

Schoolboy supplement use behaviours and doping vulnerability

Final Report prepared for
Rugby Football Union



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This programme of research was conducted between June 2013 and June 2016.

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Executive Summary

Context

By the very nature of sport, athletes are assumed to be legitimately striving to optimise their performance. As a result, they take the steps to ensure peak physical and mental fitness to achieve their performance goals. These steps might involve using permitted nutritional supplements, but in some cases, it involves using banned performance-enhancing drugs. Typically, supplement use precedes prohibited substance use and from a behavioural point of view, there is little material difference in these approaches if either of the substance categories are used to alter physique and/or enhance athletic performance. Yet, from a regulatory perspective there is an important difference, as determined by the anti-doping rules in sport. Therefore, attention is equally warranted for monitoring supplement use and misuse, alongside that of prohibited substances; each has considerable potential to compromise athlete health and well-being.

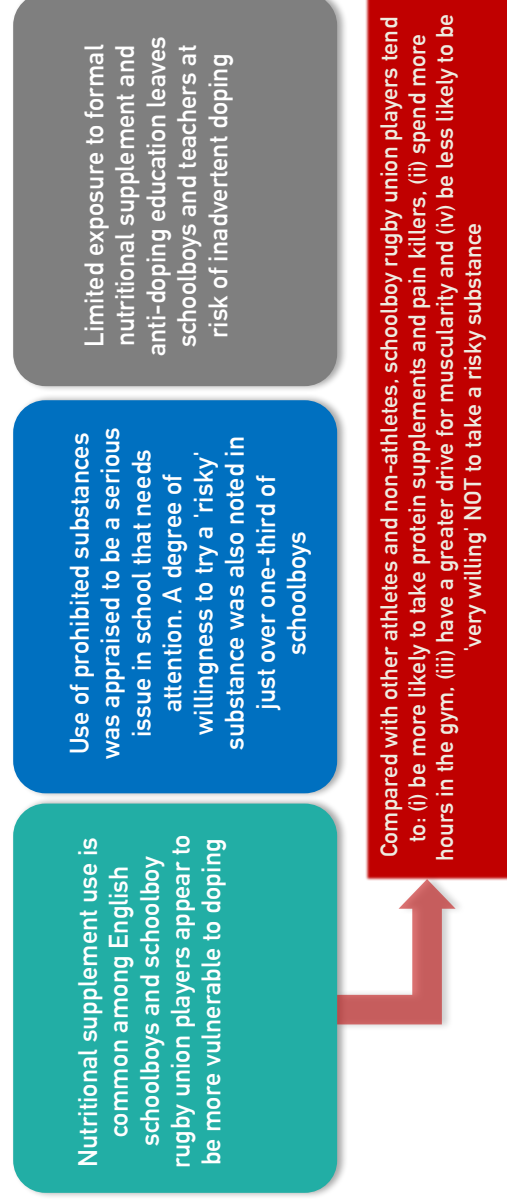
In the UK, the small, but growing, number of rugby union players committing anti-doping rule violations is a cause for concern. This concern is further intensified when strong sanctions are being imposed on schoolboys. Presently, little is known about the performance- and image-enhancing strategies used by schoolboys. At the same time, adolescence represents a development stage where boys and youths readily recognise the 'advantages' associated with enhanced physical maturity for **both play and selection**. Therefore, this research was commissioned by the Rugby Football Union to determine the practice, knowledge and beliefs of English schoolboys towards nutritional supplements and prohibited substances. Developing an understanding of the context within which adaptive and maladaptive enhancement practices might arise is fundamental to developing a research-informed and evidence-based approach to doping prevention.

Research design

We developed and deployed a two-phased mixed-methods design to secure an understanding of the socio-cultural experiences of schoolboys and their teachers. Our approach addressed the individual, situational and environmental factors that might combine to influence using nutritional supplements and prohibited substances in school sport. In phase 1 semi-structured interviews were conducted with 25 male adolescents (18 rugby union players and seven non-rugby players) and five teachers from four English schools. The findings directly informed the design of phase two, which involved completing an online survey by 771 schoolboys (mean age= 16.88 ± 0.75 years; 53% rugby union, 32% other athletic males and 14% non-athletes) and 135 coaches and teachers from schools and colleges across England.

Research insights

The figure below represents three overarching insights from the online survey and interviews. To illustrate schoolboy rugby union players' vulnerability to doping, we have detailed findings from a regression analysis.



NUTRITIONAL SUPPLEMENT USE	BELIEF THAT SIZE MATTERS	BANNED SUBSTANCE USE & BELIEFS
<ul style="list-style-type: none"> - 95% of schoolboys had consumed sports foods during their lifetime - 43% of schoolboys had used protein supplements and weight gainers (e.g., Creatine) during their lifetime - 60% of schoolboys declared prior use of energy drinks (e.g., Red Bull) - Less than 10% of schoolboys had used pre-workouts - Schoolboy rugby union players were twice as likely to use protein supplements & weight gainers than other athletic males 	<ul style="list-style-type: none"> - Schoolboy rugby union players highlighted implicit and explicit pressures to be a certain size to guarantee team selection - Increased size and strength deemed protective factors against potential harm from the physical demands of the game - Teachers/coaches were influential in the prevailing perceptions that 'size matters' - 3 in 5 schoolboys agreed that they want to do what their teacher/coach advises 	<ul style="list-style-type: none"> - Schoolboys self-declared anabolic steroid use was <1% but 1 in 4 stated they would not self-report using a banned substance if they had previously or were currently using one - The indirect estimate of schoolboys use of anabolic steroids in the last three months was in the range, 0-18% (mean estimate = 9.2%) - Schoolboys estimate 4% of their team mates/training group use banned substances compared to 12% of schoolboys from other schools and 22% of elite sportsmen
LIMITED EXPOSURE TO NUTRITION AND ANTI-DOPING EDUCATION		
<ul style="list-style-type: none"> - Schoolboys were unable to articulate why they were using supplements, or the potential risks their use presents - School teachers and coaches were ill-equipped to offer informed advice on the use of supplements - The vast majority of teachers/coaches agreed that education on supplements and banned substances should be <u>compulsory</u> within schools - Over 50% of schoolboys and nearly 50% of teachers appraised banned substance use as a serious issue that needs addressing 		

Conclusions and future actions

Nutritional supplement use is commonplace, largely accepted, and “normative” among 16-19-year-old males in England. The combination of peer endorsement for acting or looking a certain way and an overall lack of knowledge on supplement usage, encourages potentially widespread misuse of nutritional supplements. With the functional use theory in mind, our findings point to schoolboy rugby union being a fertile ground where young players can easily progress from habitual use of permitted supplementation into prohibited substance use. Tailored and targeted intervention is therefore necessary as the perception – and reinforcement - that size matters is central here. Nutritional supplement use goes hand-in-glove with regular gym attendance; interviews identified ‘the gym’ as a doping risk environment, where substance use is embedded within that social and cultural system. While our estimates of (i) schoolboy anabolic steroid use, (ii) perceived incidence of banned substance use and (iii) willingness to take a ‘risky’ substance, are all indirect, the risk of doping in schoolboy sport is apparent and should command immediate attention.

To be serious about successfully changing behaviour, an ‘overdetermining’ whole system approach is required (Grenny et al., 2013). This will ensure that all elements of activating behaviour are altered. Individuals, groups and populations must at least have: (i) the ‘capability’ to do the new behaviours (e.g., the knowledge, skills and motivation), (ii) the ‘opportunity’ for the behaviour (e.g., physical and social) and also (iii) ‘motivation’ to do it (COM-B; Michie, van Stralen & West, 2011). Through the application of COM-B we have identified specific components as being relevant to delaying the use of nutritional supplements, lessening doping vulnerability and shaping future actions. These are not either/or options because to meet the requirement for ‘overdetermining’ success, they need to occur in concert:

Capability: Schoolboys lack understanding of the need for nutritional supplements and the risks of any misuse. Similarly, teachers/coaches are influential – yet ill-equipped - sources of information and powerful agents for creating behavioural expectations for schoolboys. Similarly, strength and conditioning staff need to act powerfully. Therefore, interventions should seek to educate schoolboys and teachers/coaches on the importance of (i) a balanced diet and a ‘food first’ approach, (ii) the functional alternatives to supplement use and (iii) carefully planned and monitored strength and conditioning programmes.

Opportunity: Convenience was identified as a primary reason for using nutritional supplements. Therefore, schoolboys are likely to need the support from others around them to commit to a ‘food first’ nutritional approach. This also needs to drive a different kind of peer pressure; one where ‘food first’ is the right thing to do. Establishing a policy on the promotion and availability of nutritional supplements in school and academy settings for Under 18’s will help to create a stronger anti-doping culture.

Motivation: Schoolboys and teachers believed that education on nutritional supplements and banned substances should be compulsory in schools. Therefore, this belief should be embedded in any future actions in the field by policy makers and practitioners. In part, the desire for team and personal success drives the motivation for ‘getting bigger’; this drive may also exist in many young males regardless of their athletic potential. Addressing the belief that ‘size matters’ in rugby union will require a collective effort across the game.

The findings emphasise the need for targeted education, environmental restructuring and skill-based training intervention functions in this domain. The focus should be on creating a learning culture, rather than a compliance culture driven by regulatory or procedural processes. If we scaffold a whole system change programme incrementally – and in collaboration with key stakeholders – we are more likely to develop effective interventions that reinforce and sustain a clean sport culture. In doing so, collective responsibility will drive action to prevent doping in sport.

1

Introduction

In the pursuit of the 'good' that sport can do – contributing to the overall personal and social development of the sportsperson - it is incumbent on all National Governing Bodies (NGBs) to do what they can to foster positive pathways through performance enhancement. This will involve those agencies that 'use' sport to furnish their youth development aspirations, including schools and sports clubs. By the very nature of sport, athletes are always striving to optimise their performance; taking the necessary steps to ensure they are in peak physical and mental fitness in order to achieve their performance goals. Such steps might involve the use of nutritional supplements, or in some instances the use of banned performance enhancing drugs. The latter should be prevented where possible because it contravenes the rules of sport and can compromise athlete health and well-being. Thus, prevention is incumbent on the efforts of all those involved in the sporting landscape.

Signalling a move towards an integrated social cognitive model, an intriguing new link has been established between nutritional supplement use and doping or doping attitude (e.g., Ntoumanis, Ng, Barkoukis & Backhouse, 2014; Backhouse, Whitaker & Petróczi, 2013). Despite this growing body of evidence that positively correlates supplement use with doping behaviour, adolescents' use of nutritional supplements has received little attention compared to that afforded to the prevalence of doping. This absence risks being short-sighted since Petróczi & Aidman (2008) proposed that doping practices may emerge from prolonged use of assisted performance enhancements (i.e., using nutritional supplements and over-the-counter medicines); and it is mainly driven by maximising athletic potential by utilising the performance-enhancing properties of these potent substances. In line with the thrust of this project adopting a performance enhancement approach, the functional use theory which incorporates the incremental model of doping behaviour (Petróczi, 2013) diverges from the moralistic view (considering doping as cheating). Instead, it adopts a functional view in which assisted performance enhancement is seen as a motivated, goal-oriented and progressive practice where the goal is not gaining unfair advantage but to maximise one's athletic performance. This incremental model of doping behaviour offers theoretical foundation for the gateway hypothesis and the link

between supplement use for performance enhancing purposes and doping (see Figure 1, section 2).

The functional use theory suggests that assisted performance enhancement is not logical or linear and is influenced by a number of vulnerability factors (e.g., accessibility, perceptions, norms, experiences). As a result, it may be that nutritional supplement use alone does not act as a gateway to doping but instead a gateway arises when nutritional supplement use occurs alongside other risk factors (e.g., body image issues, doping-related perceptions, social norms). At present, little is known about what schoolboys do to improve their sport performance and/or image. In their unique developmental stage, which often favours those who are more physically advanced, schoolboys may engage with enhancement strategies that are either positive - and legitimate - or maladaptive and illegal (or at least, transgressive). More specifically, this could include the (mis-) use of nutritional supplements and/or use of performance-enhancing substances. Although research indicates that both nutritional supplement use (e.g., Nieper, 2005) and doping (e.g., Lucidi et al., 2008) are not uncommon amongst adolescents, surprisingly there is a lack of equivalent scholarly, school-based research in the UK. This programme of research served to explore these factors amongst a sample of English schoolboys.

2

Research design

The programme of research utilised a mixed-methods design, drawing upon the post-positivist paradigm. This paradigm bridges the gap between qualitative and quantitative methods (Letourneau & Allen, 1999). Whilst being concerned with quantification, causal factors and identifying generalisations which can be applied to groups, post-positivists also hold concerns for subjectivity and capturing the experiences of individuals (Clark, 1998, King & Horrocks, 2010). Despite it being possible to infer generalisations from data, they may not apply to all individuals (Charney, 1996). As a result, it is important to also take into account the impact of social interaction and subjective interpretation on experience (Yardley & Marks, 2004) in order to understand a phenomenon. Post-positivism recognises that the “truths” derived from both qualitative and quantitative methods are diverse and valuable in their contribution to knowledge development. Post-positivism therefore provides a platform from which to carry out both quantitative and qualitative research, which the research team deem necessary to understand performance and image enhancement in this context.

In order for the research team to explore the prevalence of nutritional supplement use and the psychosocial factors pertaining to doping use by schoolboys, a two-phase approach was utilised. This involved a qualitative study and a quantitative study, both involving adolescent males and school teachers.

This programme of research was focused on examining variables that are consistent with both sociocultural theories (social pressures, body dissatisfaction, internalisation, and social comparison) and models of substance use (e.g., functional use theory, Petróczi, 2013). The functional use theory suggests that doping is a goal-oriented behaviour that develops over time from the habitual use of permitted performance enhancing strategies. Rather than being seen as a moral choice, through this lens, doping is perceived as functional. Athletes who dope are not necessarily looking to cheat and outperform others but may simply be seeking ways to maximise their athletic capacities.

As part of the functional use theory, an incremental model of doping behaviour (IMDB) is proposed (Figure 1), which posits that performance enhancement is incremental but not necessarily logical or linear. It also acknowledges that goals vary between career stages and emphasises that performance goals can act as motivators for doping. Rather than the gateway to doping occurring via accustomed use of chemical substances, the IMDB suggests that the gateway occurs through habitual use of coping strategies associated with training and competition, which usually take the form of substances such as nutritional supplements or over-the-counter medications. Therefore, because athletes become accustomed to using external means to enhance their ability and training, doping is perceived as a learned behaviour and may simply represent another way to assist athletes to manage the demands of training and competition.

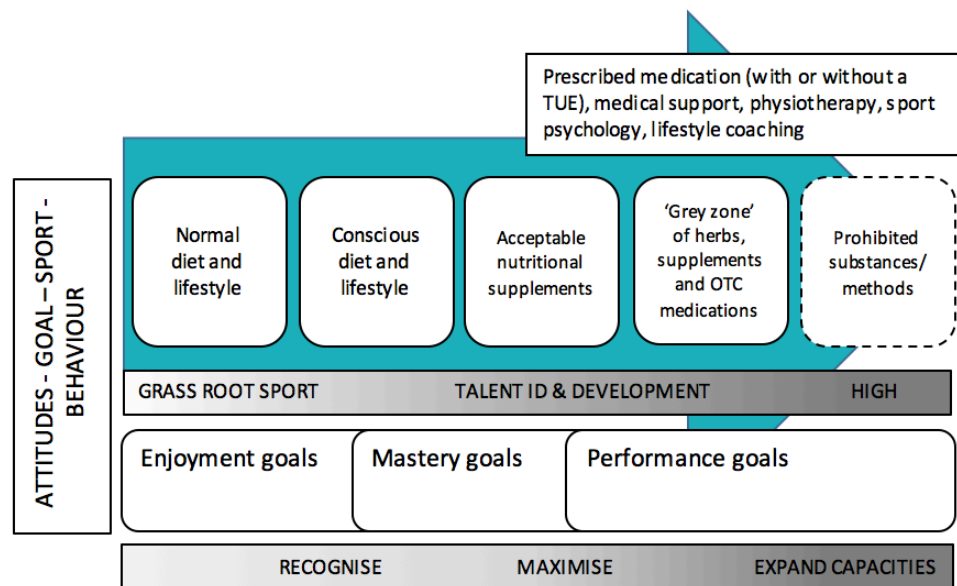


Figure 1: Incremental model of doping behaviour (Petróczi, 2013)

Phase 1: In-depth interviews

In this phase of research, semi-structured interviews were undertaken with 25 male adolescents (18 rugby union players and seven non-rugby players) and five teachers from four English schools. Data collection took place between February and June 2014. The aims of this phase of the project were to:

- 1) Develop an understanding of the socio-cultural experiences of adolescent sportsmen in a school setting
- 2) Explore the performance and image enhancing strategies used by male adolescents

-
- 3) Consider how specific individual, situational and environmental factors combine to influence the use of performance and image enhancing substances

Two interview schedules were drawn up (one for teachers and one for adolescents) to enable information to be gathered on the same topics from two different perspectives. Topics included; 1) adolescents' sporting experience, 2) conditioning for sport, 3) use of performance enhancing strategies, and 4) knowledge and perceptions of the use of nutritional supplements and banned substances.

Teachers were questioned on the same areas but drew on their experiences as the school teacher (e.g., their knowledge/experience of performance enhancing strategies used by their pupils). Following completion, each interview was transcribed verbatim and thematic analysis (Braun & Clarke, 2006) was used to identify the key themes within the data.

Phase 1 offered rich accounts of the lived experience of performance and image enhancement in school sport. From the data, five overarching themes were identified (Table 1).

Table 1: Overarching themes identified

1	<i>The physicality of the game drives my behaviour and beliefs</i>
2	<i>I use supplements and go to the gym because of those around me</i>
3	<i>We have patchy knowledge obtained from unreliable sources</i>
4	<i>We don't talk about banned substances; they're just not on our radar</i>
5	<i>It's their choice if they want to use a banned substance</i>

The findings highlighted that the use of nutritional supplements is commonplace amongst schoolboys. Of those interviewed, 85% self-reported some sort of supplement use with protein being the most commonly used supplement. Use of hydration tablets, energy drinks, BCAAs, creatine and pre-workouts was also evident amongst the sample.

In-depth interviews highlighted that those who regularly undertake gym training may be exposed to steroid use (and other banned substance use) and are thus at an increased risk of banned substance use compared to those who do not use the gym. Equally, schoolboy rugby players may be at an increased risk of using banned substances compared to male adolescent athletes in other sports because of the physicality of the game and the perception that 'big is better'. These findings provided an evidence base from which to design the second phase of the research programme where cross-sectional surveys were undertaken by male schoolboys and teachers involved with school sports teams in England.

Phase 2: Online survey

On the 1st February 2015, data collection commenced for phase 2 of the project. This ran for a total of 13 months, ending on Friday 4th March 2016.

The aims of this phase of the research were to:

- 1) Examine the prevalence of performance and image enhancing substance use in a representative sample of male adolescents in England
- 2) Investigate schoolboys drive for muscularity and doping-related perceptions, including norms and willingness to dope
- 3) Explore schoolboys' exposure to anti-doping education, doping control and NS information

The adolescent survey consisted of nine sections: 1) demographics, 2) sports participation, 3) substance use, 4) physical appearance, 5) nutritional supplements, 6) doping willingness, 7) norms, 8) drug testing and education and 9) social desirability. In comparison, the teacher survey consisted of eight sections: 1) demographics, 2) school role, 3) education and training, 4) anti-doping perceptions and beliefs, 5) prevalence perceptions, 6) substance use, 7) nutrition knowledge and 8) social desirability.

Sampling

Overall 73 schools/colleges showed interest in the project with 38 schools/colleges across England providing consent to participate. In total, 1163 adolescents started the survey. Twenty-one adolescents did not provide consent and 310 did not answer any questions (or only provided demographic information) and therefore were removed from the sample. In addition, 13 females, 38 under 16s and 10 participants over 19 were removed leaving a sample of 771 who answered all or part of the survey.

Participants were aged between 16 and 19 (mean age= 16.88 ± 0.75 years), with 81% White British. Overall, schoolboys from 42 different counties have been surveyed with Cambridgeshire (21%) and Hertfordshire (11%) being the most dominant. Of the 767 adolescents who identified the type of school they attend, 65% were pupils at an independent school, 16% a state school and 18% a college.

Sport participation

Of the 771 schoolboys surveyed, 53% of the sample were rugby union players, 32% other athletic males and 14% were non-athletes (did not take part in any sport for their school/college or a local club). The majority of those surveyed who take part in sport competed at school/club level (Figure 2). The average number of hours spent undertaking sport specific training per week was similar for the rugby players (mean= 5.3 ± 2.3 hours) and other athletic males (mean= 6.0 ± 3.9 hours).

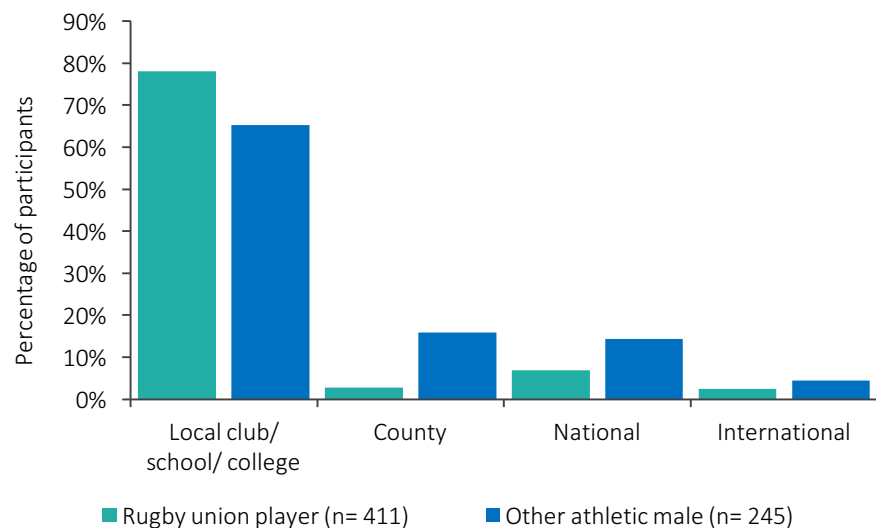


Figure 2: Schoolboys' highest level of competition (n= 656)

Schoolboy rugby players

The rugby players surveyed predominantly competed at school/club level (78%) with 13% having represented their county, 7% have competed at national level and 2% have competed at international level. Rugby union was the main sport for 70% of players, with 22% currently playing adult men's rugby. All playing positions were surveyed with flanker being the most dominant (21%).

Teacher sample

Overall, 179 teachers started the survey. One teacher did not provide consent and 39 did not answer any questions (or only provided demographic information) leaving a sample of 135 who answered all or part of the survey. Participants were

aged between 23 and 64 (mean age = 36.5 ± 9.01 years), with 82% male and 93% White British. In total, teachers from 25 different counties were surveyed.

School role

Of those teachers completing the survey, 79% worked at independent schools, 15% state schools and 6% colleges. The majority (90%) were school teachers, 8% were sports coaches and 2% were strength and conditioning coaches with the average length of time in their current role ranging from 0-32 years (mean= 8.0 ± 6.7 years). Out of 135 respondents, 53% coached their school/college rugby union team and had been coaching for 0-32 years (mean= 12.1 ± 7.6 years).

Data analysis

Descriptive statistics were conducted to compare differences between groups. Due to the nature of the data, non-parametric tests were used (Mann Whitney U, Kruskal-Wallis χ^2) to examine the data and odds ratios computed to analyse supplement use amongst rugby union players compared with other athletic males and non-athletes. The data was further interrogated using the statistical techniques of binomial logistic regression analysis and receiver operating characteristic analysis. Cluster analysis was also used to examine teacher education.

3

Research insights

Through triangulation of the findings from phase one and two of the programme of research, three overarching insights have been identified and are depicted in Figure 3. Also included in Figure 3 are findings from a regression analysis which highlight schoolboy rugby union players' doping vulnerability. Each overarching insight will be taken in turn and explored in more detail.

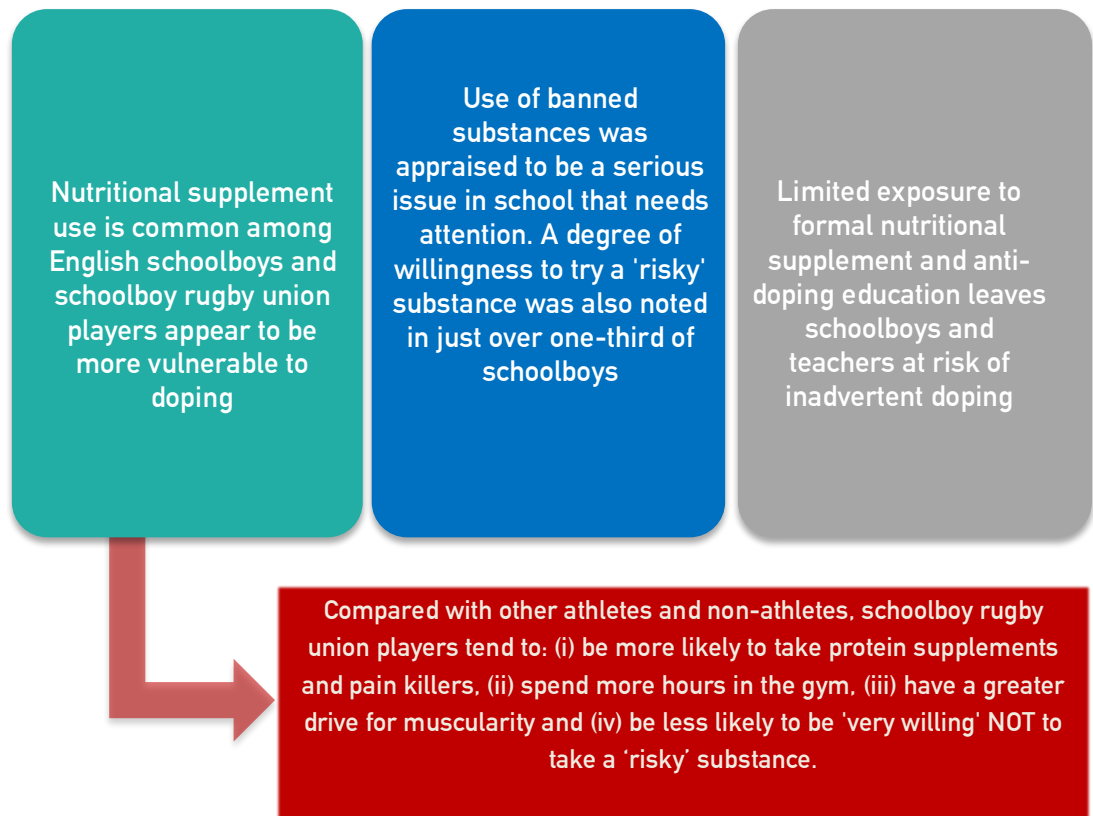


Figure 3: Key insights emerging from the data collected across the programme of research

INSIGHT ONE

Nutritional supplement use is common among English schoolboys and schoolboy rugby union players appear to be more vulnerable to doping

Compared with other athletes and non-athletes, schoolboy rugby union players tend to: (i) be more likely to take protein supplements and pain killers, (ii) spend more hours in the gym, (iii) have a greater drive for muscularity and (iv) be less likely to be 'very willing' NOT to take a 'risky' substance.

Nutritional supplements

Prevalence of nutritional supplement use

The vast majority (95%) of schoolboys surveyed had used at least one type of supplement in their lifetime, with sports foods (e.g., sports drinks, carbohydrate gels) being the most commonly ingested type (Figure 4). In addition, 82% had used at least one type of nutritional supplement within the three months prior to being surveyed (Figure 4).

Overall, 43% of schoolboys surveyed reported lifetime use of protein supplements and weight gainers (e.g., Creatine) with 79% of lifetime users also reporting use within the three months prior to taking part in the survey.

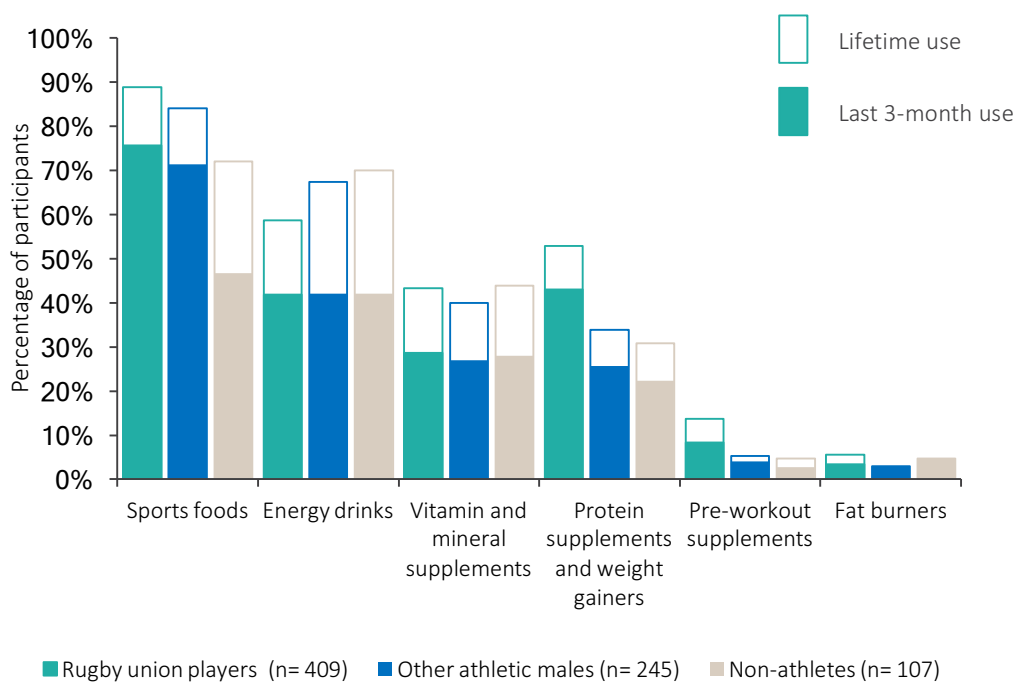


Figure 4: Percentage of participants who have used each type of nutritional supplement according to sports participation in their lifetime and within the three months prior to being surveyed (n= 761)

Frequently used supplements

Sports drinks were the most frequently used supplement, with 81% of schoolboys using them in their lifetime and 66% of schoolboys using them in the three months prior to being surveyed (Figure 5).

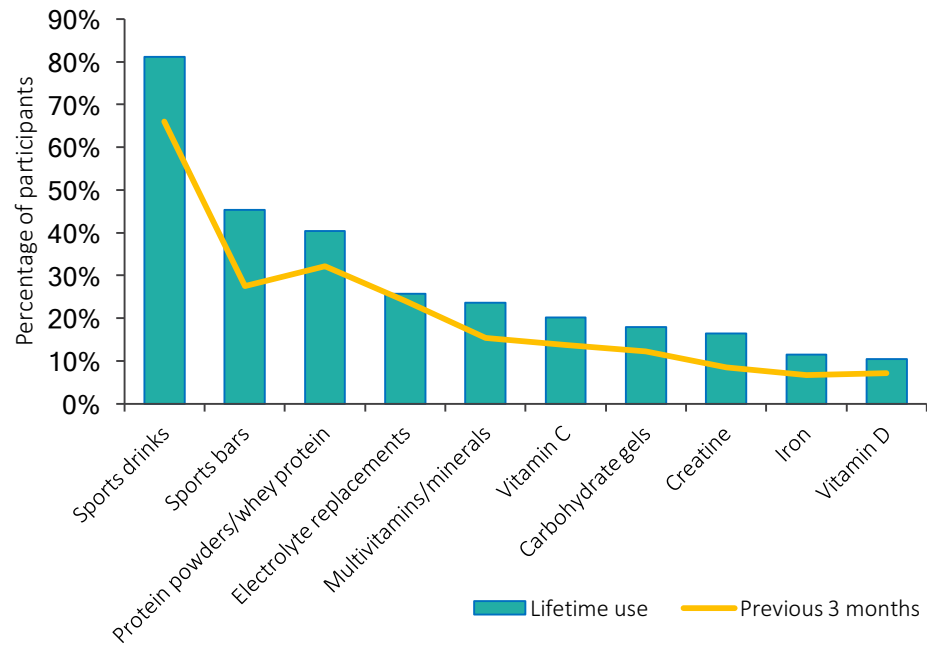


Figure 5: 10 most frequently used supplements by schoolboys (n= 771)

Over 40% of schoolboys reported consuming energy drinks during the previous three months with Red Bull and Monster being the most commonly used brands.

A minority of schoolboys also reported the use of a variety of pre-workout supplements and fat burners. Green tea was the most common fat burner reported by schoolboys (n= 16) while C4 was the most commonly reported pre-workout (n= 10). For a full list of pre-workout supplements and fat burning supplements reported by schoolboys, please see appendix.

During the interviews, a schoolboy weight trainer and a rugby union player reported their use of pre-workouts in order to improve focus. In terms of the supplementation use decision-making process, the weight trainer shared his approach to looking for reviews online about the side effects of pre-workouts and specifically C4 before deciding to use the product. Here, a reliance on self-education and the internet as a source of information are evident. Furthermore, the participant's attitude to supplementation and willingness to pass on a supplement that could pose risks to another person is highlighted:



"I look online for reviews to see if there's any side effects to pre-workouts... There's some reviews online like C4 people say you get shakes and tingles through your arms so if they say that, I stay away from those sort of pre-workouts... I just go through forums and just see what people say about the products and then see if there's a review on YouTube or something and see what they say about it and if they give the green light, I just go ahead with it and see if it works. If doesn't or it don't feel right then I just stop sell it on to somebody else who's stupid enough to take it." (S1A7-weight training).

Variety of supplements used

Many schoolboys reported using more than one type of supplement in their lifetime (mean= 2.5 ± 1.3) with rugby union players reporting using a greater number of different categories of supplements (mean= 2.7 ± 1.4, Kruskal-Wallis $\chi^2 = 15.38$, $p < .001$) than other athletic males (mean= 2.3 ± 1.3, $p = .002$) and non-athletes (mean= 2.3 ± 1.2, $p = .014$). The mean figure for variety of category of supplements used did not differ between other athletic males and non-athletes ($p = 1.000$). This finding held true in the three months before each schoolboy was surveyed (Figure 6).

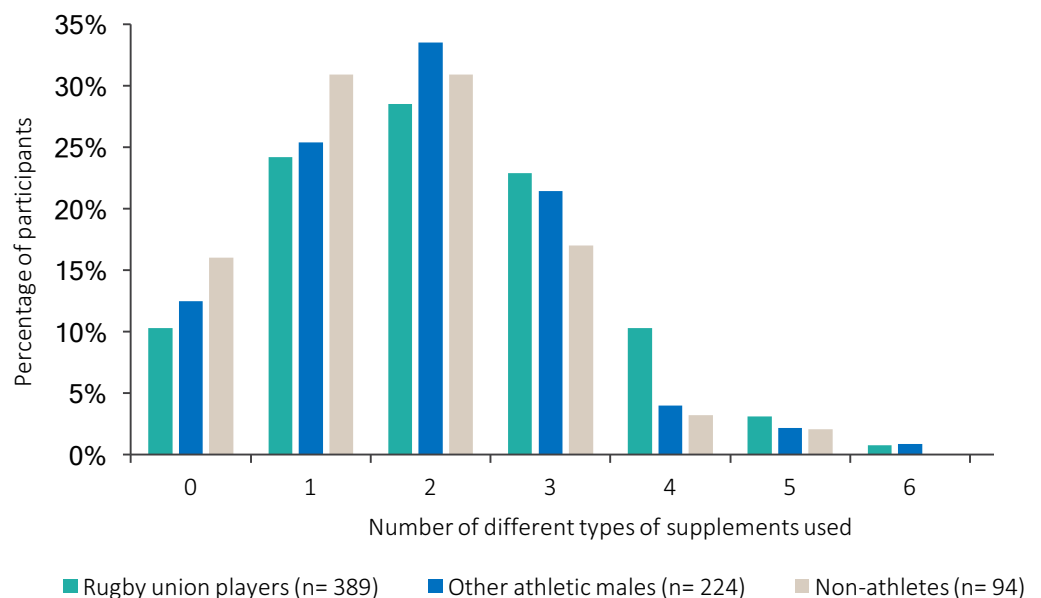


Figure 6: Total number of different types of supplements used three months prior to being surveyed according to sports participation (n= 707)

The findings indicated that schoolboys who play rugby union are between 1.5 and 2.8 times more likely to use sports foods, protein supplements and weight gainers and pre-workout supplements than other athletic males and between 2.5 and 3.1 times more likely than non-athletes (Table 2).

Table 2. Likelihood of schoolboy rugby union players using supplements compared to other athletic males and non-athletic males

	Other athletic males	Non-athletic males
Sports foods	1.5 x more likely (odds ratio= 1.49; 95% CI: 0.94 to 2.37; p = 0.0869)	3.1 x more likely (odds ratio= 3.07; 95% CI: 1.83 to 5.18; p < 0.0001)
Protein supplements and weight gainers	2.2 x more likely (odds ratio= 2.15; 95% CI: 1.54 to 3.01; p < 0.0001)	2.5 x more likely (odds ratio= 2.51; 95% CI: 1.59 to 3.97; p < 0.0001)
Pre-workout supplements	2.8 x more likely (odds ratio= 2.78; 95% CI: 1.49 to 5.21; p = 0.0014)	3.1 x more likely (odds ratio= 3.13; 95% CI: 1.22 to 8.03; p = 0.0178)

Factors influencing supplement choice

The ingredients (29%), brand (29%) and cost (24%) were reportedly the most important factors that determined the supplements schoolboys used. Whether or not the supplement had been batch tested, which is a risk minimisation process for supplement contamination, was an important factor for less than 1 in 5 of the schoolboys (15%) who responded to the question (n= 323).

To illustrate the cost factor, a number of participants during the interviews stated that the reason they purchased a particular brand was because it was cheap:

“I did use Myprotein and then I’ve gone onto Bodybuilding Warehouse just because it’s cheaper” (S2A2- rugby union) whilst another player stated “I buy Myprotein at the moment only because it’s the cheapest” (S1A9- rugby union).

Extending this finding, schoolboys' reasons for using supplements were discussed during the interviews and three reasons dominated discussions. They are illustrated in Figure 7.



Figure 7: Reasons for using nutritional supplements

Over-the-counter painkiller use

Almost one third of schoolboys surveyed (30%) had used over-the-counter painkillers at some point in their lifetime prior to training/competition, while 18.5% had used them within the three months prior to being surveyed (Figure 8).

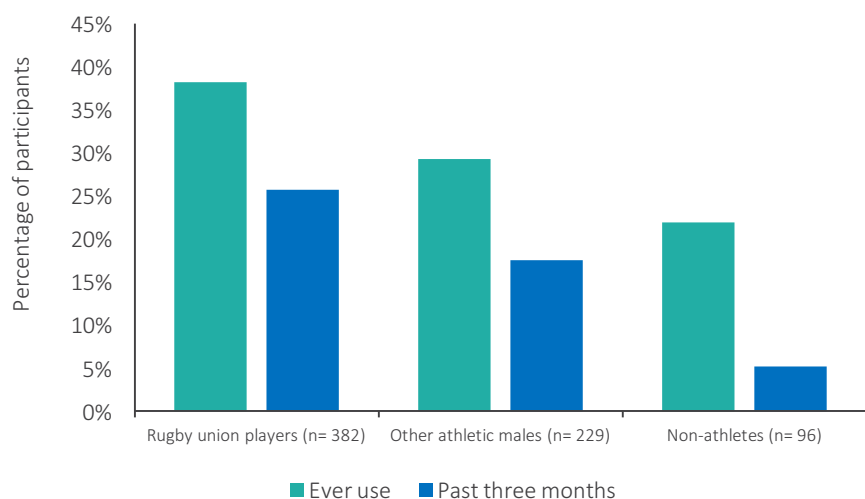


Figure 8: Percentage of schoolboys who have used over-the-counter painkillers according to sports participation (n= 707)

Gym use

Schoolboy rugby union players are 1.5 times more likely to report lifetime use of over-the-counter painkillers than other athletic males (odds ratio= 1.50; 95% CI: 1.05 to 2.13; $p= 0.0248$) and 2.2 times more likely than non-athletes (odds ratio= 2.21; 95% CI: 1.31 to 3.74; $p= 0.0031$).

Weight training hours per week

The schoolboys who played rugby union engaged in significantly more weight training per week (mean= 3.5 ± 3.6 hours; Kruskal-Wallis $\chi^2= 37.14$, $p < .001$) than other athletic males (mean= 2.5 ± 2.8 hours; $p < .001$) and non-athletes (mean= 2.0 ± 2.5 hours; $p < .001$). There was no significant difference in this variable between other athletic males and non-athletes ($p= .293$).

Weight training volume and nutritional supplement use

Schoolboys who engaged in weight training for six or more hours per week reported using a greater number of supplements in their lifetime (mean= 3.5 ± 1.4 , Mann Whitney U= 37,387, $p < .001$) and three months prior to being surveyed (mean= 3.0 ± 1.3 , Mann Whitney U= 34,854, $p < .001$) compared to those who undertook less than six hours of weight training per week (mean= 2.8 ± 1.4 and mean= 2.1 ± 1.3 respectively).

Weight training and spend on nutritional supplements

Those who used the gym for weight training purposes six or more hours per week spent significantly more money per month on protein supplements and weight gainers (mean= $\pounds 25.54 \pm \pounds 18.92$) than those who used the gym less than six hours per week (mean= $\pounds 17.10 \pm \pounds 13.91$; Mann Whitney U= 4,577, $p= .002$).

Gym regimes and programming

In-depth interviews highlighted that rugby union players were encouraged to use the gym by their school coaches and academy coaches. However, many of them admitted that they did not know what they were trying to achieve during their gym sessions:

It was just sort of the blind leading the blind in that respect... I mean there were people who knew about the gym having played at sort of a club level so they had been told by their coaches, but the majority of us we all play at schoolboy level (S4A4- football, rugby union, cricket).

Moreover, during the interviews, schoolboy rugby union players highlighted two main reasons why it was important for rugby players to go to the gym (Figure 9).

To increase confidence going into tackles

•With added size they were “*automatically in a better position to make and break tackles*” than if they were smaller (S1A4- rugby union) and more able to push people in the scrum, which increases the “*chances of you winning the collision and getting past the game line and making yards*” (S1A2- rugby union).

To protect themselves from injury

•Size is needed “*especially at a high level, you need a certain degree of body mass to actually protect yourself because the hits are big*” (S4A1- rugby union).

•*I think it was the semi-final, the team were absolutely massive and the first scrum I honestly thought I'd broken my neck because we got pushed up so hard and that just doesn't happen anymore because I've put on weight and muscle around my back*” (S1A2- rugby union).

Figure 9: Reasons schoolboys felt it was important for schoolboy rugby union players to go to the gym to increase in size

Drive for Muscularity

Defined as: An individual's desire or need to become more muscular (regardless of their actual muscle mass percentage; (McCreary & Sasse, 2000).

Drive for muscularity can be reported as a total score (representing commitment to muscular ideal), or broken down into two subscales representing behaviour and attitude elements: 1) muscularity behaviour (a proxy for engagement in muscularity enhancing behaviours) and 2) muscularity-oriented body image (desire to increase muscularity)

Those who attend the gym for weight training more than six hours per week had a significantly greater commitment to muscular ideal (mean= 4.0 ± 0.9, Mann Whitney U= 9272.5, p< .001) than those who attend less than six hours per week (mean= 2.9 ± 1.0). In addition, rugby union players demonstrated a significantly greater commitment to muscular ideal (mean= 3.2 ± 1.0, Kruskal-Wallis $\chi^2= 19.89$, p< .001) compared to other athletic males (mean= 2.9 ± 1.0, p= .002) and non-athletes (mean= 2.8 ± 1.0, p= .001). No differences emerged between athletic males and non-athletes (p= 1.00).

Considering the two subscales that form the drive for muscularity scale separately (muscularity behaviour and muscularity-oriented body image), further differences also emerged. Those who attend the gym for weight training more than six hours per week engaged in muscularity enhancing behaviours significantly more frequently (mean= 3.6 ± 1.1; Mann Whitney U= 35,761.5, p< .001) and had a greater desire to increase in muscularity (mean= 4.4 ± 1.1; Mann Whitney U= 28,752, p< .001) compared to those who attend less than six hours per week (mean= 2.2 ± 1.0 and mean= 3.7 ± 1.2 respectively).

Similarly, rugby union players engaged in muscularity enhancing behaviours significantly more frequently (mean= 2.6 ± 1.1; Kruskal-Wallis $\chi^2= 26.76$, p< .001) than other athletic males (mean= 2.2 ± 1.0, p<.001) and non-athletes (mean= 2.2 ± 1.1, p= .001). No differences emerged between athletic males and non-athletes

($p= 1.00$). In contrast, schoolboys appeared to have different desires to increase in muscularity according to their athlete type (Kruskal-Wallis $\chi^2= 7.23$, $p= .027$). However, post-hoc analysis revealed no differences in the desire to increase in muscularity between rugby union players (mean= 3.9 ± 1.2) and other athletic males (mean= 3.7 ± 1.3 , $p= .186$) or non-athletes (mean= 3.6 ± 1.3 , $p= .054$). In addition, no differences emerged between athletic males and non-athletes ($p= 1.00$).

Based on the findings of the two phases of research, we have created Figure 10 to visually represent the associations between the number of hours schoolboys spend weight training, their use of nutritional supplements and their drive for muscularity.

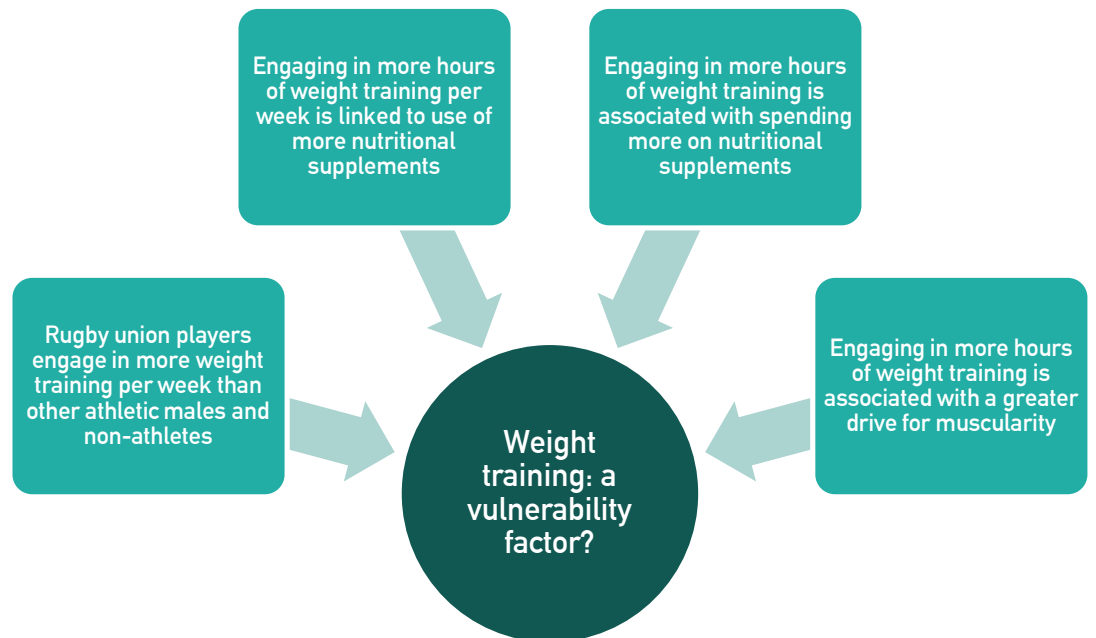


Figure 10: Factors associated with the number of hours schoolboys spend engaging in weight training

Physical demands of rugby

The rugby union players interviewed during phase 1 made repeated reference to the physical nature of rugby and the role that size plays in performance. This belief was reinforced by the teachers interviewed.

This cultural norm might go some way to explaining why the rugby players reported more gym use and a greater drive for muscularity than other athletic males and non-athletes during the in-depth interviews.

Size matters...

In the interviews, rugby union players emphasised the need to increase in size because size was associated with performance and success:

One player perceived that: "the bigger you are the better chance you have of getting further" (S1A2- rugby union).

Further, a second player noted: "if you want to get to the next level, you do need to be a certain size" (S1A13- rugby union).

In particular, players identified that body size was seen to help with tackling and carrying the ball further:

"There are players who are not extremely quick but they're big and their whole game is about hitting it up and erm like going through people and boshing people" (S1A6- rugby union).

"You need them people in your team cos they're the people that make ground for you and give you like the time and the ball obviously to score you tries" (S1A5- rugby union).

Through the interviews, it became apparent that schoolboys felt teachers and coaches further reinforced the importance of size to the players.

This is illustrated in this quote from one of the teachers who participated in the interviews:

"if you're playing teams that are 100kg, you need to be 103kg to make sure you've got the upper hand" (S2T).

Players also voice the view that size is more important than talent, with the suggestion that coaches tend to pick bigger players. One player noted:

“Well I know the coaches’ cherry pick young players that are a certain size. If someone absolutely enormous comes into your team, they will probably get put somewhere just to carry the ball” (S2A6- rugby union).

Similarly, another player reflected on individuals playing rugby union at his school:

“You hear about how coaches’ cherry pick young players who are a certain size. You hear it all the time ‘oh come and look at little Jonny at the club, he’s the best player I’ve ever seen’ and you can spot little Jonny from 50 yards away because he’s not so little, he’s the kid that looks like a 17-year-old playing with U14s and actually the skill set might be pretty rubbish but they’re big.” (S2T)

These findings were further corroborated by the teachers who again underscored the perception that coaches looked for bigger players rather than more skilful players:

“You know, coaches for decades have picked an average big player instead of a good small player, you know that’s not a new story” (S4T).

Finally, the issues that arise from the selection of size over skill and talent are highlighted by one of the rugby union players we spoke to:

“I think it’s bad in a way that you know it’s a sport where it’s not necessarily about talent. There’s a lot of talented guys who can’t, have to drop out at certain levels because they just haven’t got the size and physicality. I mean there’s a guy in my year who’s about 5ft 2 or something and he’s incredibly skinny and from aged 7 to aged 13, he was one of the better players in our year and just as everyone else grew, he just sort of had to stop playing, which is a shame” (S2A5- rugby union).

Participation in Senior Rugby

Schoolboy rugby union players who played men's rugby reported using a greater number of different supplement types in their lifetime (mean= 3.1) than those who didn't play men's rugby (mean= 2.6; Mann Whitney U= 9,987.5; p= .022). This finding remained when their last 3-month use was taken into account.

Specifically, those who play men's rugby are 2.2 times more likely to have used protein in their lifetime compared to those that don't play men's rugby (odds ratio= 2.22; 95% CI: 1.32- 3.74; p= 0.0026). They are also 1.8 times more likely to have used pre-workout supplements in their lifetime compared to those that don't play men's rugby (odds ratio= 1.82; 95% CI: 0.97-3.42; p= 0.0635)

In addition, players who participated in men's rugby had a significantly greater drive for muscularity (mean= 3.5) than schoolboy rugby union players who did not play men's rugby (mean= 3.1; Mann Whitney U= 9,191.5; p= .007)

Finally, those who played men's rugby were also 2.4 times more likely to have experienced concussion than those that have not played men's rugby (odds ratio= 2.38; 95% CI: 1.42-3.99; p= .0009).

Conformity and social influence

Schoolboys' behaviour is influenced by people around them including teachers/coaches and their peers. When surveyed, 33% of rugby players and 34% of other athletic males agreed or strongly agreed that they want to do what their team mates think they should do while 37% and 38% neither agreed nor disagreed.

In comparison, 59% of rugby players and 61% of other athletic males agreed or strongly agreed that they want to do what their coach thinks they should do, while 27% and 25% neither agreed nor disagreed.



59% of rugby union players

and



61% of other athletic males

agreed that they want to do what their coach thinks they should do

Peer influence on gym use

Schoolboys reported that they used the gym because their friends and/or team mates went to the gym. Almost 50% of the adolescents interviewed (n= 12) stated that the reason they started going to the gym was because their friends and team mates did:

“Some of the sports staff have definitely said it would be great if some of you could get bigger” (S2A6- rugby union).

In turn, three adolescents interviewed also felt pressure to go to the gym because ‘everyone else’ was going. This pressure to conform is illustrated in this quote:

“A friend of mine expressed an interest in wanting to start going- not for rugby but he just wanted to go. I happened to go with him a few times and got in a routine of going” (S1A1- weight training).

Teacher/Coach influence on gym use

School and academy rugby union coaches exerted an influence on the gym work that schoolboys engaged in. During the interviews, the rugby union players reported that within school, they were encouraged, or at times, expected to use the gym to prepare for next season:

“I’m not normally one to go to the gym and stuff like that but I think there was a lot of pressure from coaches and from other players as you see a lot of them gymming and you don’t want to let the team down... I rarely go at the moment. I do think the only reason I do go on occasions is because of the people pushing you” (S2A3- rugby union).

Equally, explicit pressure to get bigger was also highlighted:

“We got asked to like start doing some weights at school. They asked us to start doing it so we were prepared for next season” (S1A6- rugby union).

Offering further support to the associations depicted in Figure 10 around going to the gym to increase in size, to increase confidence in tackling and protection against injury, teachers further emphasised the belief that players needed to get bigger to protect their welfare:

“From a player welfare point of view, if everyone else is getting bigger, stronger, quicker then you’re not able to compete, then you’re going to carry injuries, you’re going to pick up injuries so try and encourage them that way just so they can physically survive. If they want to stretch their rugby, it’s almost a necessity” (S2T).

Players who were involved in a rugby academy also appeared to be under pressure to use the gym, but were not always motivated to do so:

“I go to the gym or I’m made to go to the gym by my academy... when you go training, you always have a session indoor- it’s a two-hour session and one hour’s in the gym and then one hour’s outside playing rugby so you can’t really get out of the gym when you go” (S4A2- rugby union).

Teacher influence on schoolboy supplement use

According to self-reported use of nutritional supplements, adolescents’ use mirrors that of the teachers and coaches (Figure 11). With the exception of vitamin and mineral supplements and fat burners - where teachers’ self-reported use appears to be higher – the pattern of use across teachers and schoolboys is strikingly similar.

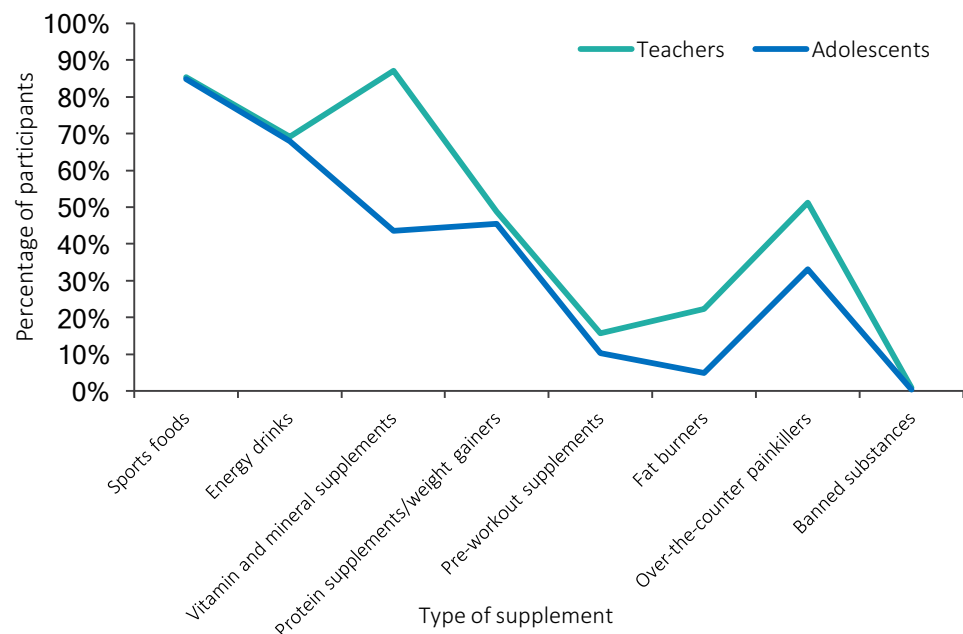


Figure 11: Schoolboys’ and teachers’ lifetime use of nutritional supplements

Interview conversations also highlighted that some schools encourage supplement use; with a number of adolescents interviewed from one school reporting that the rugby teachers encouraged the use of protein and hydration tablets and that they sold supplements to the rugby team:

“Recently like the start of this year, they [the rugby teachers] ordered a load of shakers in bulk and one of them had a contact with some protein supplier and he ordered a load of tubs of it and sold it to us. I think they sold some pre-workout stuff as well but like I said I don’t get any of it” (S1A9- rugby union)

Although teachers in the other schools indicated a stance against their players using supplements, a number of players were still using supplements and some had approached their rugby teachers for advice:

“I’ve asked Teacher 3 about his opinion on using them and he said that they’re good for sort of convenience and obviously you don’t want to be using them two or three times a day because there are nicer ways of getting nutrition... I’ve just spoken to him about whether he thought it was a good idea and he said yeah” (S2A2- rugby union).

Peer influence on supplement use

Amongst those schoolboys interviewed, a normative belief that supplement use is rife amongst their peers prevailed. In particular, it was seen as the ‘norm’ within rugby teams:

e.g., “It’s almost been like normalised in my age group now using protein shakes especially in sports like rugby, everyone does it...” (S4A3- football).

When surveyed on their perceptions of nutritional supplement use amongst their team mates/training group, there was a significant difference between schoolboy rugby union players and other athletic males. Specifically, rugby union players (mean= 43.9 ± 27.2) perceived a greater percentage of their team mates to be using protein supplements and weight gainers than other athletic males (mean= 30.1 ± 26.3; Mann Whitney U= 21,055.5, p< .001). Equally, schoolboy rugby union players (mean= 18.2 ± 18.1) perceived a greater percentage of their team mates to be using pre-workout supplements than other athletic males (mean= 15.3 ± 18.2; Mann Whitney U= 24,809.5, p= .007).

These findings reflect the patterns of supplement use amongst the schoolboys surveyed with a greater proportion of rugby union players using pre-workout supplements and protein supplements and weight gainers compared to other athletic males and non-athletes. Thus, beliefs about what peers are doing may be influencing the number of schoolboys using nutritional supplements and the types of supplements they use.

Finally, peer group recommendation was highlighted as a driver for nutritional supplement use amongst the schoolboys interviewed:

“Other people use it and recommend it so whenever I had a bit of spare money, I decided I would get myself some and see what it’s like” (S1A11- footballer) or that use occurred from observing others: “I suppose an influence to take supplements has come in an indirect fashion rather than a ‘you should take these’. It’s more an influence of seeing them take it and them being enthusiastic about it” (S1A1- weight training).

KEY INSIGHT TWO

Use of banned substances was appraised to be a serious issue in school that needs attention. A degree of willingness to try a 'risky' substance was also noted in just over one-third of schoolboys

Perceived incidence of doping

Overall, schoolboys believe that doping is less common within schools/colleges than at elite level. Those surveyed believe 4% (SD= 10.3) of their team mates/training group use banned substances compared to 22% (SD= 24.2) of elite sportsmen. In comparison to team mates, perceptions were higher in relation to the use of banned substances amongst pupils at other schools/colleges (mean= 12.1% \pm 16.2) but still lower than at elite level. Overall, 58% of schoolboys held the perception that the use of banned substances in school sport is a serious issue that needs to be addressed (22% neither agreed or disagreed).

During the interviews, mixed responses were noted in relation to where doping took place. Some schoolboys held the view that doping occurred amongst an older generation of bodybuilders:

... "There will be people who are trying to be bodybuilders who would probably use them but I wouldn't think that many sportsmen our age would" (S1A4- rugby union).

However, this was at odds with the views of one academy rugby player who said he knew others his age using banned substances:

"I've played against people who have been on banned substances... I've seen it all levels, I've seen it at England level and I've seen it at academy level. It's more common at school level because you're not constantly drug tested and they're also not illegal drugs in the eyes of the law. They're only illegal in the eyes of the RFU or the ICC or whatever it is" (S4A1- rugby union).

Similar to the schoolboys, the teachers surveyed believed, on average, that 4% of schoolboys at their school/college use a banned substance (rugby union players mean = 4.2% \pm 11.0; non-rugby playing males mean = 4.2% \pm 10.0; Figure 12).

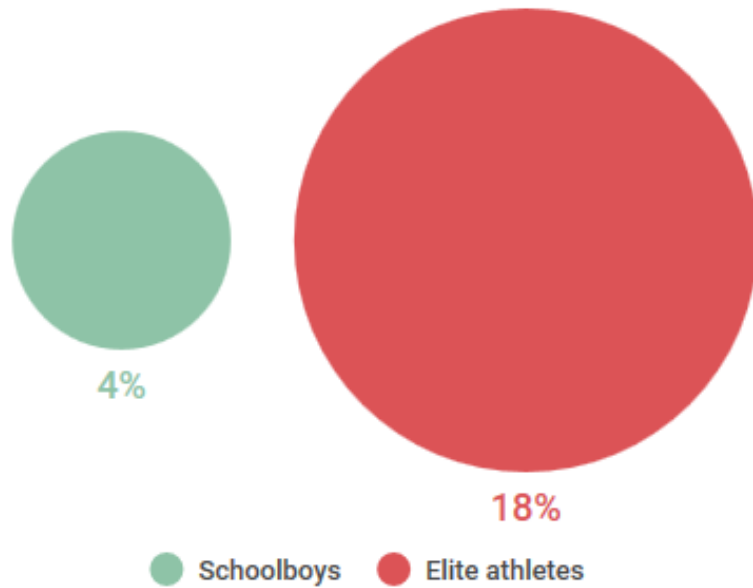


Figure 12: Teachers' perceived incidence of doping amongst schoolboys and elite male rugby union players

While this was lower than perceptions regarding the proportion of elite male rugby union players using a banned substance (mean = 18.3% ± 17.8; Figure 12), 21% of teachers surveyed believed the use of banned substances was a concern for their school/college while 25% neither agreed nor disagreed. In addition, nearly 50% of teachers agreed or strongly agreed that banned substance use in school sport is a serious issue that needs to be addressed (35% neither agreed nor disagreed).

Indirect estimate of anabolic steroid use

Of the 771 schoolboys surveyed, four reported having used a banned substance. This finding should be interpreted with caution as two participants did not report which substances they were using and one identified the fake substance Warein. The fourth athletic male reported the use of stimulants and diuretics.

Along with asking schoolboys to directly report on their banned substance use or abstinence, we also asked schoolboys - this time using a method (the Single Sample Count (SSC) estimation model; see explanatory box to the left) which provides complete protection beyond anonymity - about their anabolic steroid use in the three months prior to being surveyed.

Using this approach, the SSC model estimated that between 0 and 18.6% of schoolboys reported using steroids, at least once, in the last three months. As a model designed for large scale epidemiological studies, the sample size resulted in a wide 95% CI. Thus we can say with confidence that the rate of admitting anabolic steroid use for the survey period is most likely around 9.2%; and below 18.6%. The stark difference and its direction between the direct self-report and the indirect SSC estimation is in line with the literature on sensitive issues, where indirect estimations always yield higher levels of admission compared to the direct self-reports because of the enhanced protection - but the price for the most truthful answer is the loss in precision.

It is also worth noting that 1 in 4 schoolboys indicated that they would not have reported using a banned substance if they had previously or were currently using one (27% of rugby union players and other athletic males and 22% of non-athletes).

SINGLE SAMPLE COUNT – A FUZZY CONCEPT

The single sample count (SSC; Nepusz, Petróczi, Naughton, Epton & Norman, 2014) is an alternative to direct questioning about socially sensitive, potentially embarrassing issues and/or illegal behaviour. The SSC has been proposed to reduce response bias because it protects the privacy of the respondents; only the overall sum of outcomes of a sensitive characteristic and several innocuous characteristics is revealed. According to this privacy protection, we can expect the SSC to deliver more trustworthy prevalence estimates than direct questioning.

The SSC (like all other indirect estimation models) deliberately ask about the sensitive issue in a noisy, fuzzy way. In the SSC we only ask respondents to tell us how many 'yes' answers they have out of the 5 questions without revealing which ones. Four of the 5 questions are completely innocent (birthday questions of a person unknown to us, researchers) and only one question is the sensitive question, the one we are interested in. The deliberately noisy response protects both the respondent and the researcher because there is no way to find out what is the answer to the sensitive question specifically for each individual. Why is it good then?

Because we know the probability for a yes answer to the non-sensitive birthday questions (in our case, all set to be 50/50), we can estimate the proportion of yes answers to the sensitive question. We cannot count the yes answers to the sensitive question, we can only estimate the proportion of respondents who must have said yes to the sensitive question from the entire data. We used the option where 0 and 5 is shared (to protect respondents against an exposure if they would have to declare having 5 yes answers – a giveaway) which makes calculation complicated, so we will use the simple version for illustration. Respondents are simply asked to state how many yes answers they have out of the 5 possible yes responses. We can then estimate the proportion of respondents who must have said yes to the sensitive question by calculating the average number of yes answers for the entire sample minus the proportion coming from the birthdays (set to be 50/50).

Illustrative SSC estimate = $[(2+3+5+4+1+3+3+0+1)/10] - [4 \times 0.5] = 2.2 - 2 = 0.2$ so 20% is estimated to have said yes to the sensitive question.

Cause for concern

When asked about their beliefs of banned substance use in their school/college, 21% of teachers reported such use was a concern for their school/college while 25% neither agreed nor disagreed.

Similarly, 44% agreed or strongly agreed that nutritional supplement use in school sport is a concern for their school while 28% neither agreed nor disagreed.



44%

of teachers surveyed believed nutritional supplement use in school sport was a concern for their school/college



21%

of teachers surveyed believed the use of banned substances was a concern for their school/college

Overall, 46% of teachers agreed or strongly agreed that banned substance use in school sport is a serious issue that needs to be addressed while 35% neither agreed nor disagreed.

Banned substance use normative beliefs

Of the schoolboys surveyed who participated in sport, 36% believed their team mates would think that the use of a banned substance is wrong (35% of rugby union players and 38% of other athletic males), while 2% believed their team mates would think using a banned substance was right (2% of rugby players and 2% of other athletic males). The majority (62%) highlighted this belief was not black and white by selecting a point between these anchors.

In comparison, 72% believed their coach would consider the use of a banned substance to be wrong (72% of rugby players and 73% of other athletic males) and 1% believed their coach would consider using a banned substance to be right (1% of rugby players and 2% of other athletic males). This issue appeared to be more black and white for teachers with only 27% selecting a point between the anchors of right and wrong.

During the interviews, the schoolboys did not specifically talk about their teammates' beliefs regarding the use of banned substances but they did discuss their coach. The perception from the rugby union players interviewed was that coaches would not approve of the use of banned substances and if they were to use one, they would probably get dropped from the team:

"I don't think they would allow it. I think they would probably drop whoever took them really from the team" (S1A8- rugby union).

It was also felt that coaches would display negative emotions if one of the players were to use a banned substance:

"I think it would be a mixture of anger and disappointment cos I think they would be disappointed that like in me that I've given in and taken it but then angry that they've been led to believe that it's just like me performing and without the help of a drug or anything" (S1A3- rugby union).

Banned substance accessibility

A large proportion of schoolboys believed it would be fairly difficult, very difficult or impossible for them to obtain anabolic steroids (58%) or human growth hormone (62%). However, 28% believed it would be fairly easy or very easy to obtain anabolic steroids and 21% believed it would be fairly easy or very easy to obtain human growth hormone. Although there were no significant differences in beliefs about accessibility of anabolic steroids according to athlete type (Kruskal-Wallis $\chi^2 = 3.4$, $p = .183$), fewer rugby players (26%) reported that they believed it would be fairly easy or very easy to obtain anabolic steroids compared to other athletic males (33%) and non-athletes (31%).

Within the interviews, two of the adolescents (one rugby union player and one footballer) discussed the ease of access to banned substances as both reported that they had been offered banned substances whilst in a gym outside of school:

"The first time that I got the opportunity [to use a banned substance] was when I first really started going to the gym... There have probably been four or five times now where I've had the opportunity to buy some... I discussed them with other people that know an awful lot about the gym that have said that it can be really bad for you, like the lad that I know that's taking Dianabol. Shortly after he started taking that, he started noticing like the effects that it were having on him so it put me off a little bit really and I've never been inclined with being such a high level sports that it's going to be of any benefit for me to take it in terms of that so I've never been interested" (S1A11- football).

Willingness to use a 'risky' pill

When questioned about their willingness to use a 'risky' pill - recommended by a 'regular' in the gym - if it was guaranteed to speed up recovery from injury, undetectable and purportedly 'safe', 62% of participants reported that they were not at all willing to try the pill. However, 41% of non-athletes, 38% of other athletic males and 37% of rugby union players demonstrated some willingness to try the pill (Figure 13).

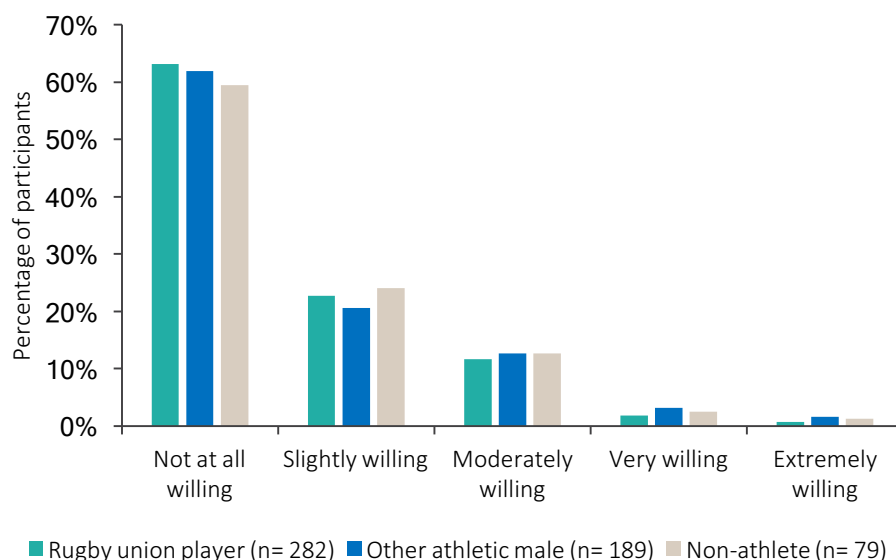


Figure 13: Schoolboys' willingness to try a 'risky' pill according to sports participation (n= 550)

In comparison, schoolboys were also asked how willing they were to say 'no thanks' and not try the pill. Overall, 68% were either very willing or extremely willing to not try the pill. However, 12% were not at all willing to say 'no thanks' and not try the pill (13% of rugby players, 11% of other athletic males and 12% of non-athletes), indicating that they were not ruling out the possibility of taking the pill (Figure 14).

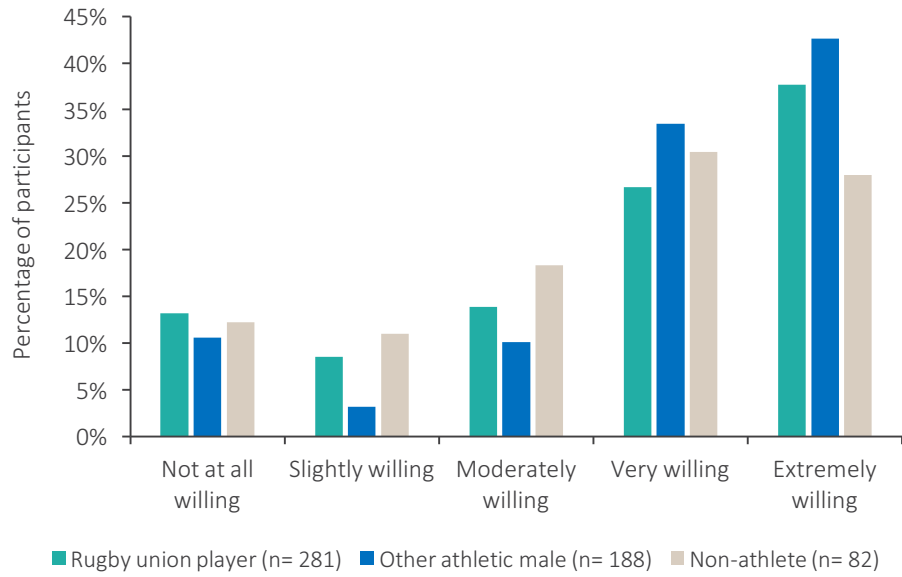


Figure 14: Schoolboys' willingness to say 'no thanks' and not try a 'risky' pill according to sports participation (n= 551)

Schoolboys' willingness to use a banned nutritional supplement was highlighted during the interviews with one weight trainer discussing his and his friends' use of the banned supplement, Craze:



"Me and my friends, we've got a bit of like Craze left so we will take that like on a rare occasion but nothing serious like steroids or anything like that" (S1A10- weight training).

For information, Craze was removed from the market following tests by US Anti-Doping that detected amphetamine-like compounds in samples of Craze.

Sanctions for banned substance use

The majority (79%) of teachers surveyed held the opinion that schoolboys who test positive for banned substances should be given a warning in the first instance and then an immediate ban if they were to test positive a second time.



79% of teachers agree

Schoolboys who test positive should be given a warning in the first instance and then an immediate ban if they were to test positive a second time

In comparison, 19% believed that schoolboys should receive an immediate ban for testing positive and 2% believed schoolboys should be able to use any banned substance as long as they are medically supervised.

KEY THEME THREE

Limited exposure to formal nutritional supplement and anti-doping education leaves schoolboys and teachers at risk of inadvertent doping

Sources of information

Schoolboys obtain information on nutritional supplements from a variety of sources. However, the internet and peers are noted to be the most dominant sources of information amongst our sample (Figure 14). Thus, rather than drawing upon reliable sources for information (e.g., nutritionists, doctors), schoolboys are relying on sources that could be unreliable and provide incorrect information. Alternatively, they don't ask for information prior to making their decision to use nutritional supplements.

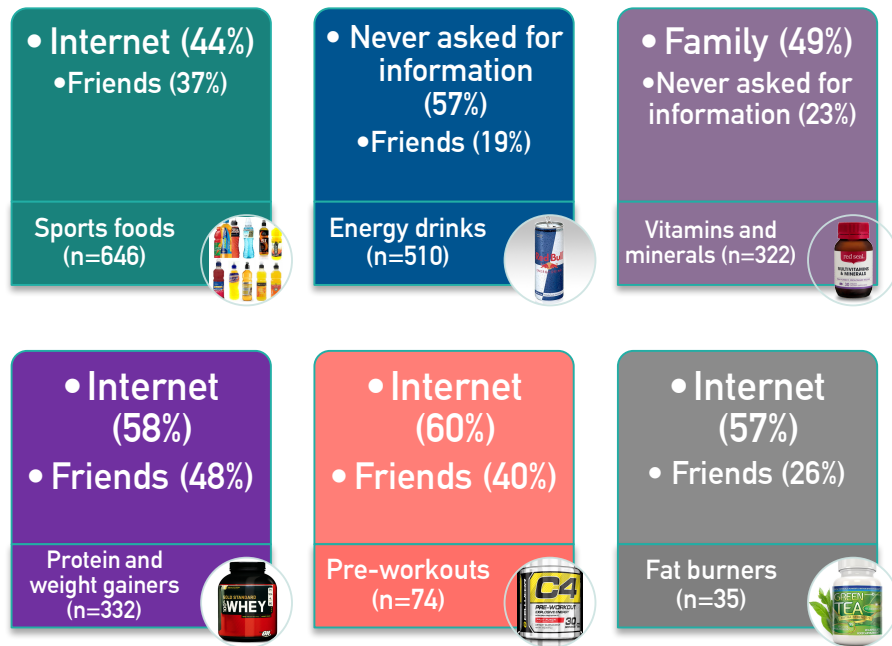


Figure 14: Source of information for each supplement category

During the interviews, the dominant use of the internet to look up products, after a conversation with others, was highlighted:

...*"If someone said take this, it's really good, I wouldn't just do it, I'd sort of look into it, look what people have said online..."* (S2A1 - rugby union)

It was evident that the internet and reviews posted online served as a key source of information for this group. However, as the quote below shows, online advice urging caution can sometimes be discounted:

"I looked it (protein) up on the internet a lot and read bits and pieces to see if it was good or not and it seemed like not too bad. Some things said like you should only start full on weight lifting and taking protein shakes and all that at 16 but I thought screw it... I've never taken you know like the full on body builder crap with all the amino acids and stuff in... I kind of think it's like soft protein which I take... I always do research before I take anything" (S1A9- rugby union).

In comparison, eight of the 25 schoolboys interviewed (including 5 rugby union players) reported getting their information and advice on supplements from their friends, while four adolescents (three weight trainers and one rugby union player) received recommendations from shop owners. In addition, one weight trainer and one footballer stated that they get advice from other people in the gym.

It was perceived that people in the gym would know what they are talking about and therefore well placed to give advice on nutritional supplements:

"I take pre-workout twice a week. I also take protein and the guy at the gym just kind of recommended it so I started taking it and it worked so I just kind of carried on doing it... When I first started going, he used to write me like a routine and stuff and then just said that protein would help with recovery and strength gains and then the pre-workout, I kind of stumbled across it with some friends and then obviously spoke to him about it and what he thought about it and then just started using it... The main research I do is with the guy who owns the gym I go to because he's like used it and he probably knows more about it than anyone in school does so I kind of trust him more than teachers or anything like that" (S1A10- weight training).

Source of nutritional supplements

Nutritional supplements

Schoolboys reported purchasing supplements from a range of sources but the internet was the principal source. For example, 80% of schoolboys who reported using pre-workout supplements purchased the product(s) online. Also, over half (54%) of schoolboys who reported using fat burners and/or protein supplements and weight gainers used the internet to purchase these products.

During the interviews a number of players reported receiving supplements from their academy (e.g., protein, creatine, BCAAs).

“Yeah [BRAND], I get supplied by it from my club cos that’s their sponsor so I take that one (S4A2- rugby union).”

“The stuff I’m given from erm my academy I take such as creatine, erm... BCAAs while I train, protein, erm and then some stuff before I go onto the pitch. That’s about it’ (S4A1- rugby union).”

Schoolboys from one of the schools converged on a discussion that their school coach provided (sold) supplements to the rugby team (e.g., protein, hydration tablets):

“My coach got us some deals on all the different supplements... he orders it for us and we pay him cos he knows someone that supplies it” (S1A6- rugby union).

“You can buy protein shakes from the teachers and stuff from the sports teacher so you are encouraged to take supplementst” (S1A13- rugby union).

“My coach he has a friend who supplies some erm and he, we buy it off him, we buy it through our coach so we get a good price but it’s also good for you, it doesn’t have a load of the rubbish things” (S1A4- rugby union).

A teacher interviewed from this school offered a contrasting account in terms of encouraging schoolboys to take supplements:

“I can’t say that I want you to take, or it’s best for you to take X or Y because it’s not morally correct” (S1T1).

Teacher knowledge and education

Findings indicate that teachers lack nutrition and supplement risk knowledge. Participants were asked seven questions relating to nutrition and five questions relating to supplement risk with the mean correct number of responses being 3.1 (SD= 2.1; range= -3 to 7) and $0.8 \pm$ (SD= 2.1; range= -5 to 5) respectively.

This lack of knowledge is concerning given the finding that teachers and coaches are a source of advice – and product supply - for schoolboys.

Education on anti-doping and nutritional supplementation

It is likely that the lack of nutrition knowledge demonstrated by the teachers surveyed is related to the education they have received on nutritional supplements and banned substances.

Overall, the teachers cluster into four groups in relation to the education they have received on nutritional supplements and banned substances (Figure 15).

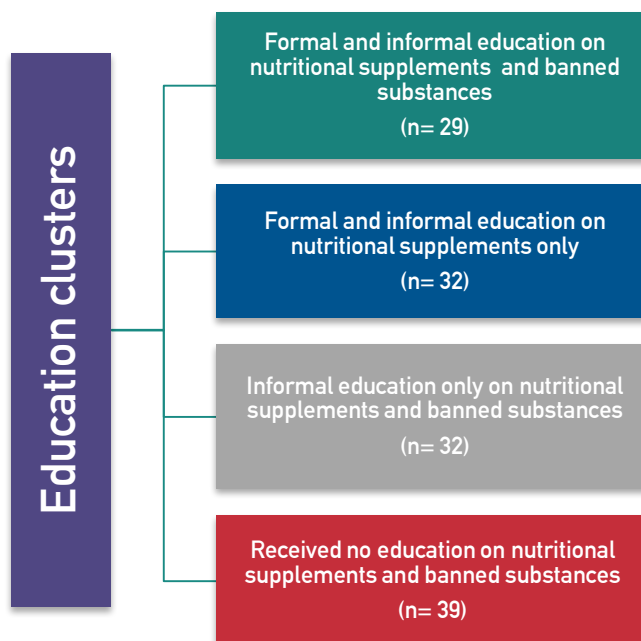


Figure 15: Education clusters of school teachers surveyed and the education they have received on nutritional supplements and banned substances

A large proportion of the teachers surveyed had not received any formal education on the use of nutritional supplements (61%) and/or banned substances (58%). Of those that had received formal education on nutritional supplements and/or banned substances, the main providers were Higher Education Institutes (79% and 67% respectively) and NGBs (54% and 62% respectively; see Figure 16).

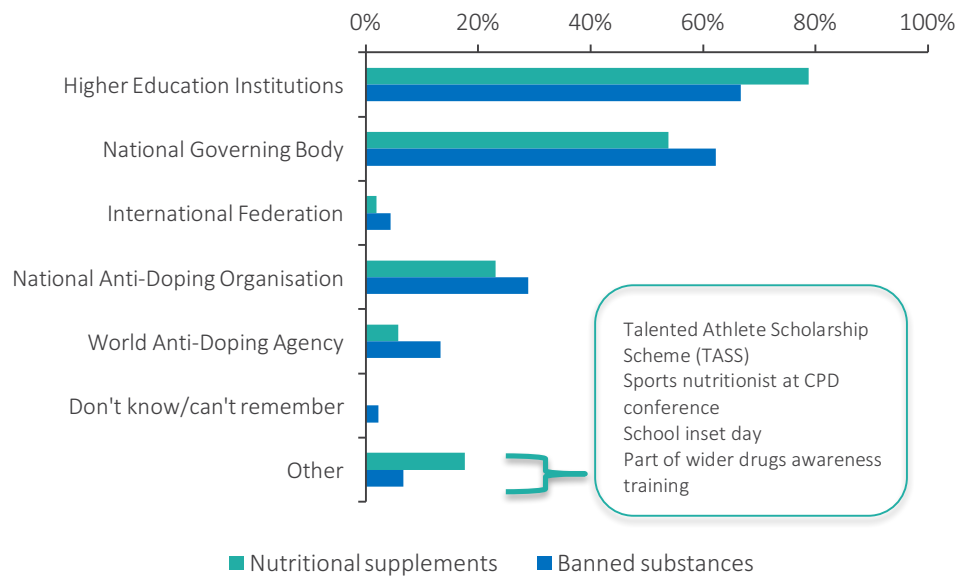


Figure 16: Sources of formal education received by teachers on the use of nutritional supplements (n= 52) and banned substances (n= 45)

In comparison, informal education was more common with fewer teachers reporting that they had not received any informal education on the use of nutritional supplements (43%) and/or banned substances (42%). Self-directed learning was the main source for those who had received informal education on nutritional supplements (72%) and/or banned substances (84%).

Despite 70% of the teachers having received some form of education in relation to nutritional supplements and banned substances, scores on the nutritional knowledge section of the survey call into question the learning that has taken place.

Schoolboy knowledge: assessing the risk of supplement use

The schoolboys lacked knowledge on the risks of using nutritional supplements. For example, only 31% acknowledged that an over-the-counter supplement could contain a banned substance (27% were unsure). Similarly, 38% of the surveyed schoolboys believed UK Anti-Doping has a list of supplements that are 100% guaranteed to be free from banned substances while 45% were unsure.

Very few schoolboys demonstrated an awareness of risk minimisation processes available to reduce the risk of consuming a nutritional supplement that contains a

banned substance (e.g., Informed Sport programme). Having said this, two rugby union players recognised the importance of batch testing nutritional supplements, while two players identified the need to check supplements online. Specific details of the risk minimisation process were seemingly lacking, as evidenced in this quote:

"I know on the RFU website there's a massive list and if I was getting a new protein, I'd check on the website like if they kind of correspond" (S1A8- rugby union).

In addition to checking nutritional supplements prior to using them, four adolescents (one track and field athlete and three rugby union players) demonstrated awareness of the need to check medications prior to consumption. For example, one academy player was aware of the risks of taking over-the-counter medications when he expressed:

"I can't take Lemsip max because it has pseudoephedrine in and that is a banned substance if you have too much of it for my sport" (S4A1- rugby union).

Schoolboy knowledge: assessing the need for supplements

Although schoolboys could identify different types of nutritional supplement (e.g., protein, pre-workouts), few could offer a sound rationale for why they need to use supplements and how the chosen supplement works. Indeed, seven interviewees admitted that they knew very little about supplements.

During the interviews, protein supplements were most frequently discussed and the following quote highlights a belief regarding the effects of protein:

e.g., "Proteins are used after you've done your workout and your muscles have torn to repair the muscle fibres and help you gain muscle mass" (S1A11- football).

Further, a lack of understanding of the need for protein supplements, and their effects, appears to be combined with a naivety about strength and conditioning and muscle gains:

"I think there's quite a culture that you see when you start going to the gym and you see it with a lot of guys going to the gym they sort of think that if they do weights and take protein shakes they'll get bigger and they don't really think about the specific weights that they are doing and the specific type of training that they are doing, they don't know and they don't think about it and they also don't actually think about why they're taking protein shakes, it's just sort of a sudden reflex reaction when you start going to the gym". (S2A5- rugby union)

Although teachers don't see nutritional supplement education as being an important angle of the journey, the experiences and behaviours of schoolboys would suggest that perhaps it should be.

"We don't particularly offer that kind of education (supplement use) because we don't see it as an important angle of the journey." (S4T)

Schoolboy education

Like the teachers, the lack of knowledge demonstrated by the schoolboys could be linked to an absence of education on these issues. The majority of schoolboys surveyed had not received education on the use of nutritional supplements (63%) and/or banned substances (62%). When we take the following view into account the fact that over half of the schoolboys had not received education on these matters should come as no surprise:

Rugby union players at School 2 had received a PowerPoint presentation on supplements ("when I started, Teacher 3 showed us a sort of nutritional PowerPoint long with some other basic stuff"; S2A5- rugby union), while one teacher at School 4 stated: "We don't particularly offer that kind of education (supplement use) because we don't see it as an important angle of the journey" (S4T).

Those that had received formal education on the use of nutritional supplements and/or banned substances, were exposed to the content via teachers in lessons (55% and 70% respectively) or school sports coaches (54% and 36% respectively; see Figure 17).

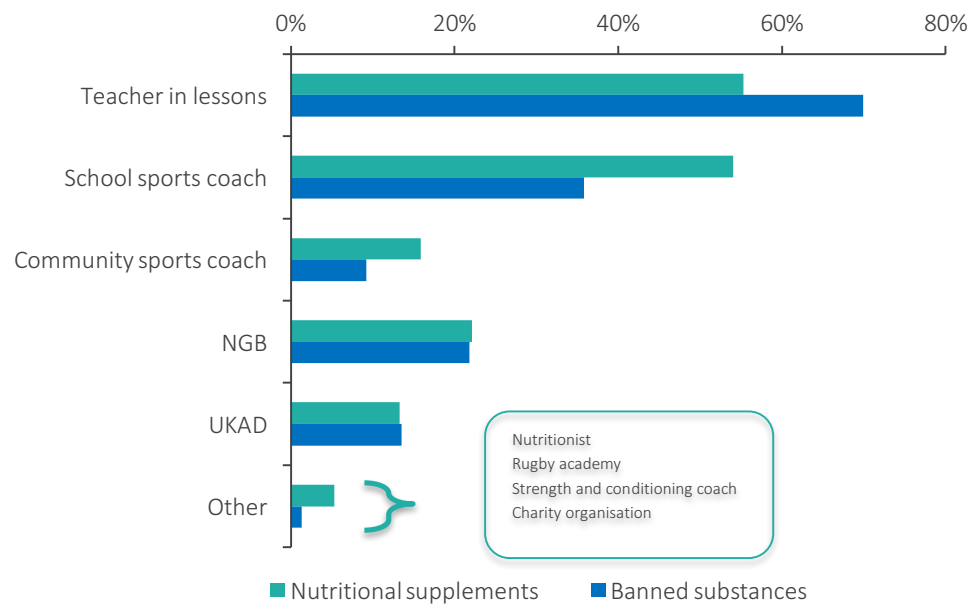


Figure 17: Sources of formal education received by schoolboys on the use of nutritional supplements (n= 226) and banned substances (n= 229)

During the interviews, schoolboys provided insight into the education they had received. For example, two players from School 2 identified receiving some education within the school setting about illicit drugs while two adolescents from School 1 mentioned that they had talked about steroids in PSHE lessons. In addition, six players discussed having received information from their rugby academy. More specifically, players had received information on checking substances and the possibility of receiving a ban for being caught taking a banned substance, along with nutritional supplement use and healthy eating.

Support for education

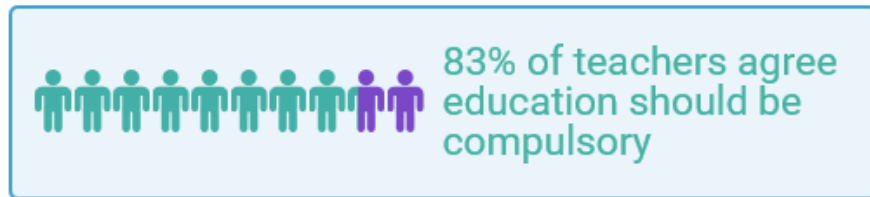
Schoolboys

Despite the lack of education received by those surveyed, findings suggest that schoolboys are supportive of receiving anti-doping education within school/college. Although 33% reported that they would be unlikely to attend a school workshop on nutritional supplements and banned substances, 47% reported that they would be likely or very likely to attend.

Teachers

Out of 127 respondents, 83% of teachers surveyed agreed that education on nutritional supplements and banned substances should be compulsory within schools, with nearly 50% of teachers reporting a belief that schoolboys are

generally ignorant, or know very little, about doping and anti-doping policies, processes and procedures.



Similarly, 88% of the teachers surveyed believed they would also benefit from anti-doping education. The majority (47%) thought they had a basic understanding and more education would be useful, while 25% felt they had a good idea of anti-doping policies, processes and procedures but still believed that it would be helpful to refresh their knowledge (Figure 18).

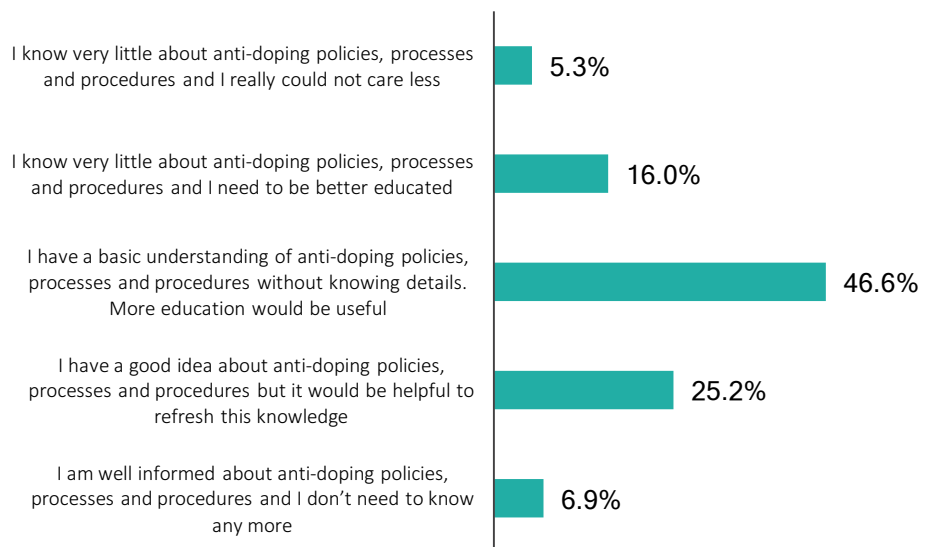


Figure 18: Teachers' perceptions on whether they are informed on the details of anti-doping (n= 131)

Although teachers were supportive of education in schools, they also identified a number of barriers that need to be overcome in order for schoolboys to be educated on nutritional supplements and banned substances within school (Figure 19).

Barriers to education

The main barrier perceived by teachers was time within the curriculum to deliver education on nutritional supplements and banned substances. In addition, the teachers surveyed raised concerns about teachers lacking knowledge within the area, therefore training would be needed in order for teachers to deliver meaningful sessions. Other barriers identified included the cost of bringing someone into school with the knowledge and expertise to deliver sessions, the relevance of the subject to pupils and whether the topic was only relevant to those studying GCSE or A level physical education and potential conflicts between the NGB and school position on the matters at hand.

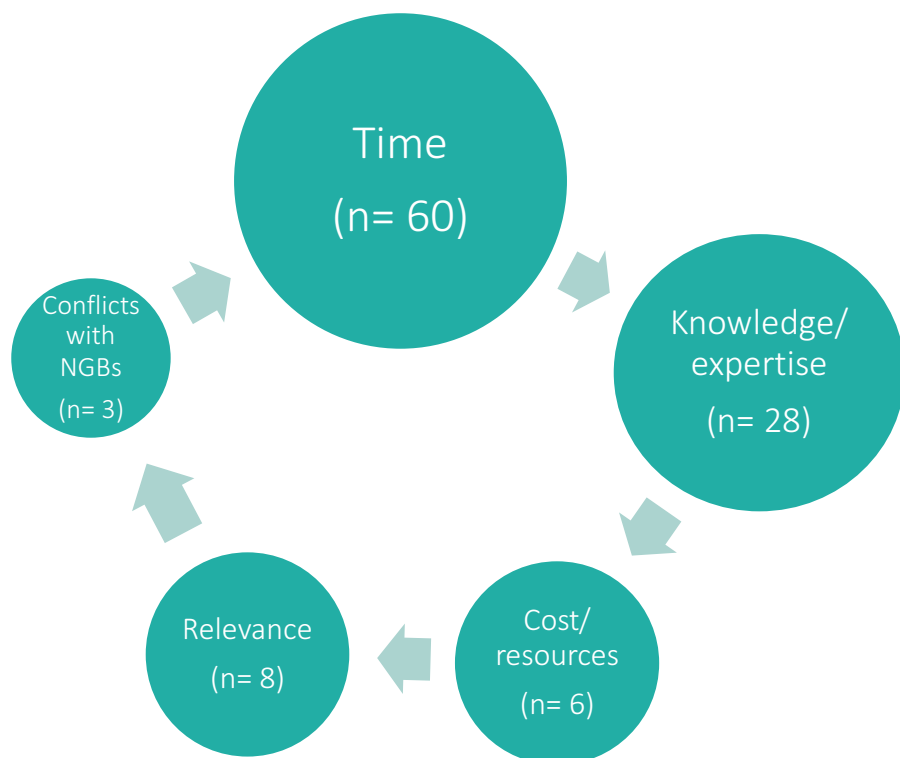


Figure 19: Teachers' perceptions of the barriers to delivering anti-doping education in schools

Acting on intelligence; the role of personal relationships

From an anti-doping policy perspective, teachers were uncertain about their responsibilities if they discovered one of their pupils was using a banned substance. Two teachers were unsure whether they would need to inform the RFU, as highlighted with a quote from one:

e.g., "I imagine you're dutybound but I should probably look into it a little bit more." (S2T)

Further, the teacher at School 3 emphasised their duty to the individual rather than the RFU:

"I hadn't thought about that no (informing the RFU). That wouldn't be my involvement, my involvement would be for the benefit of the individual not for the organisation." (S3T)

Highlighting the variability of responses to the question on reporting suspected doping behaviour in the school setting, the teacher at School 4 indicated that the action he took would depend on the player:

"I think it would probably depend on the player and that probably sounds quite bad initially, but you know, if it was a player that was involved in any kind of competition of consequence - so first 15 rugby, representative rugby, club rugby, I think I would have a duty, we would have a duty as a school to make the RFU aware of that. If it was somebody that was involved in rugby of very little consequence, I think we would probably make it an internal issue and deal with him as if he had been caught doing anything else incorrect. It could well be wrong that we take two different approaches for different players, but I think the potential consequences for that individual if rugby is just a small part of their life, the consequences for making it a bigger issue are quite significant really, whereas a player that's possibly going to go on and spend a lot of time playing rugby in quite a public space or with a club or with you know their country at schoolboy level, we've got a duty to make that individual realise that this is a really serious thing and that the governing body if not now, will at some point in the future, penalise you heavily for this. So I think that's the step, that's the stage where you make the governing body aware and that has the consequence of making the individual realise how serious an issue it is" (S4T)

When interviewed, schoolboys felt that it was down to an individual whether or not they wanted to use a banned substance. Specifically, 16 out of the 25 schoolboys interviewed felt that it was none of their business and people should be able to do what they want to do.

e.g., several individuals highlighted: *"it's their own decision" if they want to use a banned substance... "I don't think it's for me to say whether they should be doing it or not"*

One rugby union player believed that it was not his responsibility to get involved:

"I don't really want to get like all in like the hassle of it and stuff like that like I don't know... I shouldn't be the one like going out of my way to even though like I shouldn't stop playing rugby and telling someone like trying to get them banned cos you know there are people like drug agencies that come into like the academy and drug test people so it's kind of them, yeah I'll leave it down to them to catch anyone". (S4A2, rugby union)

As a result, actions that would be taken by the schoolboys if they were aware of someone using a banned substance were mixed and depended on whether the individual was a competitor or a team mate/friend. While four highlighted that they didn't think they would report an individual if they became aware of them doping, 11 adolescents believed they would probably report an individual to a coach or manager. Yet eight adolescents specifically highlighted that they wouldn't report a friend or team mate and three wouldn't report a friend but would report a competitor. One of the reasons for this was that the adolescents felt it was important to protect and remain loyal to team mates:

"It's quite tricky when you're perhaps friends with someone that's doing it or you play in the same team that someone's doing it. Erm... cos you're even though you're meant to even though it's wrong, you're meant to be one team who looks after each other and especially at the higher levels, it's quite like a brotherhood culture where everyone looks after each other and even though we are all competing against each other anyway like the only reason we are going to win is if we work as a team so I think taking someone out of that erm... cos say you didn't actually know. Say you didn't actually know that for 100% that they were doing it cos a lot of people could probably just chat about it and try and I don't know perhaps make themselves look cool or something if you didn't know, it would be quite embarrassing (laughs) erm dobbing someone in and it could ruin like a team culture" (S4A1, rugby union).

Although it appears that many of the schoolboys interviewed wouldn't report an individual using a banned substance, seven adolescents reported that they would talk to the individual who was doping to try and find out why they were doing it and convince them it was a bad idea. Three adolescents would then consider taking further action by telling a teacher if the individual continued to use the banned substance and it was starting to negatively affect other team members:

"I think I'd go talk to them myself first and see what they are taking and why they are taking it, see what people have said online about what they are taking and then if this person started making life in the gym horrid for everyone else so say they were taking steroids or something and they got their anger rage you know coming through and flipping out on people and just thinking this is my gym, you lot go stick it sort of thing, then I'd go have a word with the PE staff. Probably the head of PE because I talk to the head of PE quite a lot and I'd probably let him know, give him the heads up right I think this guy is on something dodgy, he's a bit hormonal or something like that and erm yeah he'd probably just then take him aside and have a chat, see what he's taking and see what's going on so yeah at first I'd try the right mate let's see what you are taking and then if that didn't work then I'd be right yeah get someone else involved get him to sort it out."
(S1A7- weight training)

4

Discussion

The still small, yet growing, number of rugby union players under the age of 25 years who have committed an anti-doping rule violation is a cause for concern (BBC, 2016; UK Anti-Doping, 2016). With sanctions being imposed on Under 18 schoolboy rugby union players, this research programme was conceived to determine the practice, knowledge and beliefs of English schoolboys towards nutritional supplements and banned substances.

Our findings highlight that nutritional supplement use is commonplace, largely accepted, and considered “normative” among 16-19-year-old males. Peers often endorsed acting and/or looking a certain way – young men often corresponded to secure ‘membership’ in the valuable social group that an athletic community can represent. This, combined with a lack of knowledge on supplement usage, can encourage widespread misuse of nutritional supplements, which can lead to detrimental side-effects in this maturing population. The social pressures that govern the formation and maintenance of these social groups rarely have such boundaries or rules that they down-regulate transitions into problematic supplementation practices.

With the functional use theory in mind (Petróczi, 2013), our findings point to schoolboy rugby union being a fertile ground for progression from habitual use of permitted performance enhancing strategies to prohibited substance use. The perception – and reinforcement - that size matters is powerful in supporting both legitimate and illegitimate enhancement approaches. While our estimates of (i) schoolboy anabolic steroid use, (ii) perceived incidence of banned substance use and (iii) willingness to take a ‘risky’ substance are indirect, they suggest that use of banned substances is an issue in school that warrants attention. Indeed, the preconditions for doping appear commonplace and relatively mundane, leaving many schoolboys vulnerable to doping in the future. Indeed, previous research has found between 3-11% of adolescent males saying they had used an anabolic steroid at some time during their life (e.g., Gradidge, Coopoo, & Constantinou, 2011; Nolte, Steyn, Krüger, & Fletcher, 2014; Lorang, Callahan, Cummins, Achar, & Brown, 2011).

Nutritional supplement use is commonplace and schoolboys appear uninformed of their effects and risks

The majority (95%) of schoolboys had used at least one type of supplement in their lifetime, with sports foods being reported most commonly. This lifetime prevalence rate is higher than previous research (39-91%; e.g., Braun et al., 2009; Diehl et al., 2012). Beyond sports foods, almost half reported lifetime use of energy drinks and protein supplements and weight gainers. In terms of protein supplementation, this incidence was higher than reported among high school students in other studies (13-25%; Field et al., 2005; Grm, Ars, Besednjak-Kocijancic & Golja, 2011). Yet, it is on a par with adolescents competing in high performance sport in Germany (42%; Braun et al., 2009).

In keeping with the literature, we noted that supplement users tend to consume more than one type of supplement (Diehl et al., 2012). Amongst our sample, this averaged just less than three types of supplements; corroborating previous research (2.4-3; e.g., Braun et al., 2009; Nieper, 2005; Petróczy et al., 2008). Equally, the proportion of schoolboy rugby union players who reported using protein supplements and weight gainers within the three months prior to being surveyed (44%) reflected the proportion of Irish schoolboy rugby union players using protein supplements (44%; Walsh, Cartwright, Corish, Sugrue & Wood-Martin, 2011) but was lower than the proportion of U19 academy rugby union players reporting current use (62%, Smith, Jones, Sutton, King & Duckworth, 2016).

There is a concern that adolescent rugby players are exposed to too little nutrition advice (Walsh et al., 2011) and this was also evident in our research. Consequently, schoolboys are retrieving their information on nutritional supplements from unreliable sources, such as the internet and peers. To address this, it is important that interventions are put in place to expose schoolboys to accurate and reliable education that emphasises eating for long term health (a 'food first' approach). Our evidence of widespread use of nutritional supplements stands in strong contrast to recommendations by leading authorities, who caution against supplement use by underage athletes (Desbrow et al., 2014; Maughan, Depiesse & Geyer, 2007). It has been suggested that it is between 15 and 18 years old, when adolescents develop lifelong relationships with food (Desbrow, et al., 2014) and Sports Dieticians Australia assert that "nutrient needs should be met by core foods rather than supplements, as the recommendation of dietary supplements to developing athletes over-emphasises their ability to manipulate performance in comparison to other training and dietary strategies" (p.570).

Moreover, adolescence is a good age at which to encourage the development of good dietary practices (Smith et al., 2016) and instilling a food first approach.

By approaching supplement use from the performance enhancement angle, doping prevention efforts should adopt a pragmatic approach that acknowledges the enhancement issues that drive substance use and that deter athletes from engaging with doping substances. With a focus on prevention, it will be helpful for athletes to learn about permitted and effective performance and image enhancing methods and practices (James, Naughton & Petróczi, 2010; Petróczi, 2013). With this age group, it is vital that a balanced developmental programme is implemented to avoid endorsing a biased message, which may be less successful in changing beliefs and behaviours. Therefore, the programme has to include the positive and negative effects of taking supplements (Petróczi, Dodge, Backhouse & Adesanwo, 2014), alongside a good overview of other possible ways to enhance performance. Programmes that focus on negative prevention are likely to be regarded as unbalanced – and therefore biased – and may inadvertently encourage future use; young men can be inherently curious, willing to experiment and unable to fully estimate the risk of such behaviours. Therefore, developmental programmes should seek to educate schoolboys on the importance of (i) a balanced diet and a ‘food first’ approach, (ii) the functional alternatives to supplement use and (iii) carefully planning and monitoring their strength and conditioning programmes. At the same time, the programme should include the development of cooking skills to ensure that a ‘food first’ approach can be achieved.

Teachers are ill-equipped to advise on diet and nutrition, yet they do

Although school teachers and coaches reported that they were ill-equipped to provide evidence-based advice on nutrition and supplementation, they were still a source of information, encouragement and supply. For teachers and coaches to provide schoolboys with nutrition information, they need to be adequately trained themselves to ensure they provide accurate information and answer questions/concerns (Zinn, Schofield & Ward, 2006). They also need to facilitate the opportunity for schoolboys to seek out nutrition knowledge from reliable sources (Cockburn, Fortune, Briggs & Rumbold, 2014; Zinn et al., 2006) and engage with reliable sources themselves so that they are better prepared to support their athletes and players. Furthermore, when communicating with schoolboys, it is important for teachers and coaches to recognise their student’s desire to do what they say or suggest. Although well intentioned, 3 in 5 schoolboys agreed or strongly agreed that they want to do what their coach or teacher thinks they should do.

More positively, the findings of this study also add weight to the view that schools – and the teaching community - have the potential to be powerful advocates in the prevention landscape. Working in partnership to develop a supplement policy/Code of Conduct for performance-enhancement in schools and academies (Desbrow et al., 2014) would be a strong step forward. This code or policy should establish expectations and delimit the boundaries between ethical and unethical practice (Brackenridge, 2003). Without clear boundaries, those coaches and teachers who promote 'substance' use (in one instance this involved buying in bulk and selling it on to players) are fostering a climate that might encourage doping (Petróczi, 2013). Importantly, the coaches and teachers signalled that they would be responsive to interventions to help them prevent doping.

Nutritional supplement use dovetails with a desire to be more muscular

Using nutritional supplements is most common among those with a desire to increase muscularity. Currently there is a lack of research investigating drive for muscularity amongst adolescents; only 15% of studies published within the area between 2000 and 2012, involved high school-aged students (Edwards, Tod & Molnar, 2014). Existing studies focus mainly on individuals from further education (65% of studies) and do not disclose sporting background (74%; Edwards et al., 2014), making it difficult to draw comparisons. Nevertheless, schoolboy scores on the Drive for Muscularity scale in the present study are consistent with existing research involving adolescent males (e.g., Bratland-Sanda & Sundgot-Borgen; 2011; McCreary & Sasse, 2000).

Regardless of their sport involvement, our findings indicate that schoolboys have similar desires to increase muscularity. Yet they also reveal that schoolboy rugby union players are more likely to already be engaging in muscularity-enhancing behaviours, including supplement use and weight training, than other athletic males and non-athletes. Importantly, one of the strongest correlates for anabolic steroid use is negative body image (Parent & Moradi, 2011; Ricciadelli & McCabe, 2004). Boys who perceive themselves as very under- or over-weight are at a significantly greater risk of using anabolic steroids than boys who perceive themselves as normal (Jampel, Murray, Griffiths & Blashill, 2016). Adolescent boys who wish to increase in muscularity may therefore become vulnerable to using banned substances as they pursue their legitimate interest in enhanced muscularity. Further, sports programmes that – even inadvertently - endorse size shortcomings may also be adding to that vulnerability.

Schoolboy rugby union players represent a vulnerable group

With supplement use acting as a potential gateway to doping (Backhouse, Whitaker & Petróczi, 2013; Ntoumanis, Ng, Barkoukis & Backhouse, 2014; Petróczi, 2013) and a 'size matters' culture pervading schoolboy rugby, schoolboy rugby union players represent a vulnerable group who warrant tailored intervention. Using the functional use theory (Petróczi, 2013; Figure 1), schoolboys who habitually (i) use protein supplements and pre-workouts, (ii) spend 6+ hours a week in the gym weight training and (iii) report a greater drive for muscularity at the ages of 16–19, may be more vulnerable to doping because they feel they 'know' what these legitimate approaches can do for improving their individual performance. As a result, schoolboy rugby union players may be prompted to seek out newer, albeit illegitimate, performance-enhancing strategies. Both strength and conditioning programmers and teachers/coaches need to carefully consider how they can encourage young athletes to identify progress in (i) single areas of preparation and (ii) across the many areas that contribute to performance enhancement, perhaps even beyond body size. These factors also need to be given stronger emphasis in selection for teams and academies. In structural terms, there may even be a role for NGBs to create 'scores' for what respective academies/clubs and schools do to help their athletes to develop. Such schemes may also be used to assist recruiting suitable athletes.

Protein supplements were commonly used, and their use was influenced by the prevailing social norms. Supplement use went hand-in-glove with regular gym attendance and the weight-training adolescents also used nutritional supplements. Accounts from the schoolboy interviews highlighted 'the gym' as a doping risk environment. Their accounts pointed to permitted and prohibited substance use being embedded within social and cultural systems of these particular gyms. Schoolboys commonly asserted that using supplements is 'just what you do when you go to the gym'. This supports previous research showing that using nutritional supplements was most common among athletes who do weight training for sport (Field et al., 2005). It also provides guidance about where unwanted influences exert their influence (and when), highlighting that they may not be within any given sport.

Schoolboy rugby union players reported that they used the gym following encouragement from their peers and coaches. However, many schoolboys could not articulate what they were trying to achieve by going to the gym, nor why they were using supplements. Performance-enhancement practices followed a naive sequence, where a method – often a single exercise and supplement – is used until the individual reaches a plateau; a new method is then introduced. This

provides support for the Incremental Model of Doping Behaviour (Petróczi, 2013) and the Gateway Theory (Kandel, 2002) of substance use.

Broadly, engagement in this training culture and use of nutritional supplements, was mostly driven by pragmatism. Schoolboys engaged in these practices to (i) protect themselves from the physical harm that the game might cause, (ii) enhance recovery and (iii) proactively respond to the implicit pressures to be a certain size/shape to guarantee team selection. Thus, rugby players want to toughen up for sport (Ricciadelli, McCabe & Ridge, 2006) and along with their coaches, they see increasing muscle mass as being essential for improving rugby performance (Walsh et al., 2011) and player protection. Importantly, securing selection for higher levels of performance was seen as hinging on increased size; the mantra of 'not big enough' was a major cause for concern.

From this behavioural analysis, education, environmental restructuring and skill-based training intervention functions are needed to supplement existing legalistic and procedural mechanisms. This is important to address the areas that drive negative behaviour change. With so many layers of apparent 'cause' - and so few powerfully predictive agents that produce change - it is important that 'overdetermining' approaches are deployed so that players, teachers and coaches are enmeshed in a *system* that handles every causal action/agent. Within this, creating a learning culture will be important. Furthermore, scaffolding initiatives incrementally - and in collaboration with key stakeholders - is also part of an 'overdetermining' approach across the whole system. Building on small success can be more effective than trying to achieve too much too quickly. If we do this incrementally - and in collaboration - we are more likely to develop effective interventions that prevent doping in schoolboy sport.

5

Future actions

It is important that national governing bodies do all they can to foster positive pathways through performance enhancement to prevent athletes engaging in maladaptive performance enhancing strategies. This will involve those agencies that 'use' sport to furnish their youth development aspirations, including schools and sports clubs. Thus, prevention is incumbent on the efforts of all those involved in the sporting landscape, not just the individual schoolboy. Existing approaches risk being considered piecemeal and only addressing some elements of what generates drug taking; it is now time to use this evidence-base to address all of what drives supplement use by young people in sport. Thus, we need to look at effecting change across the whole system.

Importantly, and for pragmatic reasons, the use of an 'overdetermining' approach may be best focused on legitimate ways of enhancing performance. Within this, illicit approaches can be addressed without making it the sole concern of the programme. Further, because this approach is responsive to local refinement, it will offer a strong 'fit' with the positive aspects of the local 'culture' of most schools and academies. As such, it is more likely to be enthusiastically endorsed by their key personnel.

The 'overdetermining' approach has underpinned the success of many prominent campaigns that, like anti-doping, rely on creating substantial cultural change. This is important because evidence confirms that well planned initiatives do work; not only that, but the planning process is now being structured to enhance the likelihood of even higher rates of success. No longer do we have to hope for success even when the evidence shows that 80%-90% of all organisational initiatives will fail. 'Overdetermining' approaches have now raised expectations that a similar number will succeed (Grenny et al., 2013).

Accepting that the habit of using supplementation for better performance can be a gateway to doping, then the best behaviour focus may be on delaying or reducing the propensity of schoolboys to engage in use – and misuse - of nutritional supplements. To do this, and to become properly 'overdetermining', we need to canvass all the options available and choose those that are most promising

through a systematic evaluation of theory and evidence. The Behaviour Change Wheel offers a ready-made system for making the best use of current understanding and resources available to develop a powerful strategy for behaviour change. With some support, this approach can be used by any single club or school as much as by any NGB.

Changing ingrained behaviour patterns can be challenging and success will be hard to achieve using isolated approaches, although it appears to be a cultural preference. The same is true for behaviours where one is working against a strong psychological, social or environmental force (Michie, Atkins & West 2014). Therefore, considering our study findings alongside the latest thinking in behavioural science (e.g., Michie et al., 2011) future actions should no longer prioritise individual, group or environmental approaches. Instead, it is important to acknowledge that they all have roles to play in controlling - and therefore in manipulating - behaviour. To-date we have evidence of few agents demonstrating this conceptual grasp, and even less of converting it into tangible action around anti-doping. Where there is action, isolated approaches are the norm and the individual athlete is the primary target. A focus on collective responsibility is only beginning to emerge and this needs to spread across the whole sporting system.

Recognising the complexity of performance and image enhancing behaviour, future research should explore how for a particular behaviour in a particular context, certain factors or combinations of factors could prevent the early onset and misuse of nutritional supplements and schoolboys' vulnerability to doping. Our work implicates players (and groups of players), teachers, head teachers, strength and conditioning coaches, selectors, academy staff and NGBs. The findings also have much to say about preparing young athletes to handle the pressures inherent in 'the gym'; which is often community based. Both strength and conditioning programmers and teachers/coaches need to carefully consider how they can encourage young athletes to identify progress in the full range of areas that contribute to performance enhancement, as well as - or possibly beyond - body size. These wider factors also need to be given stronger emphasis in selection for teams and for academies.

Specifically, for any behaviour to change, an individual, group or population must at least have:

- (i) the 'capability' to do it (e.g., the knowledge, skills and motivation),
- (ii) the 'opportunity' to do it (e.g., physical and social)
- (iii) the 'motivation' to do it

(COM-B; Michie et al., 2014).

The Rugby Football Union has taken a proactive approach in commissioning this research and being open to the study findings. Now comes the stage of 'implementing integrative whole system interventions. Table 3 offers a template and an example of what an integrated, 'overdetermining', approach might look like. The content of the table has been shaped by the COM-B components and is focused on the target behaviour of delaying nutritional supplement use and shaping future actions. This is offered as a template; individual groups may use the ideas we have used, supplemented by local intelligence to develop their own approaches. Others may treat it as a blue print, applying it directly to their situation.

Some of the areas for action can be enacted immediately. Others will take time to develop and take root. The COM-B analysis and future actions within this report aim to speed this development by providing a preliminary roadmap for the RFU. We hope these ideas offer a starting point to stimulate further discussion and action planning.

Table 3. Possible future actions based on COM-B analysis

COM-B component identified in the research	Domains linking to the COM-B component	Relevance of domain	Possible future action
Psychological capability	Knowledge	Schoolboys lack knowledge of the need for nutritional supplements and the risks of their use.	The RFU should work in partnership to develop education and persuasion programmes for schoolboys, teachers and coaches on the importance of: <ol style="list-style-type: none"> 1. a balanced diet and a 'food first' approach. 2. functional alternatives to supplement use. 3. carefully planned and monitored strength and conditioning programmes.
		Schoolboys evidence a lack of knowledge and understanding of effective strength and conditioning training.	
Social opportunity	Social influences	School teachers/coaches are influential – yet ill-equipped – sources of information and behavioural expectations for schoolboys.	These programmes should incorporate practical skills training so that schoolboys have the capability to enact the desired behaviours.
		Environmental context and resources	
Physical opportunity		Convenience was identified as a reason for nutritional supplement use therefore schoolboys are likely to need the support from others around them to commit to a food first nutritional approach.	The RFU should work in partnership with schools and academies to engage parents in education and training initiatives so that they can help support a food first approach. This should be reinforced through teachers.
		Access to nutritional supplements was provided by the school teachers/coaches. Schoolboy supplement use mirrored teacher use.	
Physical opportunity and reflective motivation	Cultural expectations	The belief that 'size matters' drives behaviour and is deeply embedded in social and cultural systems.	The RFU should conduct a risk analysis of the explicit and implicit biases leading to this perception. For example, the RFU are encouraged to reflect on the messages that the organisation may be cascading through promotional materials and mascots. The RFU should consider the use of modelling as an intervention technique to shape perceptions and behaviours.
	Beliefs		
Reflective motivation	Beliefs about consequences	Schoolboys and teachers believed that education on nutritional supplements and banned substances should be compulsory in schools.	With schools recognising the relevance of any future interventions, the RFU should focus on enablement to increase the means and reduce the barriers for education in schools and academies.
	Behavioural intentions	Schoolboys were reluctant to report doping behaviour. This illustrates situated, or fluid, morality, showing that doping as a concept is not black or white and its evaluation depends on the circumstances. teachers were uncertain about their responsibilities	The RFU should consider their position on speaking out about doping, when it pertains to U18's. They should in partnership with the Schools to review current policy and practice. A focus on collective responsibility, rather than individual blame, might help prevent the use of prohibited substances in schools.

6

References

- Backhouse, S. H., Whitaker, L., & Petróczi, A. (2013). Gateway to doping? Supplement use in the context of preferred competitive situations, doping attitude, beliefs, and norms. *Scandinavian Journal of Medicine & Science in Sports*, *23*(2), 244-252. doi: 10.1111/j.1600-0838.2011.01374.x
- BBC Sport. (2016). *Rugby's steroid trend 'worrying' says UK Anti-Doping boss*. <http://www.bbc.co.uk/sport/rugby-union/36218785>. Accessed 6th May 2016.
- Brackenridge, C.H. (2003). *Spoilsports: Understanding and preventing sexual exploitation in sport*. New York: Routledge.
- Bratland-Sanda, S. and Sundgot-Borgen, J. (2012). Symptoms of eating disorders, drive for muscularity and physical activity among Norwegian adolescents. *European Eating Disorders Review*, *20*, 287-293. doi: 10.1002/erv.1156
- Braun, V. & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77-101
- Braun, H., Koehler, K., Geyer, H., Kleinert, J., Mester, J., & Schänzer, W. (2009). Dietary supplement use among elite young German athletes. *International Journal of Sport Nutrition and Exercise Metabolism*, *19*(1), 97-109.
- Charney, D. (1996). Empiricism is not a four-letter word. *College Composition and Communication*, *47*(4), 567-593.
- Clark, A. M. (1998). The qualitative-quantitative debate: moving from positivism and confrontation to post-positivism and reconciliation. *Journal of Advanced Nursing*, *27*, 1242-1249.
- Cockburn, E., Fortune, A., Briggs, M. & Rumbold, P. (2014). Nutritional knowledge of UK coaches. *Nutrients*, *6*(4), 1442-1453
- Desbrow, B., McCormack, J., Burke, L.M., Cox, G.R., Fallon, K., Hislop, M., ... Leveritt, M. (2014). Sports dietitians Australia position statement: Sports nutrition for the adolescent athlete. *International Journal of Sport Nutrition and Exercise Metabolism*, *24*, 570-584.
- Diehl, K., Thiel, A., Zipfel, S., Mayer, J., Schnell, A., & Schneider, S. (2012). Elite adolescent athletes' use of dietary supplements: characteristics, opinions, and sources of supply and information. *International Journal of Sport Nutrition & Exercise Metabolism*, *22*(3), 165-174.

-
- Edwards, C., Tod, D., & Molnar, G. (2014). A systematic review of the drive for muscularity research area. *International Review of Sport and Exercise Psychology, 7*, 18-41. doi: 10.1080/1750984X.2013.847113
- Field, A.E., Austin, B., Camargo, C.A, Taylor, C., Striegel-Moore, R.H., Loud, K.J., & Colditz, G.A. (2005). Exposure to the mass media, body shape concerns, and the use of supplements to improve weight and shape among meal and female adolescents. *Paediatrics, 116*, 214-220.
- Gradidge, P., Coopoo, Y., & Constantinou, D. (2011). Prevalence of performance-enhancing substance use by Johannesburg male adolescents involved in competitive high school sports. *Archives of Exercise in Health and Disease, 2*(2), 114-119.
- Grenny, J., Patterson, K., Maxfield, D., McMillan, R., & Switzler, A. (2013). *Influencer* (2nd ed.). New York (NY): VitalSmarts.
- Grm, H. S., Ars, M. S., Besednjak-Kocijancic, L., & Golja, P. (2011). Nutritional supplement use among Slovenian adolescents. *Public Health Nutrition, 15*(4), 587-593. doi: 10.1017/s1368980011002333
- James, R., Naughton, D. P., & Petróczi, A. (2010). Promoting functional foods as acceptable alternatives to doping: potential for information-based social marketing approach. *Journal of the International Society of Sports Nutrition, 7*, 37. doi: 10.1186/1550-2783-7-37
- Jampel, J.D., Murray, S.B., Griffiths, S., & Blashill, A.J (2016). Self-perceived weight and anabolic steroid misuse among us adolescent boys. *Journal of Adolescent Health, 58*, (4), 397-402
- Kandel, D. B. (2002). Examining the gateway hypothesis stages and pathways of drug involvement. In D. B. Kandel (Ed.), *Stages and pathways of drug involvement: Examining the gateway hypothesis* (pp. 3-15). New York (NY): Cambridge University Press.
- King, N. & Horrocks, C. (2010). *Interviews in Qualitative Research*. Thousand Oaks, CA: Sage.
- Letourneau, N. & Allen, M. (1999). Post-positivistic critical multiplism: a beginning dialogue. *Journal of Advanced Nursing, 30*, 623-630.
- Lorang, M., Callahan, B., Cummins, K.M., Achar, S., & Brown, S.A. (2011). Anabolic androgenic steroid use in teens: Prevalence, demographics, and perception of effects. *Journal of Child & Adolescent Substance Abuse, 20*(4), 358-369.
- Lucidi, F., Zelli, A., Mallia, L., Grano, C., Russo, P. M., & Violani, C. (2008). The social-cognitive mechanisms regulating adolescents' use of doping substances. *Journal of Sports Sciences, 26*(5), 447-456.
- Maughan, R.J., Depiesse, F. & Geyer, H. (2007). The use of dietary supplements by athletes. *Journal of Sports Science, 25*, S103-113.
- McCreary, D. R., & Sasse, D. K. (2000). An exploration of the drive for muscularity in adolescent boys and girls. *Journal of American College Health, 48*(6), 297-304.

-
- Michie, S., Atkins, L. & West, R. (2014). *The behaviour change wheel: A guide to designing interventions*. UK: Silverback Publishing.
- Michie, S., van Stralen & West, R. (2011). The behaviour change wheel: A new method for characterising and designing behaviour change interventions. *Implementation Science, 6*, 42. doi: 10.1186/1748-5908-6-42
- Nieper, A. (2005). Nutritional supplement practices in UK junior national track and field athletes. *British Journal of Sports Medicine, 39*(9), 645-649.
- Nepusz T, Petróczi A, Naughton DP, Epton T, Norman P. (2014). Estimating the prevalence of socially-sensitive behaviours: Attributing deliberate and innocent noncompliance with the Single Sample Count method. *Psychological Methods, 19*(3), 334-355.
- Nolte, K., Steyn, B. J M., Krüger, P.E, & Fletcher, L. (2014). Doping in sport: Attitudes, beliefs and knowledge of competitive high-school athletes in Gauteng Province. *South African Journal of Sports Medicine, 26*(3), 81-86
- Ntoumanis, N., Ng, J. Y., Barkoukis, V., & Backhouse, S.H. (2014). Personal and Psychosocial Predictors of Doping Use in Physical Activity Settings: A Meta-Analysis. *Sports Medicine, 44*(11), 1603-1624.
- Parent, M. C., & Moradi, B. (2011). His biceps become him: A test of objectification theory's application to drive for muscularity and propensity for steroid use in college men. *Journal of Counseling Psychology, 58*, 246-256. doi: 10.1037/a0021398
- Petróczi, A. (2013). The doping mindset—Part 1: Implications of the functional use theory on mental representations of doping. *Performance Enhancement and Health, 2*(4), 153-163.
- Petróczi, A., & Aidman, E. (2008). Psychological drivers in doping: The life-cycle model of performance enhancement. *Substance Abuse Treatment, Prevention, and Policy, 3*:7. doi: 10.1186/1747-597X-3-7
- Petróczi, A., Dodge, T., Backhouse, S.H., & Adesanwo, C. (2014). Review of the literature on negative health risks based interventions to guide anabolic steroid misuse prevention. *Performance Enhancement and Health, 3*(1), 31-44
- Petróczi, A., Naughton, D. P., Pearce, G., Bailey, R., Bloodworth, A., & Mcnamee, M. (2008). Nutritional supplement use by elite young UK athletes: fallacies of advice regarding efficacy. *Journal of International Society of Sports Nutrition, 5*:22. doi:10.1186/1550-2783-5-22
- Ricciardelli, L. A., & McCabe, M. P. (2004). A biopsychosocial model of disordered eating and the pursuit of muscularity in adolescent boys. *Psychological Bulletin, 130*, 179-205. doi:10.1037/0033-2909.130.2 .179
- Ricciardelli, L. A., McCabe, M. P., & Ridge, D. (2006). The construction of the adolescent male body through sport. *Journal of Health Psychology, 11*(4), 577-58
- Smith, D. R., Jones, B., Sutton, L., King, R. F., & Duckworth, L. C. (2016). Dietary intakes of elite 14 - 19 year old English academy rugby players during a pre-
-

season training period. *International Journal of Sport Nutrition and Exercise Metabolism*. doi: <http://dx.doi.org/10.1123/ijsnem.2015-0317>

UK Anti-Doping. (2016). *Current anti-doping rule violations*. <http://www.ukad.org.uk/anti-doping-rule-violations/current-violations/>. Accessed 6th May 2016.

Walsh M, Cartwright L, Corish C, Sugrue, S. & Wood-Martin, R. (2011). The body composition, nutritional knowledge, attitudes, behaviors, and future education needs of senior schoolboy rugby players in Ireland. *International Journal of Sport Nutrition and Exercise Metabolism*, 21(5), 365–76.

Yardley, L. & Marks, D. F. (2004). Introduction to research methods in clinical and health psychology. In Marks, D. F. & Yardley, L. eds. *Research Methods for Clinical and Health Psychology*. London, Sage.

Zinn C., Schofield, G., & Wall, C. (2006). Evaluation of sports knowledge of New Zealand Premier Club rugby coaches. *International Journal of Sport Nutrition and Exercise Metabolism*, 16, 214–225.

Appendix

Fat burners used by schoolboys (n= 36)



- Green tea ● Thermobol ● CLAs ● Scivation-extend
- Thermo Detonator ● Grenade ● Clenbuterol ● Thermopure
- Conjugated linoleic acid ● Raspberry ketones ● USN Phedra cut
- Forza T5

Pre-workout supplements used by schoolboys (n= 80)



- White flood ● C4 Extreme ● The Curse ● T-Matrix ● Superpump
- Pulse V4 ● Pre-workout energy drink ● Optimum nutrition Pre
- Optimum nutrition gold standard ● NO-Explode ● My-Pre
- Maximuscle ● Jack3d ● C4 ● Grenade Explode ● Creapump
- Blue gel ● Trec SAW ● Mike Change after burner ● Bullnox
- Hyphy Mud ● Dynamite ● Holland and Barratt own brand ● Arnold
- Asphalt ● Muscle pharm assault ● Animal stack ● TNT ● PTF

Energy drinks used by schoolboys (top 5)

Lucozade
Rockstar
Red Bull
Monster
Relentness

Red Bull (n=372)

Monster (n=271)

Lucozade (n=103)

Relentness (n=69)

Rockstar (n=38)



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