these types of educational programmes may teach students to state desirable answers based on their perceptions of what is wanted by the coaches who administer the programme. Rather than deterring intentions to use, or actual use, these types of educational programmes may further hide these attitudes and behaviours. Adding to the concerns of educational programmes are reports that student-athletes are not interested in drug education and intervention programmes delivered by their athletic departments (Naylor *et al.* 2001) and those who deliver these types of programmes do not feel competent in their delivery (Mottram *et al.* 2008). Compounding the delivery of

these programmes are logistical issues involving time and resource availability (e.g., classroom space and scheduling issues, trained and competent staff).

A further criticism of educational programmes is the assumption that education enables athletes to make *good decisions* (i.e., stay drug free) when in reality, students may engage in a cost-benefit analysis under situations where winning and success are highly valued and addictive (Stewart and Smith 2008). Moreover, a fundamental problem in the evaluation of these programmes is that results are based on self-reported usage, rather than actual behaviour.

Still, this is not to discount the importance of education and as mentioned, the ATLAS programme has been reported to be beneficial. What is unclear is whether steroid abuse is even an issue among this population, and if it is, how best (and even whether), to deal with this issue. Therefore, the purpose of this study is to clarify issues on steroid abuse among high school athletes, to estimate the current and future extent of the problem, and to explore how, and indeed whether, steroid abuse should be managed at this level. To achieve this goal a Delphi study was conducted with a panel of experts on steroid use.

## Method

This study adopted a policy Delphi methodology. The Delphi technique is 'characterized as a method for structuring a group communication process so that the process is effective in allowing a group of individuals, as a whole, to deal with a complex problem' (Linstone and Turoff 1975, p. 3). This research approach is designed to take advantage of the group communication process (e.g., culminating and sharing of knowledge, generating ideas), and circumvent the disadvantages (e.g., group think, personal censorship, promotion of personal vested interests) through the provision of a forum that is anonymous (Matino 1983). With a policy Delphi, informed advocates on an issue are invited onto a panel and participate in multiple iterations of a questionnaire that examines a policy issue. The term 'advocate' is used, rather than expert, because the composition of the panel is meant to be heterogeneous, such that divergent opinions are solicited, and the rationale for these opinions explored.

In contrast to a standard Delphi, the policy Delphi does not seek consensus. Instead, the goal is to promote debate and the consideration of options, along with a consideration of the acceptability of these options (Turoff 1975). The policy issue is therefore thoroughly explored, disagreements identified, along with explanations for these disagreements. The outcome from this communication process is then used to inform sound decision-making.

Fifty potential advocates were identified based on their appearance in the last fifteen years in media reports/press releases on steroids where they were presented as experts or an authority on the subject. In addition, individuals with track records publishing academic work on steroids were approached. Just over 75% of the group held a terminal degree (e.g., PhD, MD, JD). Fifteen prospects currently or previously worked at a senior executive level (e.g. CEO, president, managing/laboratory director), or served as consultants for anti-doping organizations and non-profit organizations that promote drug free sport. Nineteen prospects were active, or previously active academic or medical researchers from disciplines of physiology/sports medicine/nutrition ( $n = 15$ ) and socio-cultural studies ( $n = 4$ ). Six advocates for the use or legalization of steroids were invited. This group included one known designer and supplier of steroids. One former designer and supplier of steroids, who has since become an advocate against steroid use was also invited. Five medical practitioners (non-researchers) were solicited. Of these five, four had experience working with professional major league sport franchises. Three noted investigative journalists and book authors

on doping in sport were contacted and finally, one politician who had a prominent role in the anti-doping movement was invited.

A letter of information was e-mailed to the prospective advocates inviting them to participate in the study. The purpose of the study was explained as an examination of 'the ways in which policy should be developed to address the issue of anabolic steroid use at the high school level'. Prospects were informed that the Delphi Method would involve several rounds of questionnaires and that these would be administered via e-mail. Confidentiality was guaranteed to panellists. Remuneration was not offered for participation.

Of the fifty panellists invited, sixteen accepted, eight declined and twenty-six did not respond. The number of acceptances conforms to recommendations to ensure the reliability of results obtained from a Delphi study (Matino 1983). The panel included eight active or formerly active researchers on steroids (6 PhDs, 2 MDs), two socio-cultural researchers, four current or former senior executives at anti-steroid organizations (e.g., presidents, managing/laboratory directors) and two prominent public figure advocates for the legalization of steroids.

### ***Procedure***

Panellists were provided with background information on drug testing programmes (including the Texas programme), along with variations of educational programmes (including ATLAS). Participants complete each questionnaire over the course of one to two weeks, at their convenience. Reminders were sent to advocates that missed the deadline. Three iterations of the questionnaire were performed, which is in line with recommendations from Turoff (1975). All sixteen advocates responded to round one, fourteen to round two and eleven to round three. All completed questionnaires were included in the analysis.

The questionnaires were designed to investigate the two primary issues presented earlier – i.e., is steroid abuse among this population group cause for concern and if so, what policy initiative would be appropriate to address this issue. To answer these questions, the first questionnaire was designed by identifying core areas that needed to be addressed and then specific questions were created. Panellists were presented with a summary of the results after each round. The questionnaire consisted primarily of open-ended questions. In round one the panel assessed current estimates of steroid use by high school students and athletes. For example, the panel was presented with data from MTF and asked, 'To what extent do you believe that this is an accurate reflection of the usage pattern for this population?' followed by a request to explain their answer. The panel was asked to estimate current and future (next five years) steroid use (e.g., 'What percentage of high school athletes would you estimate use AAS?') and to justify their answer. The next two questions concerned the types of steroids being used and whether this would change in the future. The panel indicated their concern of the effects of steroids on this population and whether this issue warranted attention. Finally, the panel commented on the efficacy of current anti-doping initiatives aimed at this population.

In line with recommendations from Turoff (1975) each round built on the previous round, with results and opinions shared among the group, comments solicited and new, follow-up questions posed and emergent issue discussed. In round two the panel was asked to state desirable components of educational programmes, to qualify their stance on drug testing based on comments made from round one, reflect on funding of anti-drug initiatives, to propose alternative methods not already discussed to combat steroid use and to discuss the issue of tainted supplements (an emergent discussion point raised in round one).

Round three presented the panel with their combined list of desirable components of educational programmes along with a 4-point rating scale anchor with ‘Definitely Include’ and ‘Definitely Exclude’. The panel then indicated the ways in which anti-steroid initiatives should be evaluated. Advocates were asked to respond to the criticisms levelled on drug testing and educational initiatives from the previous two rounds. Finally, advocates were asked to comment on alternative strategies proposed by other panel members and by the authors.

Data was analyzed using recommendations from Corbin and Strauss (2008). Each author read questionnaire responses multiple times, and wrote memos to identify issues. Memos were then shared with each other and discussed. The authors then worked again independently to perform open coding to identify categories and themes, and then discussed these themes and the context in which they occurred.

## **Results**

The results from Delphi studies are often summarized on a round by round basis. However, the policy Delphi is iterative and each round sought clarification, or asked participants to debate the issues identified from previous rounds. Therefore, the results from all three rounds were combined and are presented to mirror the purpose of the study – i.e., to clarify the scope of the problem followed by discussion of suggested intervention strategies. The discussion on the emergent issues of nutritional supplements and alternative strategies is also presented.

### ***Scope of the problem***

The majority of the panel (63%) believed that steroid usage among high school students was underestimated. Moreover, the panel expressed that usage among high school athletes specifically, may be higher than expected, particularly in certain power-based sports. Within the panel, two clusters emerged, with the first (38% of the panel) estimating usage among high school athletes at 1–3%, while the second (44% of the panel) estimating usage between 5–10%. One advocate in the first group acknowledged that their estimate would be higher dependent upon geographic location and the type of sport. Texas was provided as an example of a region where steroid use might be higher. Texas is well known for its football culture and it is inferred that the advocate was suggesting that steroid use is likely higher with these types of power sports.

Although the majority opinion was that steroid usage is likely underestimated, it was noted that some students who complete self-report questionnaire might report steroid usage based on their misinterpretation of what constitutes for a steroid. For example, the misclassification of corticosteroids, or prescription medication, may lead some students to report that they are using steroids, when in fact they are not. This potentially inflates reported steroid use. Several rationales were provided for the underestimation of steroid use. First, it was acknowledged that steroids are considered a taboo subject. Messages in the media, and the presence of anti-steroid campaigns serve to inform students that steroid use is wrong. There was scepticism whether students who are using would report their usage, and instead, provide socially desirable answers. This was considered to be the case even with assurances of confidentiality – and in fact, students may not understand or trust this concept. One panellist remarked that a steroid user had already lied once (i.e., to their competitor), and it was implied that therefore, a current user would not admit to use.

Second, the voluntary nature of participation in studies may mean that steroid users, or the parents of steroid users, opt out of the study. This would create a biased sample with the

potential removal of some users and hence usage would be underestimated. Third, a quarter of the panel raised the issue of contaminated sport supplements. In these cases student-athletes may be consuming steroids without their knowledge, and so do not report their usage. This would again lead to under reporting, though in this case, students would not be intentionally masking their usage. Finally, in stark contrast to this discussion, one panellist observed that in their professional experience monitoring online forums and criminal cases related to steroid use, they had yet to encounter high school athletes seeking advice or legal counsel. Based on this evidence, the panellist felt that steroid usage was likely very low. An alternative explanation for their observation is that these athletes are seeking information elsewhere. While this does raise some doubts over the scope of the steroid abuse among high school athletes, the majority of the panel did express concerns that usage is underestimated.

When asked about the possible change in usage over the next five years, seven panellists believed it would stay the same, one predicted a slight decrease and the remaining eight predicted a slight increase. The increase was justified based on a potential trickle-down effect from professional athletes' steroid usage, and growing societal acceptance of drugs in general, and steroids in particular. The increase was also explained based on the lack in regulation over the supplement industry, which may result in tainted supplements.

The panel discussed the types of steroids likely being used by this population. While two panellists stated that some sources (e.g., doctors, coaches) might have access to designer steroids, the dominant opinion of the group was that steroid users at this level are using unsophisticated versions of the drug. These types of steroids are more abundant and easier to obtain. Moreover, sophisticated or designer steroids were only considered necessary to avoid detection, which with the current testing policies in place, is fairly easily done. One panellist (an advocate for adults' use of steroids) explained that high school athletes were likely using unsophisticated steroids because of their general ignorance of steroids and because they have yet to be socialized into hard core drug use. This panellist elaborated that:

Most high school boys aren't up to injecting themselves with steroids just yet. Try giving yourself a shot one day with a 21 gauge X 1½ inch 3CC syringe. It's an acquired taste few adults can master, let alone a kid not yet out of puberty. Even letting one of your high school buddies shoot you is an exercise in trust few 17 year-olds possess. Any high school kid using real gear is likely to be using an oral form. Most of which are bad for their liver.

The panel was asked to comment on the effects of steroids and almost all (88%) stated that steroids would increase performance in some manner. Those who chose not to state a belief that steroids improved performance did so due to a lack of scientific studies pertaining to this population.

In terms of negative health effects, the majority (81%) cited the standard medical claims. However, some (19%) challenged these claims, or at least their significance and/or severity. Some panellists felt that other drug use (e.g., smoking, alcohol) warrants greater attention. It was also noted that the effects of steroid abuse is more serious with this population. Several panellists observed that high school athletes are likely using oral steroids or steroid alternatives, which pose a high potential for liver damage.

The panel was in near unanimous agreement (94%) that steroid use by high school athletes needs to be addressed. Many responders stated that education and promotion of healthy habits at an early age would be the key to prevent life long harmful habits. Health and safety was acknowledged as a primary reason for addressing steroid abuse. Moreover, several panellists indicated that it is important to teach young athletes about the importance of fair play and to instil positive attitudes in this regard. However, while the panel was in

agreement that steroid abuse should be addressed, they were divided on ways to approach the issue. The debate centred on the content and delivery of education programmes and whether drug testing should accompany educational efforts.

### ***Educational programme design***

Panellists agreed that education is an important component of anti-steroid campaigns. Based on responses from the third questionnaire the panel strongly favoured a two-sided approach, with the positive and negative effects of steroid usage presented. This was considered important because a one-sided message (i.e., steroids are only bad) would likely be met with scepticism from students. The panel was in favour of the content of educational efforts to be factual and scientific, and did not want the performance enhancing aspects of steroid use glossed over. This would include explanations on what constitutes a steroid and doping. Students also need to be educated on the supplement industry and the potential dangers that lay with contaminated products. The panel did not favour providing information on ways to engage in doping, such as dosage information. In addition, educational programmes should provide students with refusal skills and strategies to cope with peer pressure. Educational programmes also need to address alternative strategies to enhance performance. This included learning proper exercise and sport training methods, and diet and nutritional advice. Educational efforts should involve parents, coaches and administrators. Historical information on steroids was also not favoured for inclusion. Though not discussed, this may be due to concerns that this type of information would not engage students with the subject matter.

The ethical and legal issues surrounding steroids was also recommended for inclusion. It became clear that a variety of panellists felt that the issue of steroids and performance enhancing is a symptom of a much bigger problem facing society. There was concern that steroid use represents a mentality that sport, and life, is about winning at all costs. The growing acceptance and normalization of performance enhancement as a part of life was not considered a positive development. This shift in societal attitudes toward performance enhancing was mentioned as a possible catalyst for future increases in steroid abuse. One panellist stated people should revisit and ask what the role of sport is in society. The prospect that steroid use was indoctrinating an attitude that the means justify the ends was identified as worrisome. And because of this, several panellists felt that the moral and ethical issues of steroid use needed to be a major part of the conversation on ways to address steroid abuse and therefore warrant inclusion in educational efforts.

In terms of delivery, while education should be presented using a balanced approach, steroid use should not be promoted or glamorized. The panel was against the use of role models to deliver educational components (e.g., famous athletes, coaches) as role models can be unreliable and potentially may be revealed as a steroid user in the future.

### ***Deterring steroid use via drug testing***

While education was considered as a cornerstone of an anti-steroid movement, there was a small majority (57%) of the panel that believed education to be insufficient to deter steroid use. Those in favour of testing included all panellists from anti-doping organizations and several researchers on steroid use. Those oppose included the socio-cultural researchers, several researchers on steroid use and one steroid advocate (the other did not indicate a preference).

Drug testing was viewed as a necessary component of a comprehensive prevention strategy. Several arguments were presented on this issue. First, while it was acknowledged that education would prevent some from using, it will not prevent all. There is still a group

that will use. The prospect of being tested targets this group of potential users. The idea being communicated was that education will prevent some individuals from using and testing will prevent others. There will always be those who will use anyway. The inclusion of drug testing not only helps to prevent some usage, it also potentially identifies those who are going to use regardless. The same cannot be said for education.

Second, in line with the first point, an argument was made that the drug-free athletes need to have confidence that they can compete on a level playing field. Education does not necessarily achieve this outcome. Moreover, there was concern that without the possibility of detection, an anti-steroid strategy has little, if any means of enforcement (besides self-identification). The long-term ramifications of an education-only approach would be uncontrolled and increased use of steroids. Furthermore, it was argued that the long-term efficacy of education as a deterrent to steroid use is unknown.

Third, steroids were identified as a desirable and seductive drug – one that provides socially valued benefits (i.e., athletic success, physical attractiveness). Students know these drugs work and the benefits appear to outweigh the costs, particularly when there is no prospect of positive identification, and subsequent sanctions, from drug testing. Moreover, with an education-only approach, students may receive mixed messages. On one hand, they are told that steroids are bad. Yet, without the possibilities of detection or sanctions, students are exposed to a very different message – i.e., drug use is rewarded. One panellist illustrated this with a description of a football team (where supposedly steroid use is rampant) being lauded for the team's success on the field.

Finally, it was argued that while testing is considered expensive, education also involves costs, in terms of money, time, room access and personnel. Two researchers involved with educational programmes did state that education programmes are very affordable. However, others mentioned that school boards are inherently frugal and that unless education is mandated, it will not occur. Furthermore, it was questioned by panellists in favour of a drug-testing component, that if education was so effective, why had not it become widespread across the country. Analogies were drawn between the lack of success of educational programmes on teenage smoking, drinking and recreational drug use, and the likely success of an education-only anti-steroid policy. The argument presented basically stated that education has not solved these other health issues, and therefore it is unlikely that it will solve steroid abuse. Despite these criticisms, the panellists in favour of drug testing readily acknowledged that current testing programmes are inadequate.

### ***Criticism of drug testing***

While pro-testing panellists conceded that drug testing was not perfect, they argued that problem lay with the implementation of these programmes, and not the concept. Panellists mentioned numerous constraints to an effective programme. First, for a successful programme to be a deterrent, those who are being tested need to perceive that there is a reasonable likelihood that they will be tested. And ideally, this would be a reality. Current programmes do not test enough, or the right, athletes. This latter point was considered important because the large number of high school athletes make it infeasible to test a sufficient number. The prospect of target testing selected teams or athletes was suggested as a means to improve drug-testing programmes – both in terms of deterrence and detection. Moreover, eliminating loop holes, such as expanding testing to the off season, reducing notice provided to students, increasing the number of steroids tested for or not announcing the steroids that are being tested for, would be necessary if testing is to be successful.

In contrast to these views, those against drug testing believed that fundamentally these programmes are not effective in terms of deterrence or detection. Studies by Goldberg and colleagues (2003, 2007) on the Student Athlete Testing Using Random Notification (SATURN) programme were cited as evidence that drug testing does not act as a deterrent. In contrast, a proponent of drug testing cited studies by the NCAA (2010) that demonstrated that drug testing is an effective deterrent and other panellists argued that testing would be an effective deterrent among high school athletes.

It was noted that, unlike drug testing for professional athletes, testing authorities are not faced with the daunting prospect of keeping up with the pharmacists designing new steroids. As mentioned earlier, the panel believes that among this population, usage is primarily unsophisticated. Furthermore, unlike professional athletes, students are not yet that devious in planning ways to circumvent drug testing. A view was expressed that this population does not have the wherewithal to circumvent testing. In effect, it was expressed that high school athletes may not be as smart as, perhaps, we think. Thus drug testing would be considered a bigger deterrent to this population than to others (assuming students believe there is the potential to be caught).

Panellists for and against drug testing acknowledged that testing is currently too expensive, particularly with widespread programmes such as the one in Texas. Yet again, a panellist with experience working with drug-testing agencies felt that it is the way the programmes are designed, rather than the programmes themselves. In fact, almost a third of panellists believed that current programmes could be improved. Several panellists from anti-doping organizations expressed frustration with programme implementation. One stated 'testing isn't effective because it is not intended to be effective – it is intended for "show" '. Another lamented, 'The people with thorough knowledge about the conduct of [drug testing] aren't allowed to talk openly & publically about the programmes. It's a problem, because the usual suspects fill the information void with inaccuracies.' These statements illustrate that those involved with these programmes feel constrained from running the programmes the way that they would want.

Those opposed to testing stated that the current rates of incidents do not warrant testing. Compared to other health issues, such as smoking, drinking and recreational drug use, steroid abuse seems to be a minor concern. Moreover, drug testing was considered by some as dangerous because of the risk and ramifications of a false positive. This was mentioned in terms of the psychological and social detriment to the athlete and the potential increase in litigation from (false) positive test results. There was even question as to whether steroid testing could be defended on constitutional grounds.

Several panellists stated that steroid testing negatively impacts the social dynamic between students and school administrators. One academic with expertise on intervention programmes noted that testing creates an environment of suspicion and distrust. Another panellist stated that testing sends the message to youth that they can't be trusted. Testing was expressed to create an atmosphere of surveillance and the appropriateness of this was questioned. In rebuttal, a panellist explained that drug testing could positively alter the culture within a school, although they noted that the purpose of drug testing should be education, not punishment.

### ***Programme evaluation***

The panel discussed the evaluation of anti-steroid programmes. Anonymous surveys pre and post intervention were suggested as a possible means of evaluation. However, it was acknowledged that the validity of responses might be questionable. Surveys would enable

for trends to be identified. In-depth interviews were another proposition and this method could ensure that students understood questions posed.

With regard to testing, it was stated that the number of positive tests produced should not be the criteria used to evaluate these programmes. The expressed purpose of these programmes is deterrence and not detection. If detection is the purpose then programmes would need to be able to test all athletes any time, without notice – and this is not feasible.

### ***Supplements***

Over-the-counter supplements being tainted with steroids was identified as an emergent issue. The majority (63%) of the panel acknowledged that tainted supplements are a reality, and cause of concern. A sentiment was expressed that contaminated supplements is a much bigger health issue than the supposed rampant numbers of young athletes injecting themselves with steroids. The lack of government regulation, coupled with the enormous financial clout of the industry, was identified as major obstacles to address this issue. However, some panellists believed that if the general public was more informed on this problem that it might generate sufficient public support to prompt policy makers and legislatures to act.

The panel recommended that coaches, parents and students should be educated on supplements and the potential for contamination. Parents and coaches need to promote a message against the need for supplementation. Instead, more emphasis on proper nutrition, training and sleep habits are needed to counter the benefits offered via supplementation. Information should be easily available online that identifies supplements that have been cleared as safe, as confirmed by an independent third party.

### ***Alternative programmes***

Alternative approaches to address the issue of steroid abuse among high school athletes were sought from the panel. Initial responses from the panel centred on expansion of education initiatives to coaches and parents. Moreover, it was expressed that parents, in particular, need to become more involved with any anti-steroid initiative. Throughout the study, many panellists brought up the concept of improving the efficiency and effectiveness of steroid testing by targeting athletes from certain power sports. The extent to which this could be constitutionally defended was mentioned. Another proposition was information hotlines for athletes. However, what seemed apparent when the panel was asked for alternative approaches was the general lack of ideas. Some responses seemed almost pessimistic. For example, one panellist remarked that steroids not only provide enhanced sport performance, but also elevate individuals socially by helping them achieve a desirable athletic body. With this age group, when the ethical and moral issues are not presented, the decision to use steroids may well be, not just attractive, but also logical. Some believed that stricter sanctions are needed if the problem is to be curtailed. In an effort to generate discussion, the panel was asked to discuss the merits of persuasive social marketing campaigns and the concept of harm reduction (c.f. Stewart and Smith 2008, Kirkwood 2009).

The idea of marketing campaigns was met with general scepticism. While some believed these could be beneficial, the consensus was that these campaigns are at best supplementary to other initiatives. Several panellists stated that these campaigns would need to be market tested, similar to the efforts of the advertising industry, if there was a possibility for the campaign to have an impact. It was acknowledged that this is likely to be expensive and unlikely to happen.

Harm reduction was not considered feasible or appropriate. Some felt that the science of harm reduction was still in its infancy. Others believed that it would not be acceptable to parents or stakeholders. Finally, harm reduction was considered to be wrongheaded in that it negates the moral aspects of the performance-enhancing drug debate. This approach would not curtail use. Rather, it was anticipated that people would still cheat, but would find ways to circumvent the test to show they were healthy enough to compete. A view was expressed that the use of performance-enhancing drugs is ultimately to create an unfair advantage. If you supposedly level the field with sanction drug use, with the caveat that participants had to meet certain health requirements, people would still be motivated to find ways to beat the system.

Although the purpose of this line in inquiry was to generate discussion on ways to address steroid use at this level (not just harm reduction), there were few ideas generated. One exception was the idea of using new media, such as web-based programmes and video games, as a way to educate and influence attitudes. However, what did emerge from this discussion was frustration by several panellists that the efforts to combat steroid abuse are not united. One panellist expressed that it is 'not constructive to have to fight other elements of your own industry to accomplish progress.' Comments were raised that rather than working together to promote a common cause, people and agencies competed over scarce resources to promote their own initiatives. Several commented that greater collaboration between stakeholders was needed. This issue, along with others is discussed below.

## Discussion

Steroid use among high school athletes should be of concern to numerous stakeholders such as sport policy makers, school administrators and parents. Based on this study it is speculated that usage rates are probably underestimated, particularly among athletes in certain sports, and usage is estimated to increase slightly in the future. Of concern is that the likely types of steroids being consumed, whether intentionally or unintentionally (i.e., via tainted supplements), are known to be the most harmful. Furthermore, the negative side effects associated with steroids are of greater concern with this population. The taboo nature of steroid use makes it difficult to determine actual usage, and the effectiveness of intervention campaigns. In sum, the results from this study suggest that the issue of steroid abuse among high school athletes warrants concern and action.

Compared to other problem behaviours, such as smoking and binge drinking, steroid abuse may seem a minor concern. However, if the estimates of current and future usage provided by the panel are accurate, then this suggests that a large number of high school students are using or experimenting with steroids. This would mean that, based on reports from Eaton *et al.* (2010), among high school athletes, rates of steroid use may be similar to rates of adolescents who are frequent smokers (7.3%), and likely exceed those who currently use cocaine (2.8%), or have ever used heroin (2.5%). Placed in this context, concerns over steroid abuse appear justified.

Still, there is dire need to ascertain accurate estimates of use. The issue of self-report questionnaires, the wording and comprehension of questions and the limitations of drug testing mean that the extent of the problem remains speculative. Alternative methods to determine usage rates are needed. Considering the secretive nature of steroid use, methods that enable trust to develop between researcher and participant may be appropriate. As imparted by one panellist, in-depth interviews would enable trust to develop, and moreover, may overcome issues related to comprehension by providing opportunities for clarification. While this type of methodology would be more time intensive, and expensive,

it would provide a potentially more valid means to determine usage. This could be instrumental in persuading policy makers that more resources need to be devoted to tackle this issue. It should be a priority for future research to reveal accurate estimates of use as any discussion of intervention becomes moot absent knowledge of the extent of the problem.

The issue of tainted supplements provides a clear policy window for action to be taken to regulate the supplement industry. While the Food and Drug Administration has taken action to inform consumers on tainted supplements and warn manufacturers over the production of tainted supplements, self-regulation and compliance tend to be the way this issue is managed. Of concern is that many students use supplements – which may, or may not be contaminated. Research by Hoffman *et al.* (2008) suggests that nearly 40% of twelve grade boys use protein powder and 22% use creatine. The ubiquitous consumption of supplements, coupled with the health concerns these supplements present, could provide policy makers with ammunition to mandate more vigorous regulation.

While addressing the issue of supplements through education may prevent unintended use, it does not thwart intended use. As described earlier, the panel was divided over whether education was sufficient to address steroid use. There are several points of interest from this discussion. First, education is necessary and needs to be presented in a way that is credible and persuasive. As Wanjek *et al.* (2007) reports, we may well overestimate the extent to which high school students understand the effects of steroids.

Second, while education needs to be factual, many panellists felt that moral education was not just needed, but should be a cornerstone of any intervention. Other researchers have also suggested that moral beliefs will be more effective mechanisms to deter steroid use than either legal or social (i.e., disapproval from others) sanctions (Strelan and Boeckmann 2003). Moreover, steroid use among adolescents has been reported to involve moral reasoning and the decision to use predicted when steroid use is considered morally justified (Lucidi *et al.* 2008). Efforts are needed to design educational initiatives that seamlessly integrate a moral component that enables the initiative to remain credible and persuasive.

Third, more valid ways to evaluate educational interventions should be sought. While it may be possible to improve the design of self-report questionnaire, it would seem appropriate that less reliance is placed on these instruments. The problem with self-report questionnaires is that it does not provide opportunities for clarification of items on a complicated subject. Changes over time may indicate an increase in comprehension of the subject matter, rather than a real change in use, intentions or attitudes. Moreover, participant may report socially desirable answers, particularly after a period where participants have been informed of what constitutes a desirable action.

The issue of drug testing was contentious. Panellists against drug testing were, for the most part, fundamentally opposed to this strategy. It is unclear if any type of middle ground could be reached between those in favour and those against drug testing. As noted, a policy Delphi is not intended to resolve these differences, but to explain why these differences exist. For those fundamentally opposed to testing, issues involved damaging the relationship between students and administrators, and because of the cost and effectiveness (in terms of detection and deterrence) of drug testing. In contrast, it was argued that education, while important, will always be insufficient to control use. Steroid use was considered to potentially provide numerous benefits making them highly attractive and education would be insufficient to deter all athletes from using.

What appears clear from the panel discussion is that drug testing programmes have great potential to be improved. The question is what is stopping these improvements. At the high school level, constitutional issues would potentially prevent targeted testing formats. However, what seemed to be implied from panellists is that drug testers are hampered in

their efforts. On several occasions, panellists involved with drug testing suggested that those opposed to testing did not understand the issues involved within their organization. Moreover, the evaluation of the success of these programmes is difficult, particularly if emphasis is placed on deterrence rather than detection. This creates a quandary, in that the evaluation of these programmes is based on demonstrating that the lack of positive tests is indicative of programme success rather than an inconsequential problem. For advocates of drug testing to generate support for their programme, efforts need to be made to demonstrate that these programmes are efficient and effective, both in terms of the possibility of detection and their direct impact in deterrence.

Steroid use among high school athletes is a complicated and contested policy issue. This was evident throughout the policy Delphi process as panellists expressed frustration with opposing opinions and with the issue over steroid abuse in general. When the subject of alternative strategies was broached, few panellists responded with new ideas. Instead, current ideas were repackaged, or, general cynicism was expressed. It may well be that the policy Delphi, with the temporal lag between rounds, is not the best format for the task of idea generation. Perhaps a real time discussion, along with geographical dispersion to allow anonymity, such as using an instant message format, would have been better suited to this task. Future research should consider such an approach.

Still, it was surprising that the panel seemed stumped when asked for alternative strategies particularly given the qualifications of the panel. Several times during the discussion, panellists questioned the role of sport in society; yet, this did not translate into alternative strategies to combat steroid abuse. For example, many panellists acknowledged the myriad benefits that steroids provide the adolescent user, but no discussion was raised on whether these benefits could be challenged. For instance, the benefits of obtaining an athletic scholarship may serve as a motivating factor for adolescent steroid use (Humphreys and Ruseski 2011). Removing this benefit (i.e., ending athletic scholarships) would be one way to address the cost-benefit equation. This type of approach would be in line with recommendations from Stewart and Smith (2008) who argue that we may need to challenge our systems of sport if we are to generate effective anti-doping policies.

Finally, the perception of inter-agency competition should be of concern to policy makers if steroid abuse among this population is to be addressed. In other countries, the benefits of collaborative partnerships between agencies to address doping have had success (Stamm *et al.* 2008). Coordination among stakeholders would seem beneficial considering the challenge of addressing steroid abuse at this level. The high school athlete is in an environment where great emphasis is placed on winning (Coakley 2009). Moreover, perceptions of the harm caused by steroids are declining, and seeking performance enhancement is normative. If steroid abuse among high school athletes is not addressed, the original concerns of the Texas Senate (i.e., an epidemic of use) may be prophetic.

### Limitations

While the composition of the panel was diverse, it would have been beneficial to include those in a position to legislate policy initiatives (i.e., politicians). Several panellists did not complete all three rounds, which may have influenced the results. This included both steroid advocates, two researchers specializing in ergogenic aids and one specializing in steroid detection. The latter individual input into uncovering limitations faced by testing procedures could have been especially fruitful to this study. Finally, one panellist observed that the conversation ignored gender differences of use, which should be considered.

## References

- Assael, S., 2009. High school testing loses momentum. *ESPN the magazine* [online]. Available from: <http://sports.espn.go.com/espn/otl/news/story?id=3951039> [Accessed 25 April 2012].
- Bahrke, M.S., *et al.*, 2000. Risk factors associated with anabolic-androgenic steroid use among adolescents. *Sports medicine*, 29 (6), 397–405.
- Beaver, K.M., *et al.*, 2008. Anabolic–androgenic steroid use and involvement in violent behavior in a nationally representative sample of young adult males in the United States. *American journal of public health*, 98 (12), 2185–2187.
- Beel, A., Maycock, B., and McLean, N., 1998. Current perspectives on anabolic steroids. *Drug and alcohol review*, 17 (1), 87–103.
- Bissinger, H.G., 1990. *Friday night lights: a town, a team and a dream*. Cambridge, MA: Da Capo Press.
- Casavant, M.J., *et al.*, 2007. Consequences of use of anabolic androgenic steroids. *Pediatric journal of North America*, 54 (4), 677–690.
- The Catlin Perspective, 2011. Amazon steroids not on Texas high school, steroids lists. *The Catlin perspective* [online], 4 March. Available from: <http://thecatlinperspective.wordpress.com/> [Accessed 5 February 2012].
- CNN, 2010. Record drug tests at London 2012. *CNN* [online], 7 April 2010. Available from: <http://www.cnn.com/2010/SPORT/04/07/olympics.london.drug.tests/index.html> [Accessed 25 January 2012].
- Coakley, J., 2009. *Sports in society: issues and controversies*. 10th ed. New York: McGraw-Hill, 122–151.
- Cook, B., 2011. 32 indicted in steroid ring that targeted high school athletes. *Forbes* [online], 2 November. Available from: <http://www.forbes.com/sites/bobcook/2011/11/02/32-indicted-in-steroid-ring-that-targeted-high-school-athletes/> [Accessed 14 April 2012].
- Corbin, J. and Strauss, A., 2008. *Basics of qualitative research*. 3rd ed. California: Sage Publications.
- Eaton, D.K., *et al.*, 2010. Youth risk behavior surveillance – United States, 2009. *MMWR surveillance summaries*, 59 (SS-5), 1–142.
- Goldberg, L., *et al.*, 2000. The adolescents training and learning to avoid steroids program: preventing drug use and promoting health behavior. *Archives in pediatric & adolescent medicine*, 154 (4), 332–338.
- Goldberg, L., *et al.*, 2003. Drug testing athletes to prevent substance abuse: background and pilot study results of the SATURN (Student Athlete Testing Using Random Notification) study. *Journal of adolescent health*, 32 (1), 16–25.
- Goldberg, L., *et al.*, 2007. Outcomes of a prospective trial of student-athlete drug testing: the Student Athlete Testing Using Random Notification (SATURN) study. *Journal of adolescent health*, 41 (5), 421–429.
- Haan, N., Aerts, E., and Cooper, B.A.B., 1985. *On moral grounds: the search for practical morality*. New York: New York University Press.
- Hanson, J.M., 2009. Equipping athletes to make informed decisions about performance-enhancing drug use: a constructivist perspective from educational psychology. *Sport in society*, 12 (3), 394–410.
- Haugen, K.K., 2004. The performance-enhancing drug game. *Journal of sports economics*, 5 (1), 67–86.
- Hoffman, J.R., *et al.*, 2008. Nutritional supplementation and anabolic steroid use in adolescents. *Medicine & science in sports & exercise*, 40 (1), 15–24.
- Humphreys, B.R. and Ruseski, J.E., 2011. Socio-economic determinants of adolescent use of performance enhancing drugs: evidence from the YRBSS. *The journal of socio-economics*, 40 (2), 208–216.
- Irving, L.M., *et al.*, 2002. Steroid use among adolescents: findings from project EAT. *Journal of adolescent health*, 30 (4), 243–252.
- Johnston, L.D., *et al.*, 2011. *Monitoring the future national survey results on drug use, 1975–2010. Volume I: secondary school students*. Ann Arbor: Institute for Social Research, The University of Michigan.
- Jones, G. and Jacobson, G., 2005. The secret edge. Steroids in high school. *Dallas Morning News* [online]. Available from: <http://www.dallasnews.com/sharedcontent/dws/spe/2005/steroids/index.html> [Accessed 15 October 2012].
- Kanayama, G., *et al.*, 2007. Anabolic steroid abuse among teenage girls: an illusory problem? *Drug and alcohol dependence*, 88 (2), 156–162.

- Kirkwood, K., 2009. Considering harm reduction as the future of doping control policy in international sport. *Quest*, 61, 180–190.
- Laure, P. and Binsinger, C., 2005. Adolescent athletes and the demand and supply of drugs to improve their performance. *Journal of science and medicine*, 4, 272–277.
- Laure, P. and Binsinger, C., 2007. Doping prevalence among preadolescent athletes: a 4-year follow up. *British journal of sports medicine*, 41 (1), 660–663.
- Linstone, H.A. and Turoff, M., eds., 1975. *The Delphi method: techniques and applications*. London: Addison-Wesley publishing company.
- Lorang, M. et al., 2011. Anabolic androgenic steroid use in teens: prevalence, demographics, and perceptions of effects. *Journal of child & adolescent substance abuse*, 20 (4), 358–369.
- Lucidi, F. et al., 2008. The social-cognitive mechanisms regulating adolescents' use of doping substances. *Journal of sports sciences*, 26 (5), 447–456.
- Matino, J.P., 1983. *Technological forecasting for decision making*. 2nd ed. New York: North-Holland.
- Miller, J., 2011. Steroid testing of teen athletes shrinks as state cuts funds. *Dallas Morning News* [online], 2 January. Available from: <http://www.dallasnews.com/news/community-news/collin-county/headlines/20110102-steroid-testing-of-teen-athletes-shrinks-as-state-cuts-funds.ece> [Accessed 17 March 2012].
- Miller, K.E. et al., 2002. Anabolic-androgenic steroid use and other adolescent problem behaviors: rethinking the male athlete assumption. *Sociological perspectives*, 45 (4), 467–489.
- Miller, K.E., et al., 2005. Adolescent anabolic steroid use, gender, physical activity, and other problem behaviors. *Substance use & misuses*, 40 (11), 1637–1657.
- Mottram, D., Chester, N., and Gibson, J., 2008. Evaluation of a tutor network system for a national education programme on drug-free sport. *Sport in society*, 11 (5), 560–569.
- Naylor, A.H., Gardner, D., and Zaichkowsky, L., 2001. Drug use patterns among high school athletes and nonathletes. *Adolescence*, 36, 627–638.
- NCAA, 2010. *2009 National study of substance use trends among NCAA college student-athletes* [online]. Available from: [http://www.ncaa.org/wps/wcm/connect/public/NCAA/Resources/Research/NC\\_AA+Studies+of+Substance+Use+Habits+of+College+Student-Athletes](http://www.ncaa.org/wps/wcm/connect/public/NCAA/Resources/Research/NC_AA+Studies+of+Substance+Use+Habits+of+College+Student-Athletes) [Accessed 10 November 2011].
- Stamm, H., et al., 2008. The public perception of doping in sport in Switzerland, 1995–2004. *Journal of sport sciences*, 26 (3), 235–242.
- Stewart, B. and Smith, A.C.T., 2008. Drug use in sport: implications for public policy. *Journal of sport & social issues*, 32 (3), 278–298.
- Strelan, P. and Boeckmann, R., 2003. A new model for understanding performance-enhancing drug use by elite athletes. *Journal of applied sport psychology*, 15 (2), 176–183.
- Terry-McElrath, Y.M., O'Malley, P.M., and Johnston, L.D., 2011. Exercise and substance use among American youth, 1991–2009. *American journal of preventative medicine*, 40 (5), 530–540.
- Texas Senate News, 2007. *Committees looking at significant legislation* [online], 22 March. Available from: <http://www.senate.state.tx.us/75r/senate/archives/Arch07/p032207a.htm> [Accessed 15 October 2011].
- Thiblin, I. and Petersson, A., 2004. Pharmacoepidemiology of anabolic androgenic steroids: a review. *Fundamental & clinical pharmacology*, 19 (1), 27–44.
- Trenton, A.J. and Currier, G.W., 2006. Behavioural manifestations of anabolic steroid use. *CNS drugs*, 19 (7), 571–595.
- Trout, G.J. and Kazlauskas, R., 2004. Sports drug testing – an analyst's perspective. *Chemical society reviews*, 33 (1), 1–13.
- Turoff, M., 1975. The policy Delphi. In: H.A. Linstone and M. Turoff, eds. *The Delphi method: techniques and applications*. London: Addison-Wesley Publishing Company, 84–101.
- United States Drug Enforcement Administration, 2012. *Federal trafficking penalties* [online]. Available from: <http://www.justice.gov/dea/agency/penalties.htm> [Accessed 19 April 2012].
- University Interscholastic League, 2012. *UIL Anabolic steroid testing program* [online]. Available from: <http://www.uil-texas.org/health/steroid-information> [Accessed 10 January 2012].
- van den Berg, P., et al., 2007. Steroid use among adolescents: longitudinal findings from project EAT. *Pediatrics*, 119 (3), 476–486.

- Wanjek, B., *et al.*, 2007. Doping, drugs and drug abuse among adolescents in the state of Thuringia (Germany): prevalence, knowledge and attitudes. *International journal of sports medicine*, 28 (4), 346–353.
- The Washington Post, 2004. Text of President Bush's 2004 State of the Union address [online]. *The Washington Post*, 20 January 2004. Available from: [http://www.washingtonpost.com/wpsrv/politics/transcripts/bushtext\\_012004.html](http://www.washingtonpost.com/wpsrv/politics/transcripts/bushtext_012004.html) [Accessed 17 March 2012].
- Wichstrøm, L., 2006. Predictors of future anabolic androgenic steroid use. *Medicine & science in sports & exercise*, 38 (9), 1578–1583.
- Wichstrøm, L. and Pedersen, W., 2001. Use of anabolic-androgenic steroids in adolescence: winning, looking good or being bad? *Journal of studies on alcohol*, 62 (1), 5–13.
- Yesalis, C.E., *et al.*, 1997. Trends in anabolic-androgenic steroid use among adolescents. *Archives of pediatric adolescent medicine*, 151 (12), 1197–1206.