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# Athletes' Knowledge and Views on OTC Medication

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## Key words

- anti-doping
- WADA
- prohibited list
- OTC stimulants
- monitoring program
- questionnaires

## Abstract

A questionnaire was administered to elite athletes from Australia, Canada, the UK, and the USA representing 10 Olympic sports in order to explore knowledge and understanding of over-the-counter (OTC) medication since the removal of many of these substances from the World Anti-Doping Agency (WADA) Prohibited List, in 2004. Athletes demonstrated limited knowledge and understanding. Around half (50.5%) knew the penalty incurred following a doping violation involving a banned OTC stimulant. The terms Monitoring Program and Specified Substance List

were understood by 43.3% and 67.5% of respondents, respectively. Overall, the status of substances in relation to the Prohibited List was correctly identified in just 35.1% of cases. As a whole, athletes were of the opinion that OTC stimulants posed a risk to health, were performance enhancing and that their use was against the spirit of sport. They were undecided as to whether these drugs should be returned to the Prohibited List. Elite athletes require targeted education programmes that will enable them to make informed decisions on the potential of OTC medications for therapeutic or performance enhancing purposes.

## Introduction

Athletes participating at a high-level tend to avoid over-the-counter (OTC) medicines since they may contain prohibited substances [4]. In 2003, UK Sport reported that out of the 100 anti-doping results that required further investigation, 49 were for stimulants, almost half of which were due to OTC stimulants, such as ephedrine, pseudoephedrine and phenylephrine [11]. Anti-doping violations involving stimulants have been a major concern for governing bodies and many violations may have been unintentional due to the use of OTC products for therapeutic purposes. It is known that athletes competing at the highest level of competition are most in favour of prohibition of stimulants, found commonly in OTC medication [4]. Reasons suggested for this opinion were their reputed ergogenic properties and the moral and ethical argument of this practice providing an unfair advantage. However, research into the area of athletes' attitude towards the use of these substances is limited. Cut-off levels for the concentration of these substances in the urine were introduced by the International Olympic Committee (IOC). However, it has been

shown that, following multiple therapeutic dosing of either phenylpropanolamine or pseudoephedrine, the concentration of these two drugs in the urine remained above the IOC cut-off levels for at least 6 and 16 h, respectively [3]. This finding suggests that even with the presence of cut-off levels, unintentional violations due to the therapeutic use of OTC preparations are extremely likely.

In January 2004, the World Anti-Doping Agency (WADA) introduced the first World Anti-Doping Code (WADC) and a revised Prohibited List. Amongst other changes, many of the stimulants available for purchase OTC, including caffeine, phenylephrine, phenylpropanolamine, pseudoephedrine and synephrine were removed from the 2004 Prohibited List. These substances were transferred to a WADA Monitoring Program. By removing some of these stimulants from the list it was hoped that unintentional violations would be minimised. However, the attitude of athletes that the use of substances is acceptable as long as they are "legal" may have increased the likelihood of their use for performance enhancing purposes.

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The aim of the study was to assess athletes' knowledge and understanding relating to anti-doping and OTC medication since the introduction of the 2004 WADA Prohibited List and Monitoring Program and to elicit their views on these changes in doping control procedures.

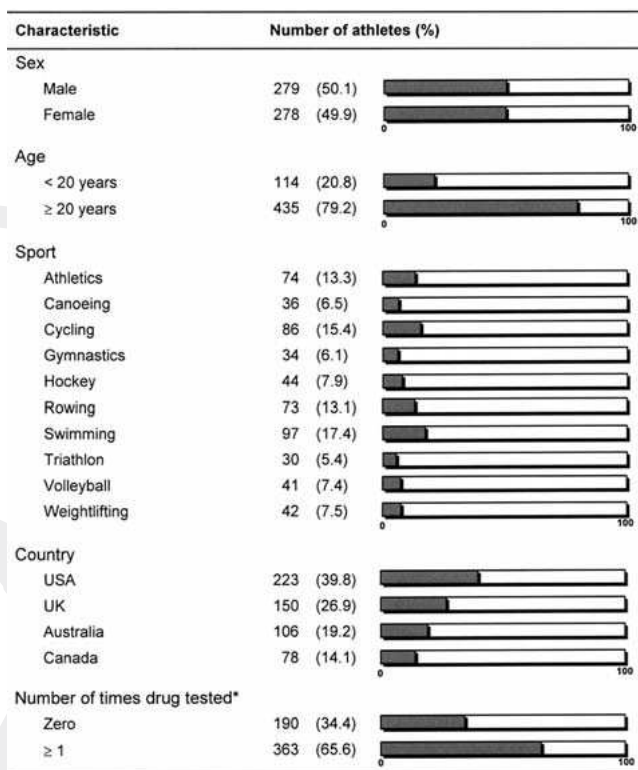
## Methods

A questionnaire was developed to assess elite athletes' knowledge and understanding relating to anti-doping and OTC medication, using open and closed questions, as appropriate. The questionnaire was modified following the undertaking of a pilot study that used a convenience sample of endurance athletes. Modifications were made that enabled the use of more effective questions to obtain the information required. Knowledge was established by asking questions on the maximum time an athlete would be banned for a first violation involving a banned substance, the meaning of the terms "Monitoring Program" and "Specified Substances" and the ability to identify which of a series of eight drugs were on the current Prohibited List. Views and opinion on OTC medication use in sport was established using a five-point Likert scale. Statements used in this section were based on WADA's criteria for including substances on the Prohibited List. These are, whether the substances are performance enhancing and a potential risk to health and against the spirit of sport. Respondents were also asked their opinion on whether they considered drugs that were part of the Monitoring Program should be put back on the Prohibited List. Demographic details were used to establish the influence of age, sport, country of representation, and experience of being drug tested on the responses to other questions. The Bristol Online Survey software (BOS, Bristol University, UK) was used to construct the questionnaire on-line. Ethical approval was granted by Liverpool John Moores University Ethics Committee.

The questionnaire was distributed to athletes from four English-speaking nations: Australia, Canada, the UK, and the USA. Athletes targeted were those competing at the highest (i.e. international) level selected through their affiliation to elite squads or athlete testing pools, representing 10 Olympic sports, including track and field athletics, canoeing, cycling, gymnastics, hockey, rowing, swimming, triathlon, volleyball and weightlifting. These sports were selected to provide a spectrum of sporting endeavour, including individual and team sports and incorporating a wide range of athletic skills. Sports were chosen because they were well represented across all four nations.

Distribution, over a six-month period, was achieved through personnel from the respective National Anti-Doping Organisations (NADOs) including the Australian Sports Anti-Doping Authority (ASADA), the Canadian Centre for Ethics in Sport (CCES), UK Sport, and the United States Anti-Doping Agency (USADA). NADO personnel used mailing lists from their athlete testing pools to target the relevant individuals. Where appropriate, NADO representatives corresponded with the specific sports' National Governing Bodies (NGB) to distribute the questionnaire to those athletes who were part of their elite squads.

Electronic questionnaires were accessed by athletes via an email outlining the project and incorporating a web-link to the questionnaire. Completed on-line questionnaires were maintained on a central database. Postal questionnaires were returned via a stamp-addressed envelope directly to the Research Team. All questionnaires were anonymous.



**Fig. 1** Respondents demographics described numerically as a percentage of the whole population ( $n = 557$ ) and with percentages illustrated graphically. \* Athletes were asked to specify the number of times they had been drug tested in- and out- of competition. The profile of each was equal. Therefore, for the purposes of cross-tabulation analysis, data were combined.

Completed questionnaires were coded and entered into a data file for analysis using the Statistical Package for the Social Sciences (SPSS®), version 14 (Chicago, IL, USA). Frequency analysis and comparisons between frequency counts were performed using cross tabulation matrices and  $\chi^2$  analyses. Where appropriate (i.e. for the parametric data), differences between groups were assessed using  $t$ -tests and analysis of variance (followed-up with Tukey's multiple comparisons). Statistical significance was accepted at  $p < 0.05$ .

## Results

NADO representatives attempted to contact the athletes affiliated to their respective organisations and NGBs. The researchers had no means for determining how many of these athletes were reached. From the athletes that were contacted, 557 completed and returned questionnaires, 507 (91%) electronic responses and 50 (9%) postal. The demographic profile of respondents is shown in **Fig. 1**.

Knowledge and understanding were assessed through the responses to four questions. These questions related to the knowledge of the maximum penalty incurred following a doping violation involving a banned OTC stimulant and the status of substances in relation to the Prohibited List and the understanding of the terms Monitoring Program and Specified Substances. The percentage of respondents who understood the term Monitoring Program (43.3%) and Specified Substances (67.5%) was generally low. Only 50.5% of respondents knew the maximum

**Table 1** Summary of statistical analysis relating to respondent knowledge and understanding with country of representation

Question	Respondents answering correctly				Statistical significance (p value)
	Australia (% of total Australian respondents)	Canada (% of total Canadian respondents)	UK (% of total UK respondents)	USA (% of total USA respondents)	
Knowledge of the penalty for a doping offence	58 (54.7)	35 (44.9)	72 (48.3)	114 (51.8)	0.536
Understanding of "Monitoring Program"	46 (43.4)	39 (50.0)	60 (40.0)	96 (43.0)	0.552
Understanding of "Specified Substance List"	71 (67.0)	42 (53.8)	116 (77.3)	147 (65.9)	0.004*
Mean % score for identifying the prohibited status of drugs	64.0	61.3	59.4	60.4	0.034*

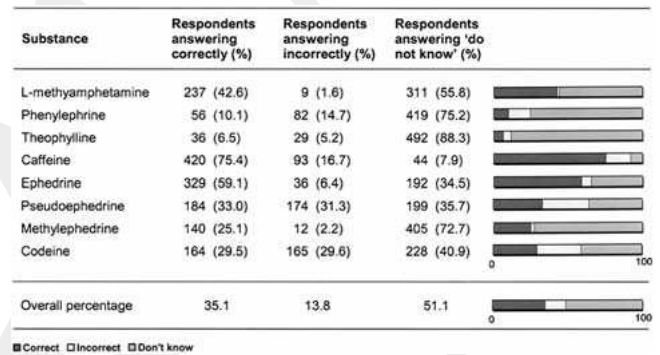
\* Statistically significant ( $p < 0.05$ )

penalty incurred following a first doping violation involving a banned OTC stimulant. Athletes' knowledge on the status of selected substances in terms of the Prohibited List was also poor – highlighted by the high proportion of incorrect or 'do not know' responses, overall (● Fig. 2). With the exception of caffeine and ephedrine, the status of the substances present in common OTC medications, was not widely known. Respondents' collective knowledge on the prohibition status of selected substances was established by determining an overall score.

Respondents' knowledge and awareness were compared across the demographic data. Younger athletes (aged less than 20 years) were generally less knowledgeable than older athletes, although the difference was not marked ( $t_{(547)} = -0.902$ ,  $p = 0.367$ ). For example, 40.4% of younger athletes understood the term Monitoring Program compared with 43.9% older athletes ( $\chi^2_{(1)} = 0.332$ ,  $p = 0.564$ ) and 39.8% of younger athletes knew the penalty for a doping offence compared with 52.8% older athletes ( $\chi^2_{(1)} = 5.506$ ,  $p = 0.019$ ). Their respective percentage scores for identifying the status of drugs in terms of the Prohibited List were 57.6 for younger athletes and 61.8 for older athletes ( $t_{(547)} = -3.135$ ,  $p = 0.002$ ). Knowledge and understanding was generally poor, irrespective of country of representation (● Table 1). Although UK respondents when compared to those from other nations stated that they had an understanding of the term "specified substances" ( $\chi^2_{(3)} = 13.508$ ;  $p = 0.004$ ), Australian respondents generally performed better in terms of knowledge ( $F_{(3, 553)} = 2.907$ ;  $p = 0.034$ ). Post hoc analysis (Tukey HSD) demonstrated that the significant difference was evident between Australian and UK athletes ( $p = 0.024$ ). Nevertheless, the difference in real terms was small.

With respect to respondents' sport, those representing triathlon were most aware of the maximum ban imposed following a positive drugs test involving a banned OTC stimulant (66.7%) whilst those representing gymnastics demonstrated a limited awareness (32.4%). Regarding an understanding of the Monitoring Program, approximately half of track and field athletes and swimmers and less than a third of hockey and volleyball players reported an understanding of the term. As with the overall trend, understanding of the term Specified Substances was generally greater with almost 80% of gymnasts and hockey players reporting an understanding. With regards to identifying whether particular drugs were present or not, on the Prohibited List scores were similar to the overall sample mean (60.9%) with outer limits of weightlifting (67.1%) and volleyball (52.3%).

Scores of each question relating to knowledge and understanding were ranked according to a respondent's sport (● Table 2). Generally, the ranking showed inconsistency across sports with the exception of volleyball, which consistently scored low in comparison to the other sports.



■ Correct □ Incorrect ■ Don't know

**Fig. 2** Respondents' knowledge with regards to the status of selected substances in terms of the Prohibited List.

No statistical difference in knowledge and understanding was recorded between those athletes who had been drug tested one or more times and those athletes who had not been tested ( $t_{(555)} = 0.297$ ,  $p = 0.767$ ). For example, 43.8% of athletes who had not been tested understood the term Monitoring Program compared with 43.0% of athletes who had been tested ( $\chi^2_{(1)} = 0.006$ ,  $p = 0.939$ ) and 46.3% of non-tested athletes knew the penalty for a doping offence compared with 52.6% of tested athletes ( $\chi^2_{(1)} = 1.737$ ,  $p = 0.188$ ). Their respective percentage scores for identifying the status of drugs in terms of the Prohibited List were 59.4 for non-tested and 61.7 for tested athletes ( $t_{(555)} = -1.939$ ;  $p = 0.053$ ).

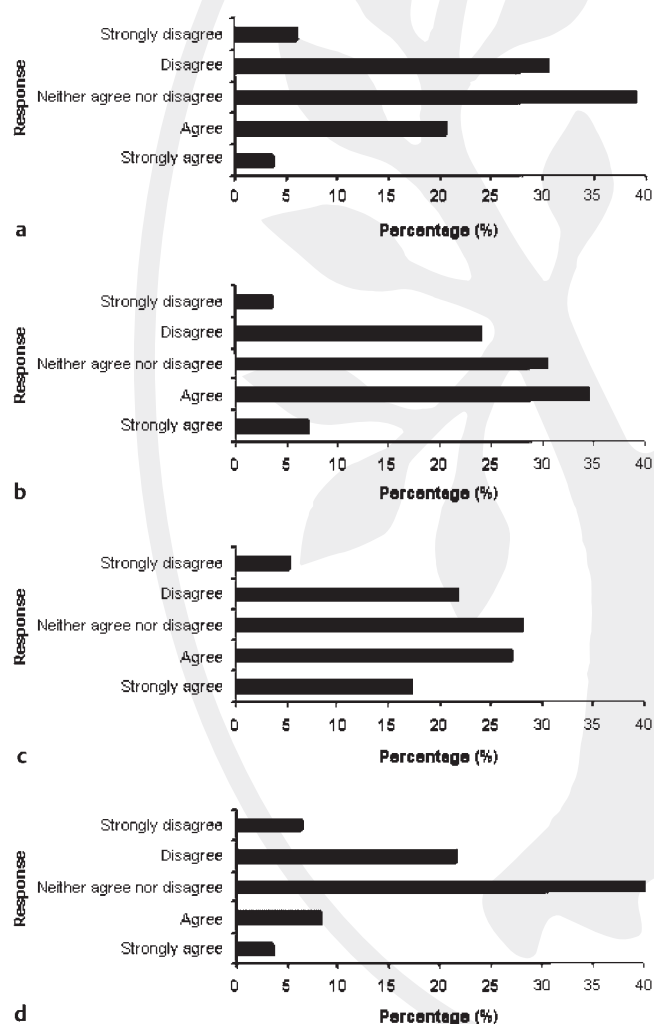
Athletes expressed their level of agreement with a series of statements pertaining to specific issues relating to anti-doping and OTC drugs (● Fig. 3a to d). These statements related to WADA's criteria for determining whether or not a substance should be placed on the Prohibited List. Many athletes were disinclined to give an opinion on these statements, however overall, respondents were generally inclined toward the opinion that OTC stimulants are performance enhancing, pose a risk to health and their use is against the spirit of sport but that OTC stimulants should not be put back on the WADA Prohibited List.

## Discussion

Knowledge and understanding regarding prohibited substances are paramount amongst elite athletes since a positive test, albeit as a consequence of ignorance, would have a significant effect on an individual's sporting career and reputation. It was clear from the results of this study that respondents, overall, had a limited knowledge and awareness of OTC medication in reference to anti-doping.

**Table 2** Ranking of performance on knowledge and understanding according to sport

Rank	Question Maximum penalty for a doping offence involving a banned OTC stimulant	Question Understanding of "Monitoring Program"	Question Understanding of "Specified Substance List"	Question Identifying the status of drugs in terms of the Prohibited List	Overall ranking score (based on the accumulated rankings for all four questions)
Highest 1	Triathlon	Athletics	Gymnastics	Weightlifting	Athletics, Cycling, Weightlifting (17)
2	Athletics	Swimming	Hockey	Rowing	–
3	Cycling	Rowing	Canoeing	Cycling	–
4	Canoeing	Cycling	Swimming	Canoeing	Rowing (18)
5	Weightlifting	Gymnastics	Weightlifting	Triathlon	Canoeing (19)
6	Hockey	Weightlifting	Rowing	Athletics	Swimming (21)
7	Rowing	Triathlon	Cycling	Swimming	Triathlon (23)
8	Swimming	Canoeing	Athletics	Hockey	Gymnastics (25)
9	Volleyball	Volleyball	Volleyball	Gymnastics	Hockey (26)
Lowest 10	Gymnastics	Hockey	Triathlon	Volleyball	Volleyball (37)



**Fig. 3 a to d** Respondents' opinion on the statements. **a** OTC stimulants are not performance enhancing. **b** OTC stimulants are a potential risk to the health of the athlete. **c** The use of OTC stimulants is against the spirit of sport. **d** OTC stimulants removed from the WADA Prohibited List in January 2004 should be put back on.

Respondents had generally poor knowledge with regards to the prohibition status and on the legislation following a doping violation involving a banned OTC stimulant. Similarly, awareness of the Monitoring Program was poor. Specified substances were better understood, perhaps reflecting athlete's awareness of "loopholes" in the testing system. It was surprising that knowledge and understanding were so low considering that 65.6% of respondents had been tested. Lack of awareness and understanding is concerning and may reflect current paucity in anti-doping education and information provision within sports or a lack of communication between WADA, NADOs, NGBs, and athletes. The World Anti-Doping Code (WADC) states that "...Anti-Doping Organisations should plan, implement and monitor information and education programmes" [12] (p. 50, section 18.2). Education needs to encompass all those involved in sport, from the elite athletes through to potential, school level athletes, their respective supporters including coaches and medical personnel and even journalists [1,10]. Professional coaches, in particular, have been shown to be a prime target group for further education and training on doping [7]. This has also been acknowledged and acted upon by WADA, who launched a coaches' educational tool kit in 2007 [13]. Further research evaluating current education models would be useful in identifying good practice. As expected, differences in knowledge and understanding between younger and older athletes indicated a slightly greater knowledge in the older age group. Education directed at younger age groups at school and sports clubs is more likely to influence an individual's behaviour in terms of anti-doping [2,5,9].

Some difference in knowledge and understanding was seen across nations and sports. The questions used to ascertain knowledge and understanding were fundamental to the WADA Code and, therefore, should have been known to all respondents. WADA regulations apply equally to all sports, therefore, differences in responses between sports are difficult to explain. Team sports were the lowest ranking on knowledge and understanding, perhaps because team members take less individual responsibility for keeping up-to-date on doping issues. Other factors that might influence differences between sports are the extent to which testing is carried out within individual sports and the age range of competitors, both factors of which have been shown, in this study, to influence knowledge and understanding. For example, gymnastics, the lowest ranked individual sport tends to have a lower age range. Sports that appear to have a par-

ticular doping problem, such as athletics, cycling, and weightlifting, showed a tendency to perform relatively better on the knowledge and understanding questions. It is likely that to combat such a negative reputation, specific NGBs and athletes take a more pro-active stance with regards to anti-doping knowledge and education. Organisations such as WADA and NADO's have the responsibility to promote drug-free sport and NGBs role is to adhere to the WADC and function under the direction of their NADO. Devolution of this responsibility to NGBs and individual sports clubs is deemed to be essential in improving the accessibility of anti-doping information and maintaining the drug free sport ethos. Education must not only focus on the athlete but on all those with a responsibility to athletes.

Respondents' views generally reported that OTC stimulants are a risk to health, are performance enhancing and that their use is against the spirit of sport. There was uncertainty as to whether they should be placed back on the Prohibited List. By incorporating further questions with psychometric properties, the researchers may have been able to gain further information with regards to the premise behind the overall views held by respondents.

A difficulty encountered in carrying out the study was the distribution of questionnaires to elite athletes across four nations. The endorsement of the project from each NADO was critical to its success. The use of the Internet as a research methodology in a survey-based project was attractive. The software employed ensured anonymity and, therefore, fulfilled ethical requirements. Issues still remain in terms of the accessibility of potential respondents to the Internet [8] and that more frequent Internet users are likely to be over-represented in on-line surveys [6]. Postal questionnaires were used in instances where the electronic distribution of questionnaires was not possible. Analysis of demographic data collected from the two methodologies showed no statistically significant differences, therefore, data were combined for analysis.

## Conclusion

In conclusion, it is evident that elite athletes require targeted education programmes that will enable them to make informed decisions on the potential of OTC medications for therapeutic or performance enhancing purposes. It is also incumbent on national federations and support personnel such as team doctors

to ensure that athletes are fully aware of their responsibilities in drug-free sport.

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