Survey of Nutritional Supplement Use Among Young Elite UK Athletes

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Background
The objective was to study nutritional supplement use among young elite UK athletes to establish whether a rationale versus practice incongruence exists, and to investigate the sources of information.

Survey data were analyzed for association between supplements used and motives for using such substances among young athletes along with the sources of advice and literature precedents on supplement effects.

Methods
Participants were elite UK male and female athletes, within the age range between 12 and 21 (n = 403), mean age 17.66 ± 1.99. Associations between type of supplements and reasons for using supplements were tested by calculating Pearson’s \( \chi^2 \) and the strength of these symmetric associations shown by phi (\( \phi \)) association coefficients.

Results
Single supplement use was reported by 48.1%, with energy drinks being the most popular, consumed by 41.7% of all athletes and 86.6% of the supplement users in the sample.

No agreement was observed between athletes’ rationale and behavior in relation to nutritional supplements except for creatine. Among health professionals, nutritionists and physiotherapists, followed by coaches, were most frequently consulted.

Answers regarding reasons and supplements used showed incongruence and suggest widespread misinformation regarding supplements and their effects is an issue for the young athlete.

Conclusion
Widespread supplement taking behavior was evidenced in the young elite athlete population with the most notable congruence between rationale and practice among young athletes being performance-related.

Young athletes in the present sample appear to be less ‘health conscious’ and more ‘performance focused’ than their adult counterparts.

Further research, using a full list of supplements, is warranted to test the hypothesis that health consciousness is less dominant in supplement choice by young athletes.

Background
'Supplement' is an overarching name for vitamins, minerals, herbal remedies, and other substances taken orally and regulated as foods and are subject to the general provisions of the Food Safety Act 1990, the Food Labeling Regulations 1996 and the Trade Descriptions Act 1968.

In the UK, supplements are required to exhibit efficacy before marketing only if they contain medical claims and fall outside food regulations.
Previous studies have highlighted incongruencies between choices of supplement use in adult high performing athletes and reasons for use.

Choices of supplement for maintenance of health and performance enhancement were divergent from informed choices based on scientific evidence [1,2].

In contrast to the adult population, young developing athletes have different nutritional requirements, which are critical to maintain growth, health and to achieve athletic potential [3].

A recent study of 32 track and field junior athletes selected for Team Great Britain at the World Junior Championships found that 62 per cent of the sample used supplements [4]. Females (75%) were found to use more supplements than males (55%) although this difference was not statistically significant.

This trend, also found elsewhere [5], may be attributed to a greater knowledge of nutritional needs among females, greater genuine need for supplementation (e.g. menstrual loss) or advertising campaigns having a greater influence on females [4].

Multivitamins were used most frequently, followed by vitamin C and then iron [4,6]. As reviewed by McDowall [7], seven studies over a twelve-year period report the prevalence of supplement use between 22 and 71% in young athletes (age ranges from 13–19).

Health benefits, illness prevention, enhancing performance, taste, rectifying a perceived poor diet and increasing energy were the most frequently cited reasons for supplement use among young athletes [7,8].

**Aims**

Supplement use appears to be widespread in young athlete populations, for both health reasons and for the enhancement of performance.

The aim of this paper is to better understand nutritional use among elite young athletes, specifically exploring (i) sources of advice, and (ii) incongruence between the rationale for use and the supplements used, with a view to enhance sports coaches and health practitioners' understanding of supplement use in the young athlete.

Results will be compared to those obtained from a similar survey among adult high performing UK athletes [1,2].

**Methods Measures**

Questions used for this analysis were from the modified version of the original UK Sport "Drug-Free Sport" survey [9]. The modified version of the questionnaire was piloted in sub-elite sports groups, and sent to sports coaches for detailed feedback.

In light of the age range of this population, it was predictable that the suggested changes focused on the simplification of certain technical terms, as well as the general accessibility of the language used.

The questions used for the analysis in this paper and responses were recorded on a ten by ten matrix of supplements and advisors: “If you use/have used any of the following supplements, who advised you to take it?”;

How much do you agree or disagree with the following statement: ”You have to take supplements to be successful”; with answers recorded on a 4-point Likert-type scale with the fifth option being ‘do not know’ instead of the neutral mid-point; “Which of the following (if any) describe
why you take a supplement or supplements?”

It must be noted that athletes were not explicitly asked to give a rationale for using a particular supplement.

Congruency was statistically tested between two answers athletes gave independently by chi-square test of association and the strength of relationship was estimated by calculating \( \phi \) coefficients [10].

**Participants**

Young elite athletes with ages ranging between 12 and 21 were identified via the Talented Athlete Scholarship Scheme (TASS); the UK Sport World Class Development Program (WCDP); the National Academy Systems in cricket and Rugby Union; and via the Professional Footballers Association.

The questionnaire was distributed to 1,674 athletes. For TASS athletes, questionnaires were administered by TASS program staff; for WCDP athletes, cricket and rugby union academy members and young professional footballers by the research team.

Questionnaires were delivered to the athletes by post to their home address with a consent/assent form and information sheet. A period of one month was given for the return of the questionnaires.

Follow up letters were sent to the athletes after this period to ask them to fill out the questionnaire if they had not already sent it back. A Freepost envelope was included with the questionnaire.

**Results**

Of the 1,674 questionnaires distributed, 412 were returned and 403 were within the age range required. The highest response rate was from WCDP athletes (43%), followed by TASS (29%) and National Government Bodies (NGB) athletes (18%), calculating an overall response rate average of 25%.

Overall this average was brought down due to a very low response rate from the football players in the NGB athlete group. The sample predominantly consists of white (93.8%) male (64.5%) athletes compared to females (33.0%) with 2.5% of the information missing.

Over two thirds of respondents (67.0%) are between age 16 and 19 whilst the 12–16 and the 20–21 age groups formed 12.5% and 19.9%, respectively. Age information for 0.5% of the participants was missing. The mean age was 17.66 ± 1.99.

Close to one-third of the athletes in the sample were rugby union players (27.8%), followed by football players (13.9%) and swimmers (6.7%). Table tennis, equestrian, fencing, synchronized swimming, rowing, diving, water polo, canoeing, golf, judo, orienteering, taekwondo, tennis, cricket and disability athletics were contributed to the sample by 1 to 5%, listed in decreasing order.

The individual contribution from the remaining 17 sports was ≤ 1%. The majority of the young athletes (78.4%) did not believe that nutritional supplementation was necessary to be successful in sport with only 4.2% claiming not having the knowledge to answer the question.

However, contrary to this belief, almost half of the respondents (48.1%) reported using at least one supplement from the list provided with a considerable proportion of athletes using more than one supplements. On average, 2.96 supplements were used among the elite young athletes (574 instances with 194 supplement users).
Among the desired outcomes resulting from supplement use, maintaining strength was the most frequently cited reason among all athletes in the sample (34.7%) and supplement users (72.2%), followed by avoiding sickness (56.1% of users) and endurance enhancement (55.2% of users).

One-third of the supplement user athletes listed the ability to train longer (30.4%) and helping to recover (32.5%) among the reasons, whereas 23.2% take supplements to remedy imbalanced diet.

Overcoming injury and other reasons equally contributed with 16.5% to the picture. Given the age group, an unexpectedly modest proportion (5.7%) reported lack of sleep among the reasons, whereas 13 athletes (6.7%) claimed that they do not know why they take supplements.

With regard to sources of advice on nutritional supplementation, many young athletes appear to decide on their nutritional supplementation themselves without advice.

The considerable overlap between self-managed supplementation and medical advice (Figure 3) is, however, somewhat reassuring. The coaches' role in advising athletes on supplements, especially in taking energy drinks and protein was also evidenced.

Among health professionals, athletes indicated that advice was sought from nutritionists and/or physiotherapists. The only exception to this pattern was iron supplementation, which was taken following general practitioners' advice.

Source of information regarding the supplements reported, expressed as ratio between the number of sources and incidents reported.

To assess athletes' understanding of the benefits of nutritional supplements and to investigate the presence or lack of informed choices, the association between used supplements and reasons for using supplements were tested.

Under an assumption that the choices of athletes were informed ones, a strong association is expected between a given reason for their use and a given supplement.

The most relatively strong associations fell in the performance quadrant using creatine, whey protein and energy drinks. Notably, the strongest associations were found between maintaining strength and whey protein ($\chi^2 = 94.355, \phi = .484, p < .001$) and creatine ($\chi^2 = 80.327, \phi = .447, p < .001$).

Among health maintenance reasons, only multivitamin showed a considerable congruence with aiding recovery. Interestingly, no association between vitamin C and health maintenance was evidenced.

**Discussion**

Recently, considerable attention has been given to the benefits, and to a lesser degree, drawbacks of nutritional supplement use. The 2007 report of the Science and Technology Committee of the House of Commons, among other important recommendations, urges researchers to explore acceptable means to increase human performance.

Under the strict regulation of the World Anti-Doping Agency (WADA) and their expanding list of prohibited substances, athletes and researchers have turned to nutritional supplements: vitamins, minerals, herbs, botanicals and non-herb non-mineral substances.
A study commissioned by UK Sport evidenced that supplement use is predominant among adult high-performing UK athletes (62%) with an average of 3.22 supplements used per athlete [25].

In comparison, only 48.1% of emerging UK elite athletes reported supplementation in the present study with an average of 2.96 supplements used.

The use of multiple supplements is a common practice, which manifests in both a higher number of adverse reactions and in those reactions being more severe [26,27].

Whilst the potentially adverse effects of long term use of supplements and concomitant use are yet to be established for many substances, the reported multiple use of supplements, coupled with self-managed supplementation is concerning.

The exceptions are caffeine (for example the effects on the cardiovascular system) and vitamin C (for example as a pro-oxidant intake at high levels), where the benefits and side effects from long-term use have been established [28,29].

The supplement-use profiles for both adults and young athletes contained multivitamin and vitamin C among the most widely used supplements. Moreover, adult athletes showed the highest level of informed choices in health maintenance reasons and supplements, emerging athletes exhibited more congruency in performance enhancements [1,2].

For example, contrary to the adult data, which showed no association between whey protein and strength, the association between protein and strength was the strongest one among young athletes.

Among all the supplements queried among UK athletes, creatine and whey protein use can be the most accurately predicted from the reasons given for using such supplements and vice versa, complemented by vitamin C in the adult survey and energy drinks in the present youth survey.

With the exception of these substances, there was a considerable mismatch of rationale and practice.

The appearance of the energy drinks in the youth data is in keeping with the literature [30]. In addition to energy drinks, creatine and whey protein, young athletes used a wide variety of supplements seemingly without a clear understanding of what supplements can or cannot do.

The significant self-managed supplementation may partially explain the observed lack of congruence between reasons and supplement used.

**Implications**

Athletes appear to have a perceived need for nutritional supplementation. Although speculative at this point, based on the existing literature, it is not unreasonable to assume that athletes are likely to take a combination of substances and perhaps in large doses. For example, the OSL for creatine (5 g/day), is routinely exceeded both in practice and in scientific studies [31,32].

Reservations apply to even the most commonly used supplements regarding long term use, combinations and appropriate dosages.

These reservations concern: 1) an increased health risk to an otherwise healthy population and 2) the possibility of positive doping tests caused by supplements containing banned substances.
To negate potential health risks arising from potentially inappropriate supplement use, an increased involvement of health professionals, with appropriate training, is desirable.

The partial limitation of this study arises from using a closed list of nutritional supplements. Whilst the wide range of supplements includes both relatively harmless supplements (e.g. energy drinks, bars), through macro- and micronutrients to potentially harmful substances (e.g. some herbs), the survey was limited to ten relatively harmless substances.

However, the aim of this study was to investigate the congruence between rational and practice. Therefore this paper does not provide a comprehensive picture of supplement use patterns and interpretation along this line must be done cautiously.

The list of 'other' substances indicates that the range of supplements used regularly expands well beyond the ten substances investigated. As dosage and/or concomitant use influence toxicity, having information of these parameters is paramount.

Future research should also expand the list of supplements and include other supplements with particular emphasis on those that are potentially harmful and those with unknown effects (e.g. herbal extracts or exotic supplements).

**Conclusion**

Widespread supplement taking behavior was evidenced in the young elite athlete population.

Contrary to the result from the adult survey [1,2], the most notable congruence between rationale and practice among young athletes was performance-related. This observed difference in supplement-using patterns, may partially be explained by age differences.

Young athletes in the present sample appear to be less 'health conscious' and more 'performance focused' than their adult counterparts.

Further research, using a full list of supplements, is warranted to test the hypothesis that health consciousness is less dominant in supplement choice by young athletes.

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