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THE IMPACT OF CHANGES TO THE PROHIBITED LIST ON THE USE OF OVER-THE-COUNTER MEDICATION BY ATHLETES

Final Report

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Executive summary

Aim

The broad aim of this project was to explore the use of over-the-counter (OTC) medication, amongst athletes, from four nations and across 10 sports, with specific reference to stimulants on the Monitoring Program and Prohibited List.

Methodology

1. A review of the scientific literature was undertaken to establish current evidence with regards to the physiological and performance enhancing properties of OTC medication and their desirability as drugs of abuse.
2. A questionnaire was developed to assess respondents:
    i. demographics;
    ii. use of OTC drugs;
    iii. knowledge and understanding of OTC medication in reference to anti-doping measures; and
    iv. views and opinions regarding changes to the Prohibited List.

    It was administered to elite athletes from Australia, Canada, the UK and the USA representing 10 Olympic sports, including: track and field athletics, canoeing, cycling, gymnastics, hockey, rowing, swimming, triathlon, volleyball and weightlifting.
3. Data from WADA-accredited laboratories was obtained to assess current proportions of urine samples testing positive for stimulants on the Monitoring Program and Specified Substance List.

Key findings

The current research has generated several key findings with regards to the use of OTC drugs amongst elite athletes across four major sporting nations:

i. Athletes who had used OTC products containing substances present on the Monitoring Program over the preceding 12 months accounted for 38 percent of all respondents.
ii. A small proportion of athletes used OTC products for their reputed ergogenic properties.
iii. Athletes demonstrated limited knowledge relating to the penalty incurred following a doping violation involving a banned OTC stimulant; the terms

Monitoring Program and Specified Substance List; and the status of substances in relation to the Prohibited List.

iv. If unsure of the prohibitive nature (or otherwise) of an OTC product almost all athletes would consult someone for advice.

v. Both WADA and individual NADOs were the choice by many athletes in terms of whom they would consult for advice. A significant proportion of younger athletes stated that they would consult an individual such as their coach, training partner or team doctor.

vi. Athletes representing cycling and triathlon were most likely to be dissatisfied with anti-doping education within their sport.

vii. The development of a list according to ailment, highlighting OTC products that do [not] contain prohibited substances was deemed an appropriate measure to improve the information available to athletes.

viii. Data from the Monitoring Program supports that of the questionnaire with regards to pseudoephedrine use, however data that pertains to phenylephrine is difficult to interpret.

ix. As a whole, athletes were of the opinion that: OTC stimulants were not performance enhancing; they posed a risk to health; their use was against the spirit of sport; and yet should remain off the Prohibited List.

Conclusions

Whilst the balance of scientific evidence would promote the use of caffeine as an ergogenic aid, the evidence for the use of other stimulants found in OTC medication for the treatment of the symptoms associated with upper respiratory tract infection is less convincing.

The use of OTC products amongst elite athletes is significant, however the evidence suggests that use of such preparations is primarily for therapeutic purposes.

An overall limited knowledge and awareness of OTC medication in reference to anti-doping was evident amongst elite athletes, suggesting that ignorance remains an important factor in the use of drugs by athletes. This is only tempered by their willingness to seek advice from reliable sources.

The inability of the Monitoring Program to provide valid evidence to support the misuse of substances contained in OTC medications highlights the need to expand the current programme to all WADA-accredited laboratories and to include continual qualitative assessment of the situation.

Section 1. Introduction

1.1. Background

In January 2004 the World Anti-Doping Agency (WADA) introduced the first World Anti-Doping Code (WADC) and along with this came a revised Prohibited List. Amongst other changes, the new 2004 list saw the removal of some of the stimulants, including, amongst others, caffeine, phenylephrine, phenylpropanolamine, pseudoephedrine and synephrine. These substances were transferred to a Monitoring Program and were no longer considered prohibited substances. The purpose of the programme is to monitor these substances to assess whether they are being misused in sport and thus providing evidence for their re-introduction to the Prohibited List.

The WADA stated that the criteria for a substance to be considered for inclusion on the Prohibited List were that the use of a substance:

1. Enhances performance;
2. Risks the health of an athlete; and
3. Is against the spirit of sport.

The reasoning behind the reclassification of many OTC drugs was that they did not meet two out of the three criteria for inclusion on the list. An additional reason for the reclassification was the view held, that athletes should not be penalised for using readily available OTC medications, containing these substances, to treat cough and cold symptoms (WADA, 2003).

It is also evident that the term OTC is becoming misleading due to the greater availability of such products directly from the shelf and from outlets other than pharmacies, such as supermarkets. It is inevitable that this would have a direct effect on the availability of these products to a wider market.

Unfortunately, the removal of substances, present in readily available OTC medications, from the Prohibited List may increase the likelihood of their use for performance enhancing purposes. The attitude that use of substances for such purposes is acceptable as long as they are ‘legal’ highlights the underlying ethical and moral problem surrounding drug misuse in sport.

The following study will attempt to provide further information regarding the use of OTC stimulants by athletes.

This report will consist of the following sections: -

i) A review of the most relevant literature;
ii) A survey of elite athletes concerning the use, knowledge and views and opinions of the use of OTC medication in sport;
iii) Recommendations for further research and practical suggestions with regards to anti-doping issues that arise from the findings from the current research.

1.2. Literature review

Prior to 2004, Chester *et al*. (2003a) found that athletes participating at a high-level tended to avoid OTC medicines or those containing IOC prohibited substances. Nevertheless, in the year April 2002-2003 UK Sport reported that out of the 100 anti-doping results that required further investigation, 49 were for stimulants. Almost half of these were due to the stimulants phenylpropanolamine, ephedrine, pseudoephedrine and phenylephrine (UK Sport, 2003), which can all be found in a large number of OTC cough, cold, allergy and hay fever preparations. This data suggests that anti-doping violations involving stimulants were a major issue and many of these may have been unintentional violations due to the use of OTC products for therapeutic purposes. Initially, cut-off levels for the concentration of these substances in the urine were introduced. However, in a study conducted by Chester *et al*. (2004) it was concluded that following multiple therapeutic dosing of either phenylpropanolamine or pseudoephedrine, the drug urine concentrations remained above the IOC cut-off levels for a at least 6 and 16h respectively. This suggests that even with the presence of cut-off levels, unintentional violations due to the therapeutic use of OTC cough, cold, allergy and hay fever preparations were extremely likely. By removing some of these stimulants from the list it was hoped that such unintentional violations would be minimised.

The stimulants phenylpropanolamine, pseudoephedrine and phenylephrine, which have been removed from the Prohibited List, and ephedrine, which remains on the List are also known as sympathomimetic amines. Sympathomimetic amines (SA) are compounds that stimulate the sympathetic nervous system and initiate to a lesser or greater extent the sympathetic response. They have a number of actions that give rise to their therapeutic use and their potential use as ergogenic aids. Their action as α_1-receptor agonists means

that SA cause vasoconstriction of arterial smooth muscle. This restricts blood flow to affected tissues, like the nose and eyes, and prevents mucus accumulation in these areas. Sympathomimetic amines are therefore effective decongestants for use in cough, cold and allergy (Armstrong and Chester, 2005).

According to Armstrong and Chester (2005), there are a number of ways that SA's could have a positive effect in terms of the body's response to stressful situations. These include increased cardiac activity, bronchodilation, increased oxygen uptake and ventilation, redistribution of blood flow to working muscles, increased glycogenolysis and central nervous system stimulation. However, studies in this area are inconclusive in terms of SA use and performance enhancement. Studies that have assessed the performance effects of pseudoephedrine (Gillies *et al*., 1996; Chester *et al*., 2003b), phenylpropanolamine (Chester *et al*., 2003b) and ephedrine (Sidney and Lefcoe, 1977) alone have shown no significant improvements. However, recent work has found that in combination with caffeine, pseudoepedrine (Weatherby and Rogerson, 2002) and ephedrine (Bell *et al*., 1998; 2002) significantly improves exercise performance.

There are numerous studies relating to the side effects of SA's. Thomas *et al*. (1991) reported cardiovascular effects including vasoconstriction and an increase in cardiac performance following phenylpropanolamine administration at recommended therapeutic doses. These effects can be attributed to the action on α_1- and β_1-adrenergic receptors. Increased systolic blood pressure following administration of SA's has been observed by several investigators (Bye *et al*., 1974; Thomas *et al*., 1991; Chester, 2000; unpublished). It is therefore advised that use of SA's be avoided by hypertensives. According to Mottram (1999) the likelihood of adverse side effects when used at supratherapeutic doses and the lack of evidence of performance enhancement makes SA's less desirable for abuse.

In addition to SA's, caffeine is a common constituent of OTC medication. However, unlike SA's the literature supports the ergogenic properties of caffeine. Ingestion of moderate doses of caffeine (3-6 $mg.kg^{-1}$ body mass), 60 min prior to exercise has been shown to enhance performance during prolonged, submaximal exercise (Graham and Spreit, 1995; Pasman *et al*., 1995; Greer *et al*., 2000) and during high-intensity exercise of short duration (Jackman *et al*., 1996; Bruce *et al*., 2000). The mechanism(s) by which caffeine elicits these ergogenic effects are unknown, but may include its ability to stimulate the central nervous system, to act as an adenosine receptor antagonist or to improve muscle contractility (Graham, 2001).

Although evidence of specific health problems is equivocal, health authorities discourage long-term use of caffeine. Adverse health effects are minimal but may include tachycardia, insomnia, headache, dizziness, and diuresis at doses exceeding 9 $mg.kg^{-1}$ body mass (Pasman *et al*., 1995). Caffeine ingestion in moderate doses has no adverse effects on the thermoregulatory response during exercise (Dunagen *et al*., 1998) and exercise appears to negate the effect of caffeine-induced diuresis (Wemble *et al*., 1997). The lack of reported adverse effects on health and performance, following moderate doses of caffeine makes it an appealing ergogenic aid.

Nevertheless, Chester *et al*. (2003a) found that athletes competing at the highest level of competition were most in favour of prohibition of stimulants, found commonly in OTC medication. Reasons suggested for this 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.

The current research was designed to address, internationally the motives of athletes, from various sports, in terms of their use of substances present in OTC medications. Such qualitative data will provide support to the urinalysis results provided by the doping control laboratories.

1.2. Aims

The aim of the study was to assess the use of OTC drugs amongst athletes since the introduction of the 2004 Prohibited List. Athletes' motives for OTC drug use since the introduction of the List, their knowledge relating to anti-doping and OTC medication and their views on changes to the List would also be considered.

In order to achieve the aim a questionnaire would be administered to athletes and analysed to assess:

- The extent of use of OTC stimulants present on the Monitoring Program and Specified Substance List, since January 2004;
- The reasons for use of OTC stimulants present on the Monitoring Program and Specified Substance List, since January 2004;
- Knowledge and understanding relating to anti-doping and OTC medication use in sport amongst elite athletes;
- Views and opinion of elite athletes on anti-doping and OTC medication use in sport

- The influence of age and experience of being drug tested, on the use of OTC stimulants and the knowledge and understanding and views and opinion of anti-doping and OTC medication use in sport; and
- The influence of sport and country of representation, on the use of OTC stimulants and the knowledge and understanding and views and opinion of anti-doping and OTC medication use in sport

Also, laboratory test data were to be collected from the WADA, relating to substances present on the Monitoring Program and the Specified Substance List. This data would be analysed to assess:

- The extent of use of these substances since January 2004; and
- Changes in the use of these substances since January 2004

Section 2. Methodology

2.1. Questionnaire

A questionnaire was developed that comprised of questions pertaining to respondent demographics, use of OTC drugs, knowledge and understanding of OTC medication relative to anti-doping measures and views and opinions regarding changes to the Prohibited List (Appendix 1). The questionnaire was modified following the undertaking of a pilot study that used a convenience sample of endurance athletes. The Bristol Online Survey software (BOS, Bristol University, UK) was used to construct an on-line questionnaire – identical to the postal questionnaire. The ethics committee of Liverpool John Moores University granted ethical approval for the study.

2.2. Subjects

The questionnaire was distributed to 6326 athletes from four nations: Australia, Canada, the UK and the USA. Athletes targeted were those competing at the highest level selected through their affiliation to elite squads or athlete testing pools. Athletes represented 10 Olympic sports, including track and field athletics, canoeing, cycling, gymnastics, hockey, rowing, swimming, triathlon, volleyball and weightlifting.

2.3. Distribution

The questionnaire was distributed to elite athletes across four nations (i.e. Australia, Canada, the UK and the USA) competing at the highest level (i.e. international) over a period of six months. Distribution was achieved by postal or electronic means in the first instance via personnel from the relative National Anti-Doping Organisations (NADO) 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). Where possible representatives from the respective NADOs, used mailing lists from the athlete testing pool to target the relevant individuals. Where this was not achievable NADO representatives corresponded with the specific sports' National Governing Bodies (NGB) to provide their support to the project and instigate distribution of the questionnaire to those athletes that were part of their elite squads. Where direct correspondence with NGBs was necessary it was done with the support of the corresponding NADO.

Representatives from the NGBs volunteered to distribute the questionnaires to individuals from their elite squads.

Questionnaires were not distributed directly from the research team to the athletes and were therefore anonymous. Where electronic questionnaires were used an email outlining the project, together with a web-link directing the recipient to the questionnaire was distributed to the respective athletes via a NADO or NGB representative. Following completion of the questionnaire, on-line submission to a central database maintained anonymity. Alternatively postal questionnaires were returned via a stamp-addressed envelope directly to the Research Team.

2.4. Monitoring Program data

Data from specific laboratories (i.e. those involved in the Monitoring Program) was obtained from WADA outlining proportions of positive urine samples (relative to the total number of test samples) involving substances on the Monitoring Program and Specified Substance List (Appendix 2). This was used as a comparative data set to provide evidence of current use of drugs found in OTC medication in-competition.

2.5. Statistical analysis

Completed questionnaires were coded and entered into a data file for analysis using the Statistical Package for the Social Sciences (SPSS®), version 14 (Chicago, Illinois, USA). Frequency analysis and comparison between frequency counts was performed using cross tabulation matrices and Chi^2 analysis. Where appropriate differences between groups were assessed using t-tests and analysis of variance. Statistical significance was accepted at $P < 0.05$.

Section 3. Results

3.1. Demographic profile

From the total of 6326 athletes that were contacted, 557 completed and returned questionnaires. From this total, 507 (91%) were electronic responses and 50 (9%) were postal responses. Response rates attributed to the country of representation were 16 percent for those athletes representing the USA, 11 percent for Australia, seven percent for Canada and six percent for the UK. The two independent variables deemed to be the most indicative of exposure to anti-doping measures were age of respondents and the number of occasions tested. The proportions of respondents in these two categories were similar with regards to the profile evident across the independent variables according to Chi-square analysis. Respondents' sex, sport and country of representation were defined as moderator variables. The characteristics of respondents are highlighted in Table 1.

Overall there were an equal proportion of male and female respondents with approximately an 80:20 split between those aged 20 years and over and those aged below 20 years. The highest proportion of athletes represented the USA with a relatively low proportion representing Canada (Table 1). Swimming was the highest represented sport amongst respondents followed by cycling, track and field athletics and rowing. Triathlon, gymnastics and canoeing were the lowest represented (Table 1). With regards to the number of occasions that respondents had been drug tested, almost two thirds had been tested on one or more occasions whilst approximately one third had not been tested.

3.2. Knowledge and understanding

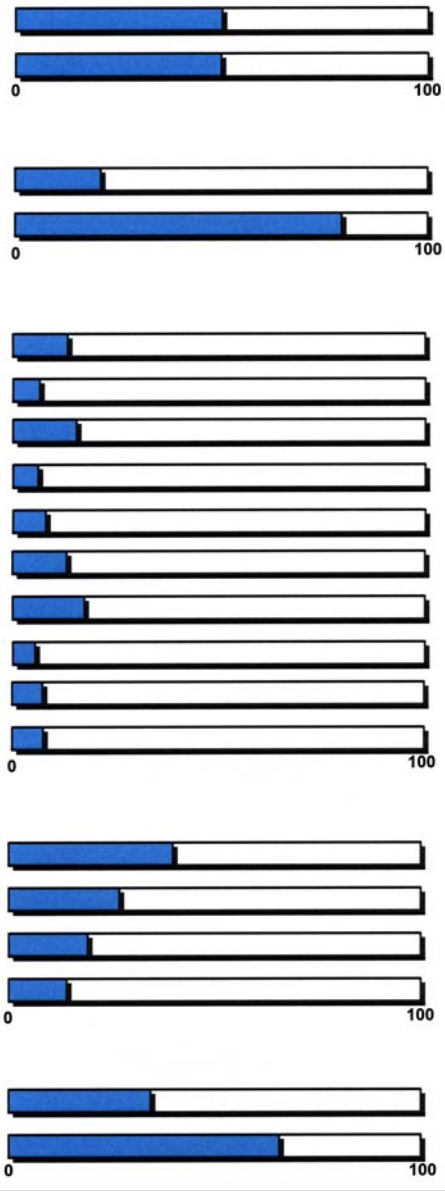
Knowledge and understanding was assessed through the responses to four questions. These questions related to the penalty incurred following a doping violation involving a banned OTC stimulant; the terms Monitoring Program and Specified Substance List; and the status of substances in relation to the Prohibited List (Appendix 1).

Respondents' knowledge was poor with regards to the maximum penalty incurred following a first doping violation involving a banned OTC stimulant, with only 50.5 percent of athletes answering correctly. Similarly, respondents alleged understanding of the Monitoring Program and the Specified Substance List was generally poor (Table 2). Less

than half of the respondents were familiar with the Monitoring Program and only two-thirds were familiar with the Specified Substance List.

Table 1: Respondent characteristics

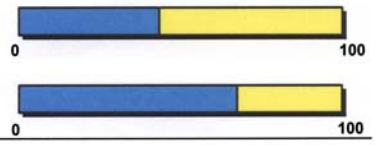
Characteristic	Number of athletes (%)	
Sex		
Male	279 (50.1)	
Female	278 (49.9)	
Age		
< 20 years	114 (20.8)	
≥ 20 years	435 (79.2)	
Sport		
Athletics	74 (13.3)	
Canoeing	36 (6.5)	
Cycling	86 (15.4)	
Gymnastics	34 (6.1)	
Hockey	44 (7.9)	
Rowing	73 (13.1)	
Swimming	97 (17.4)	
Triathlon	30 (5.4)	
Volleyball	41 (7.4)	
Weightlifting	42 (7.5)	
Country		
USA	223 (39.8)	
UK	150 (26.9)	
Australia	106 (19.2)	
Canada	78 (14.1)	
Number of times drug tested*		
Zero	190 (34.4)	
≥ 1	363 (65.6)	



*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.

Table 2: Respondents alleged understanding of the terms 'Monitoring Program' and 'Specified Substance List'

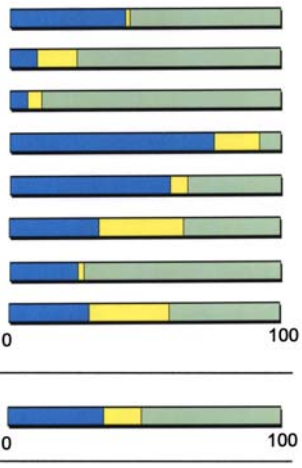
Term	Respondents reporting an understanding (%)	Respondents not reporting an understanding (%)
Monitoring Program	241 (43.3)	316 (56.7)
Specified Substance List	376 (67.5)	181 (32.5)



Athletes knowledge on the status of selected substances in terms of the Prohibited List was also poor – highlighted by the high proportion of 'do not know' responses, overall (Table 3). Furthermore, only 35.1 percent of athletes identified the correct status of substances, overall. The status of the substances, pseudoephedrine, phenylephrine and codeine – ingredients in common OTC cold and flu medications, was not widely known. However, the awareness with regards to the status of the stimulants, caffeine and ephedrine was, in comparison, high. Respondents' collective knowledge on the status of selected substances in terms of the Prohibited List was established by determining an overall score for question nine (60.9%).

Table 3: Respondents knowledge with regards to the status of selected substances in terms of the Prohibited List

Substance	Respondents answering correctly (%)	Respondents answering incorrectly (%)	Respondents answering 'do not know' (%)
L-methyamphetamine	237 (42.6)	9 (1.6)	311 (55.8)
Phenylephrine	56 (10.1)	82 (14.7)	419 (75.2)
Theophylline	36 (6.5)	29 (5.2)	492 (88.3)
Caffeine	420 (75.4)	93 (16.7)	44 (7.9)
Ephedrine	329 (59.1)	36 (6.4)	192 (34.5)
Pseudoephedrine	184 (33.0)	174 (31.3)	199 (35.7)
Methylephedrine	140 (25.1)	12 (2.2)	405 (72.7)
Codeine	164 (29.5)	165 (29.6)	228 (40.9)
Overall percentage	35.1	13.8	51.1



When comparing respondents' knowledge and awareness across the demographic data, it was apparent that younger athletes (aged < 20 years) were generally less knowledgeable than older athletes (aged ≥ 20 years) (Table 4). When questioned on the penalty incurred following a doping offence involving an OTC stimulant, 40 percent of younger respondents compared with 53% of older respondents answered correctly (p = 0.019). When questioned on whether particular substances did or did not feature on the Prohibited List, as a group, older athletes scored over 4% higher than younger athletes (p = 0.002). Although these differences were statistically significant the practical significance of these differences is small. Indeed, a four percent difference in score equated to less than one further question answered correctly. Moreover, older athletes scored four percent higher compared with their younger peers when asked if they understood the key term 'Monitoring Program', although contrary to the trend three percent lower when asked if they understood the term 'Specified Substance List'.

Table 4: Summary of statistical analysis relating respondent knowledge and understanding with age

	Respondents answering correctly		
Question	**Aged < 20 years (% of total respondents aged < 20 years)**	**Aged ≥ 20 years (% of total respondents aged ≥ 20 years)**	**Statistical significance (P value)**
Knowledge of the maximum penalty for a doping offence involving a banned OTC stimulant	45 (39.8)	228 (52.8)	0.019*
Knowledge of the term 'Monitoring Program'	46 (40.4)	191 (43.9)	0.564
Knowledge of the term 'Specified Substance List'	80 (70.2)	290 (66.7)	0.549
Mean score (%) for identifying the status of drugs in terms of the Prohibited List	57.6	61.8	0.002*

* statistically significant (P< 0.05)

Knowledge and understanding was generally poor, irrespective of country of representation (Table 5). Examination of each question highlights the overall

inconsistency of knowledge and understanding in relation to each country, with arguably the exception of Australian respondents. Whilst Australian respondents generally performed better in terms of knowledge and understanding, the differences between respondent groups according to their country of representation are small in practical terms. Indeed, a difference in the response to a single question relating to whether a particular drug is present or not, on the Prohibited List equates to a 12 percent difference in score.

Table 5: Summary of statistical analysis relating respondent knowledge and understanding with country of representation

Question	Respondents answering correctly				Statistical significance (P value)
	Australian respondents (% of total Australian respondents)	Canadian respondents (% of total Canadian respondents)	UK respondents (% of total respondents from the UK)	USA respondents (% of total respondents from the USA)	
Knowledge of the maximum penalty for a doping offence involving a banned OTC stimulant	58 (54.7)	35 (44.9)	72 (48.3)	114 (51.8)	0.536
Knowledge of the term 'Monitoring Program'	46 (43.4)	39 (50.0)	60 (40.0)	96 (43.0)	0.552
Knowledge of the term 'Specified Substance List'	71 (67.0)	42 (53.8)	116 (77.3)	147 (65.9)	0.004*
Mean score (%) for identifying the status of drugs in terms of the Prohibited List	64.0	61.3	59.4	60.4	0.034*

* statistically significant ($P < 0.05$)

The knowledge and understanding of issues relating to anti-doping and OTC medication of respondents was generally low according to the sport they competed in. Those respondents 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%). Respondent awareness of the Monitoring Program was low with approximately half of track and field athletes and swimmers and less than a third of hockey and volleyball players reporting an understanding of the term. As with the overall trend, understanding of the term Specified Substance List was generally greater with almost 80 percent 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%) apart from those representing weightlifting (67.1%) and those representing volleyball (52.3%).

Scores of each question relating to knowledge and understanding were ranked according to a respondent's sport (Table 6). Generally, the ranking showed inconsistency across sports with the exception of volleyball, which appeared to score particularly low in comparison to the other sports.

Table 6: Ranking of performance on knowledge and understanding according to respondents sport

	Ranking of knowledge and understanding relating to the performance of questions 6 to 8				
Rank	**Question 6** Maximum penalty for a doping offence involving a banned OTC stimulant	**Question 7a** Understanding of the term 'Monitoring Program'	**Question 7b** Understanding of the term 'Specified Substance List'	**Question 8** 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)

Athletes who had been drug tested scored higher in terms of knowledge and understanding than the competitors who had not been tested (Table 7). However, respondents who had not undertaken a drugs test demonstrated a slightly greater knowledge and awareness of the Monitoring Programme and Specified Substance List. Indeed there was a statistically significant difference (p = 0.038) between respondents who had not been drugs tested and those who had in terms of their perceived understanding of the 'Specified Substance List'.

Table 7: Summary of statistical analysis relating respondent knowledge and understanding with the number of occasions drug tested

	Respondents answering correctly		
Question	**Respondents not drug tested (% of total respondents not tested)**	**Respondents drug tested one or more times (% of total respondents tested one or more times)**	**Statistical significance (P value)**
Knowledge of the maximum penalty for a doping offence involving a banned OTC stimulant	88 (46.3)	191 (52.6)	0.188
Knowledge of the term 'Monitoring Program'	84 (43.8%)	157 (43.0%)	0.939
Knowledge of the term 'Specified Substance List'	141 (73.4)	235 (64.4)	0.038*
Mean score (%) for identifying the status of drugs in terms of the Prohibited List	59.4	61.7	0.053

* statistically significant (P < 0.05)

3.3. Use of OTC medications

Athletes were asked to specify any medications they had used in the past twelve-months for the treatment of symptoms associated with cold and flu or hay fever. This information allowed the identification of specific active ingredients that featured on the Monitoring Program or Specified Substances List (Figure 3). Pseudoephedrine and phenylephrine were found to be the most commonly used substances. Furthermore, 38% of respondents

reported use of a medication containing at least one of those substances from the Monitoring Program in the preceding 12 months. The use of the remaining substances, highlighted, bar codeine were negligible.

Use of OTC drugs containing phenylephrine was significantly higher amongst respondents from Australia and the UK when compared to those from Canada and the USA ($p < 0.001$). Twenty percent of Australian respondents and 19 percent from the UK reported use in the last 12 months, compared to negligible use by Canadian respondents and those from the USA. Similarly, there was a significant difference in the use of OTC medications containing pseudoephedrine with respect to respondents' country ($p < 0.001$). Products containing pseudoephedrine were more commonly used by athletes from the USA (46%), Australia (28%) and Canada (32%), when compared with those from the UK (5%). Furthermore, there was a significant difference in the use of codeine amongst athletes representing the different countries ($p < 0.001$). Twenty percent of Australian athletes reported using OTC products containing codeine over the preceding 12 months whilst there was negligible use across all other respondents.

Reports on the use of any substances that were part of the Monitoring Program (i.e. pseudoephedrine, phenylephrine, phenylpropanolamine, caffeine) over the last twelve-months differed significantly according to respondents' country ($p < 0.001$). Only 24 percent of UK respondents had taken at least one of these substances during this period, compared with 46 percent from the USA, 43 percent from Australian and 34 percent from Canada.

The use of specific substances contained in OTC medications according to the frequency of drug tests experienced by respondents was also statistically significant ($p = 0.029$). Thirty six percent of athletes tested out-of-competition had used an OTC medication containing pseudoephedrine, compared with only 25 percent of those who had not been drug tested out-of-competition. Although not significant, the data suggest that athletes who had been tested (both in- and out-of-competition) on one or more occasions, were more likely to use an OTC medication containing pseudoephedrine (66.7%) or codeine (77.3%), compared with those athletes who had not been drug tested (Pseudoephedrine 33.3%; Codeine, 22.7%).

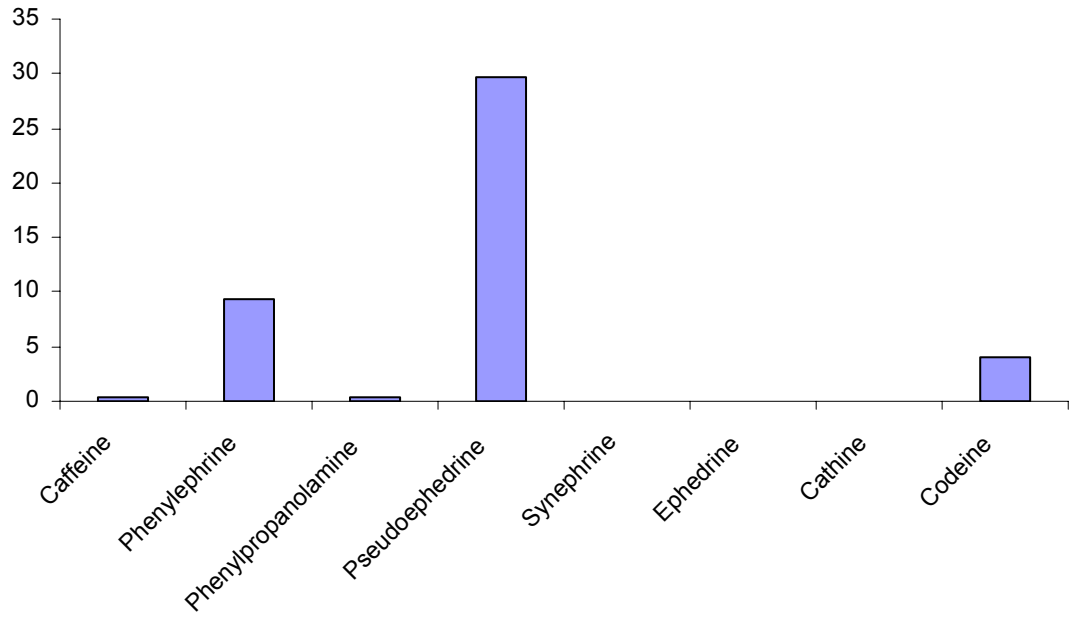


Figure 3: Substances included in OTC medicines used by athletes for the treatment of symptoms associated with cold and flu or hay fever (%)

With regards to respondents' motivation for using OTC medications, a high proportion (73.2%) stated that their main reason was for the treatment of symptoms associated with illness (Table 8). A notable proportion of respondents (23.3%) declined to answer this question with a small proportion reporting the use of OTC medications for ergogenic reasons (3.4%).

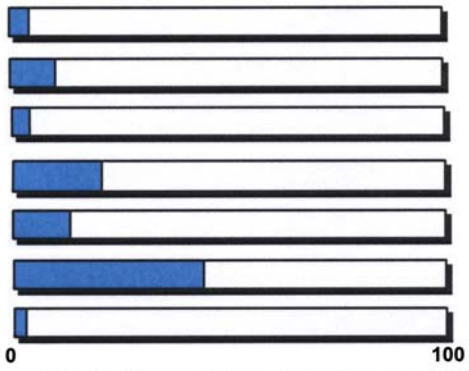
Table 8: Respondents' primary reason for using OTC drugs

Reason	Respondent number (%)	
To treat the symptoms of illness	408 (73.3)	
To enhance performance	4 (0.7)	
Both of the above	15 (2.7)	
Answer declined	130 (23.3)	
		0 100

Of all respondents, 96 percent stated that if they were unsure about the status of a particular substance on the Prohibited List, they would consult someone for advice. In terms of whom they would consult for advice, in the first instance, both national and international anti-doping organisations were cited most frequently (Table 9).

Table 9: Whom athletes would consult in the first instance, for advice on the status of a substance with regards to the Prohibited List

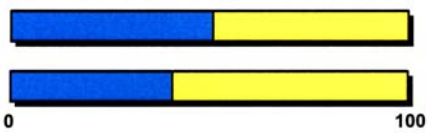
Whom athletes would consult	Respondents (%)
Fellow athlete	25 (4.7)
Coach	56 (10.5)
Team manager	22 (4.1)
Team doctor	109 (20.5)
NGB	72 (13.5)
NADO/WADA	234 (43.9)
Other	15 (2.8)



It was clear that age was a factor in terms of whether respondents would consult, in the first instance, an organisation with a responsibility for anti-doping education (NGB, NADO and WADA) or an individual for advice, regarding a query concerning OTC medication (Table 10). Those aged less than 20 years were more likely to approach an individual rather than an organisation in the first instance for advice, compared to those aged 20 years or over.

Table 10: Whom respondents would consult (individual or organisation) in the first instance, for advice on the status of a substance with regards to the Prohibited List according to age

	Whom respondents would consult in the first instance	
Respondents age	Individual	Organisation
< 20 years (%)	55 (50.9)	171 (49.1)
≥ 20 years (%)	53 (40.8)	248 (59.2)



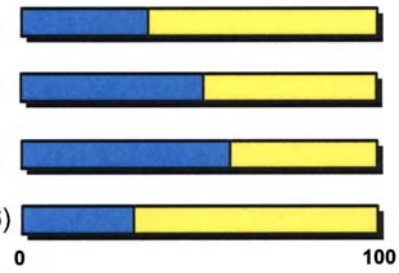
Individual Organisation

As regards the country of representation, there were significant differences between those athletes most likely to consult an individual and those most likely to consult an organisation for advice in the first instance, concerning OTC drugs ($p < 0.001$). Australian and the USA athletes were most likely to consult an organisation, in the first instance for

advice on OTC drugs whilst Canadian and UK athletes were most likely to consult individuals (Table 11).

Table 11: Whom respondents would consult (individual or organisation) in the first instance, for advice on the status of a substance with regards to the Prohibited List according to country of representation*

	Whom respondent would consult in the first instance	
Respondents' country	**Individual (%)**	**Organisation (%)**
Australia	37 (35.6)	67 (64.4)
Canada	39 (51.3)	37 (48.7)
UK	84 (58.7)	59 (41.3)
USA	66 (31.4)	144 (68.6)

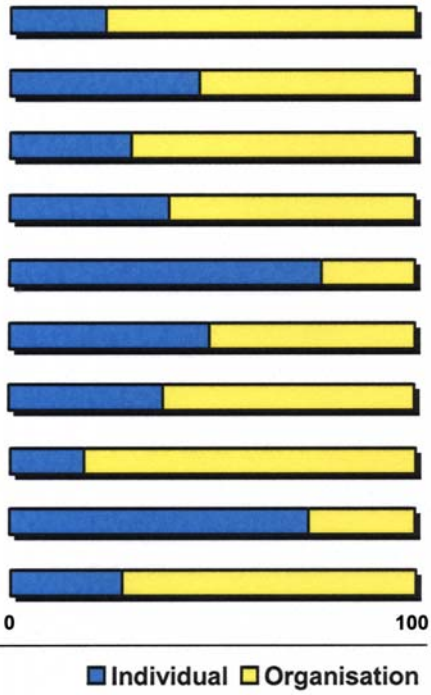


* $P < 0.001$

Responses also differed significantly ($p < 0.001$) with regards to respondents' sport and whether an individual or an organisation would be consulted, in the first instance for advice regarding the use of an OTC medication (Table 12). Triathletes (81.8%), track and field athletes (76.5%), weightlifters (72.5%) and cyclists (70.0%) were most likely to consult, an organisation whereas Hockey players (76.9%) and volleyball players (73.7%) were most likely to consult an individual for advice regarding the use of OTC medication.

Table 12: Whom respondents would consult (individual or organisation) in the first instance for advice on the status of a substance with regards to the Prohibited List according to the sport*

	Whom respondent would consult in the first instance	
Respondents' sport	**Individual (%)**	**Organisation (%)**
Athletics	16 (23.5)	52 (76.5)
Canoeing	15 (46.9)	17 (53.1)
Cycling	25 (30.1)	58 (69.9)
Gymnastics	13 (39.4)	20 (60.6)
Hockey	30 (76.9)	9 (23.1)
Rowing	35 (49.3)	36 (50.7)
Swimming	35 (38.0)	57 (62.0)
Triathlon	4 (18.2)	18 (81.8)
Volleyball	28 (73.7)	10 (26.3)
Weightlifting	11 (27.5)	29 (72.5)

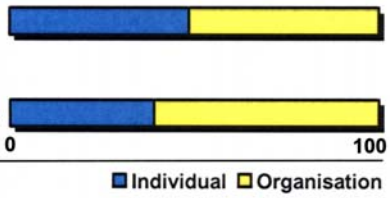


* $P < 0.001$

The experience of a respondent with regards to being drug tested was also a factor in terms of whether they would consult an individual or an organisation, in the first instance, for advice on the use of OTC medication (Table 13). Those respondents that had been drug tested on one or more occasions were more likely to consult advice from an organisation compared with those who had not been drug tested (p = 0.042).

Table 13: Whom respondents would consult (individual or organisation) in the first instance for advice on the status of a substance with regards to the Prohibited List according to the number of occasions drug tested*

	Whom respondent would consult in first instance	
Respondents' experience of drug testing	**Individual (%)**	**Organisation (%)**
Not drug tested	90 (48.6)	95 (51.4)
Tested on one or more occasions	136 (39.1)	212 (60.9)



* $P = 0.042$

In addition, respondents were asked who they had actually received advice from in the past 12 months (Figure 6). Team Doctor, NGB, coach and fellow athlete were highlighted as the most popular channels through which advice had been received, whilst a relatively low proportion of respondents had received advice from their NADO and WADA.

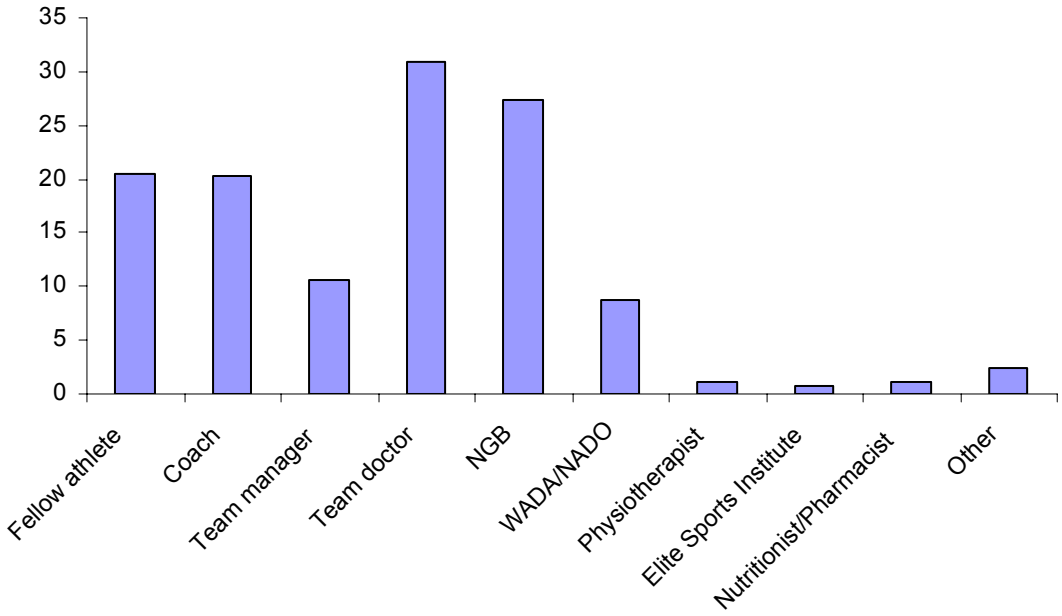
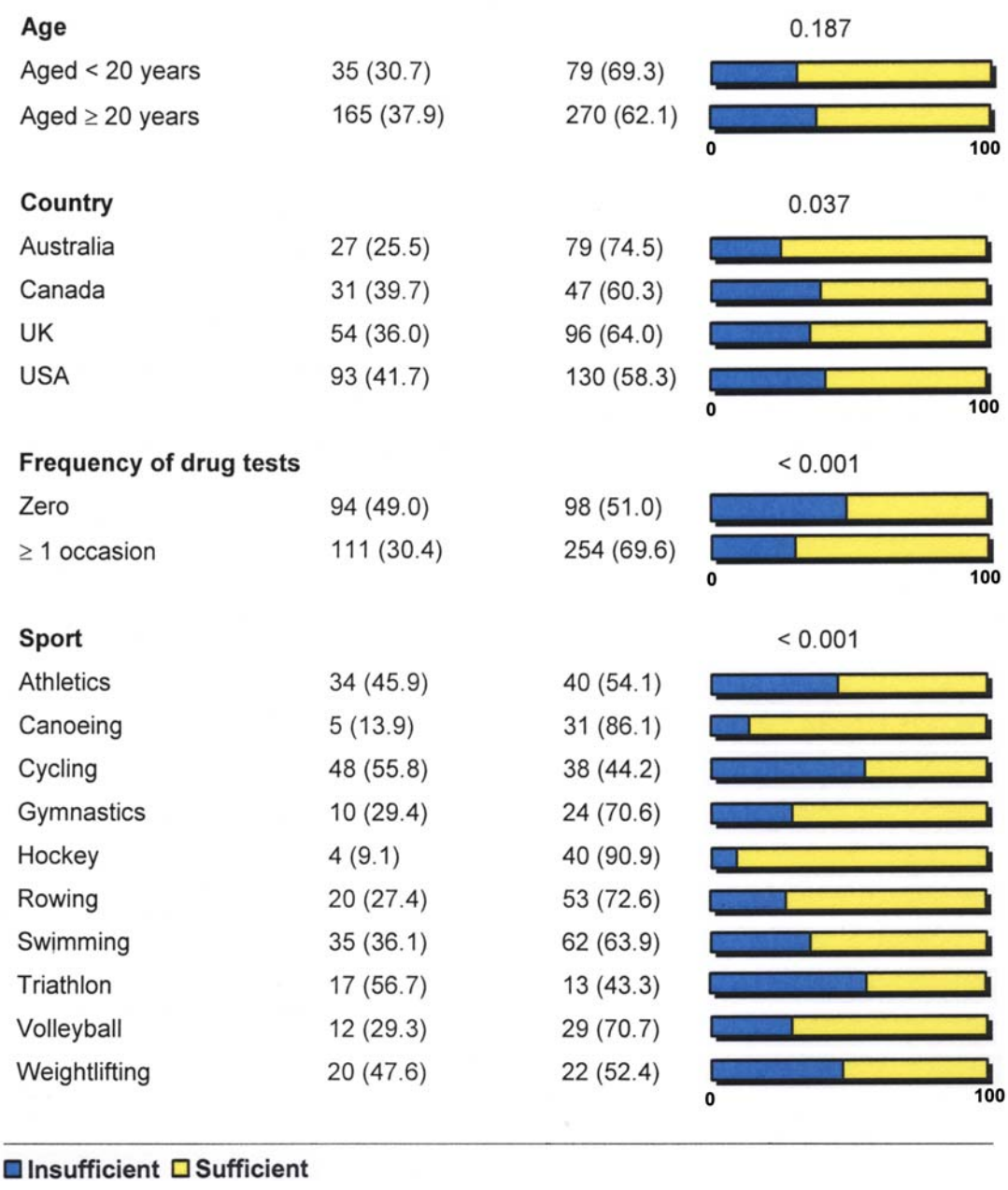


Figure 6: Sources from whom respondents have received advice regarding OTC drugs during the preceding 12 months (%)

With respect to anti-doping education, a relatively high proportion (63.2%) of all respondents stated that, in their opinion it was sufficient within their sport. Indeed, athletes from the UK, Canada and the USA were similarly impressed (Table 14). However, a significantly greater proportion of Australian athletes stated that they were satisfied with anti-doping education in their sport compared to athletes from the other nations ($p = 0.037$). Also, athletes who had been drug tested compared to those that had not, were more likely to be satisfied with the level of anti-doping education they had received in their sport ($p < 0.001$). With regards to specific sports, respondents representing triathlon and cycling were less satisfied with their anti-doping education, whilst respondents representing hockey and canoeing expressed particularly high satisfaction ($p < 0.001$).

Table 14: Respondent satisfaction in terms of anti-doping education within their sport according to specific respondent characteristics

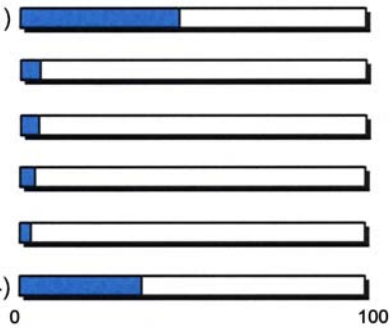
Respondents' characteristic	Respondents stating doping education is insufficient (%)	Respondents stating doping education is sufficient (%)	Statistical significance. *P* value
Age			0.187
Aged < 20 years	35 (30.7)	79 (69.3)	
Aged ≥ 20 years	165 (37.9)	270 (62.1)	
Country			0.037
Australia	27 (25.5)	79 (74.5)	
Canada	31 (39.7)	47 (60.3)	
UK	54 (36.0)	96 (64.0)	
USA	93 (41.7)	130 (58.3)	
Frequency of drug tests			< 0.001
Zero	94 (49.0)	98 (51.0)	
≥ 1 occasion	111 (30.4)	254 (69.6)	
Sport			< 0.001
Athletics	34 (45.9)	40 (54.1)	
Canoeing	5 (13.9)	31 (86.1)	
Cycling	48 (55.8)	38 (44.2)	
Gymnastics	10 (29.4)	24 (70.6)	
Hockey	4 (9.1)	40 (90.9)	
Rowing	20 (27.4)	53 (72.6)	
Swimming	35 (36.1)	62 (63.9)	
Triathlon	17 (56.7)	13 (43.3)	
Volleyball	12 (29.3)	29 (70.7)	
Weightlifting	20 (47.6)	22 (52.4)	



Respondents also highlighted areas within anti-doping education that they believed should require further attention (Table 15). Opinion amongst respondents was extremely varied, with a total of 280 responses covering 28 different suggestions (the 'other' category consisted of 23 suggestions, provided by no more than five individual respondents). The most prominent response was that a revision of the Prohibited List should include substances indexed by brand or ailment.

Table 15: Respondents suggestions with regards to improving anti-doping education relating to OTC drugs

Theme	Citations (%)
Prohibited List indexed by brand/ailment	129 (46.1)
Improved access and distribution of the Prohibited List	16 (5.7)
Support for younger athletes	15 (5.3)
More assured advice from NGB	12 (4.3)
Nutritional and homeopathic alternatives	9 (3.2)
Other	99 (35.4)



3.4. Views and opinions

Respondents expressed their level of agreement to a series of statements pertaining to specific issues relating to anti-doping and OTC drugs (Figures 7 to 10). A high proportion of athletes responded that they neither agreed nor disagreed with the statements: 'OTC stimulants are not performance enhancing' and 'OTC stimulants removed from the WADA Prohibited List in January 2004 should be put back on'. However, respondents were generally inclined toward the opinions that OTC stimulants are performance enhancing, pose a risk to health, their use is against the spirit of sport and that they should be left off the Prohibited List.

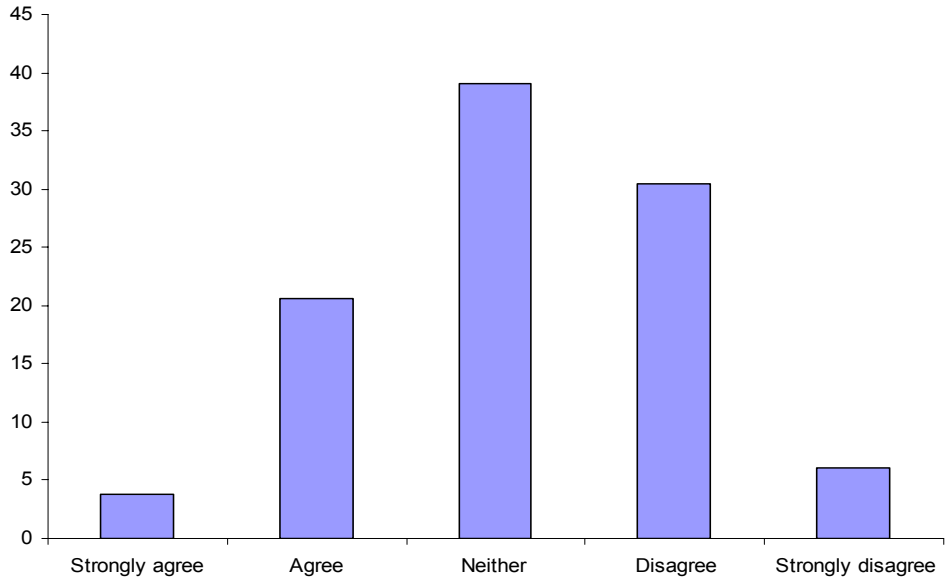


Figure 7: Respondents' opinion on the statement that OTC stimulants are not performance enhancing (%)

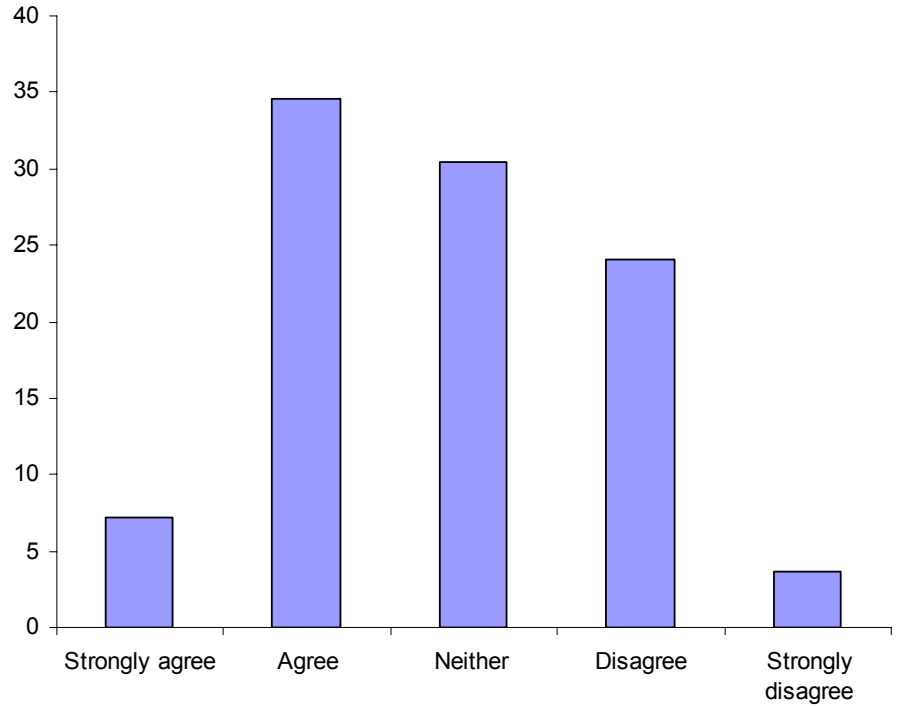


Figure 8: Respondents' opinion on the statement that OTC stimulants are a potential risk to the health of athletes (%)

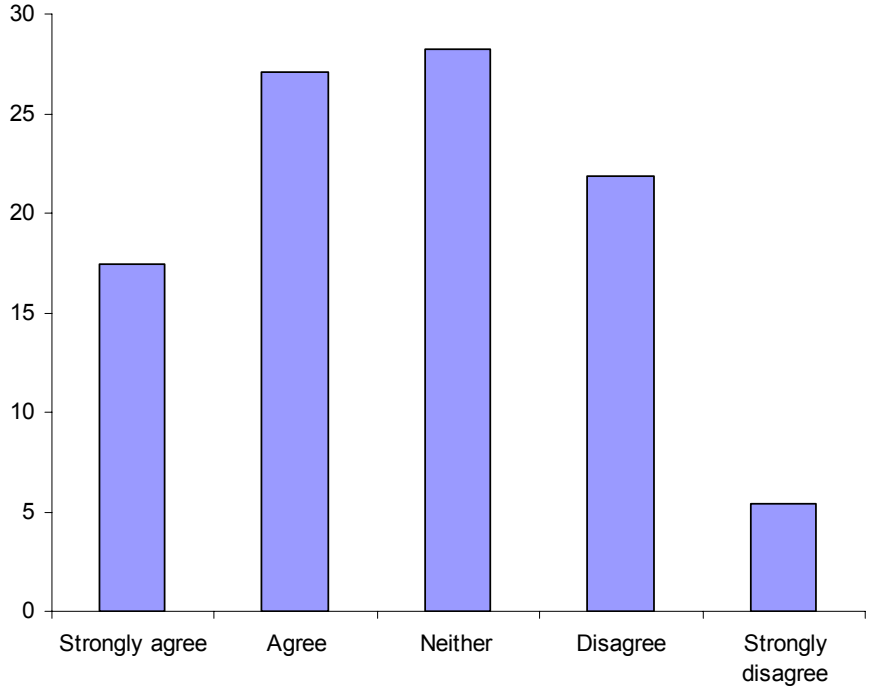


Figure 9: Respondents' opinion on the statement that use of OTC stimulants is against the spirit of sport (%)

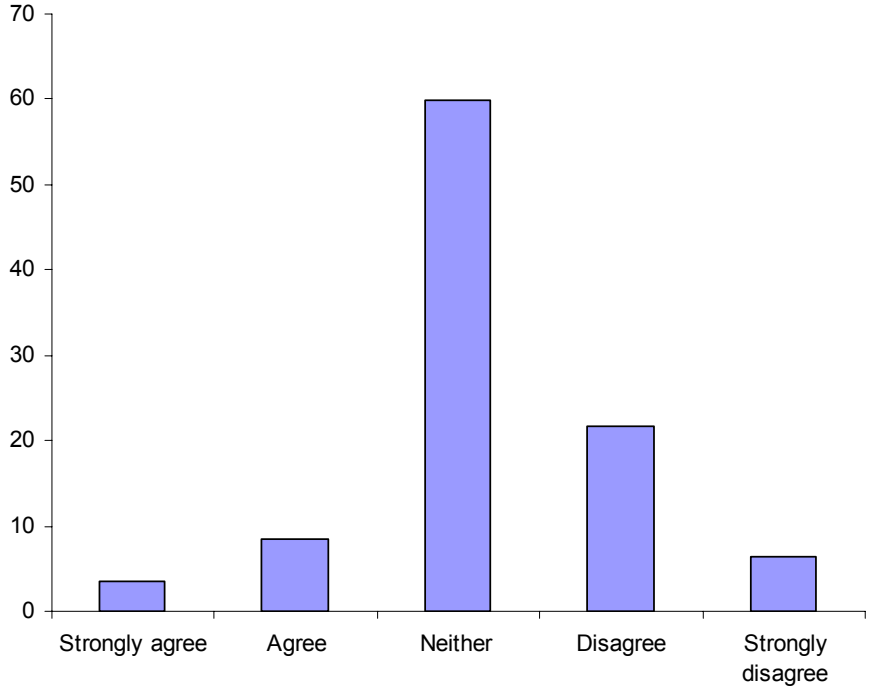


Figure 10: Respondents' opinion on the statement that OTC stimulants removed from the WADA Prohibited List in January 2004 should be put back on (%)

Section 4. Discussion

4.1.1 Use of OTC medications

In an attempt to corroborate the findings of the Monitoring Program respondents specified OTC medication that they had taken during the preceding 12 months. A significant proportion of respondents (38%) had taken medication containing at least one substance that was part of the Monitoring Program. As regards to individual substances, pseudoephedrine use was most common, followed by phenylephrine. The use of other stimulants present on the Specified Substance List and the Monitoring Program was negligible. This data compares well with a study by Chester *et al*. (2005; unpublished) examining OTC drug use in UK endurance athletes, whereby 40.6 percent had used stimulants present on the Monitoring Program. This was in contrast to research carried out prior to the introduction of the Monitoring Program where track and field athletes competing at the highest level tended to avoid OTC medicines containing such stimulants. However, from the whole sample, consisting of a range of athletes from recreational to international level, 28.1 percent had used pseudoephedrine and 37.2 percent had used phenylephrine (Chester *et al*., 2003a).

Apart from only two reports of phenylpropanolamine use in the current study there were no reports of the use of other sympathomimetic amines such as synephrine and cathine and the WADA Specified Substance, ephedrine. According to an Internet search for products containing stimulants on the Monitoring Program and those categorised as 'specified substances' the availability of ephedrine is limited to a small proportion of proprietary medicines and cathine and synephrine are not contained in any OTC medication across the four nations investigated (Appendix 3). Interestingly, phenylpropanolamine is no longer an ingredient in OTC medication as a consequence of the increased prevalence of serious adverse effects reported in the literature (Gibson and Warrell, 1972; Norvenius *et al*., 1979; Horowitz *et al*., 1980; Berstein and Diskant, 1982; Johnson *et al*., 1983; Lake *et al*., 1990; Horowitz *et al*., 2000).

Caffeine did not represent a significant proportion of athletes drug use despite its presence in a considerable number of OTC preparations (Appendix 3). Nevertheless, recent work performed by the research team has illustrated the premeditated use of caffeine as a reputed performance enhancer within cyclists and track and field athletes (Chester and Wojek, 2006; unpublished). Recent findings suggest that the use of caffeine in these sports tends to involve the use of OTC supplements designed to combat

tiredness or supplements directly manufactured for the athletic market rather than those used for the treatment of symptoms associated with upper respiratory tract infection. Indeed, the expansion of the caffeinated 'energy drinks' market in recent years has seen a concomitant rise in the association of such products and manufacturers with sport.

Current data also appears to support that from WADA-accredited laboratories involved in the Monitoring Program (Appendix 2). The proportion of in-competition, positive urine tests indicate increased use of pseudoephedrine and caffeine by athletes, post January 1st 2004 (Appendix 2; Figures 1 and 2). The removal of phenylpropanolamine from OTC medication in 2000 is also evident from the Monitoring Program data. The proportion of samples tested positive for phenylpropanolamine demonstrates a considerable drop from 2000 onwards (Appendix 2; Figure 3). However, a similar pattern was evident in the test data regarding phenylephrine whereby the proportion of positive samples dropped significantly during 2003 onwards (Appendix 2; Figure 4). Whilst this data is difficult to interpret since the availability of phenylephrine does not appear to be limiting (Appendix 3) it does question the representativeness of the data and validity of the Monitoring Program. To be most effective all WADA-accredited laboratories should be incorporated into the Monitoring Program, to eliminate possible bias in the statistics where differences occur in the availability of particular drugs, in certain countries. A significant proportion of samples testing positive for synephrine in both the Tokyo and Oslo laboratories during 2004 and 2005 whilst almost all other laboratories registered zero positives during this period (Appendix 2; Table 1). Commentary accompanying these results highlights a presence of synephrine in numerous Japanese foodstuffs. This example demonstrates the importance of the Monitoring Program in identifying peculiar results and enabling further examination in an attempt to explain them.

From the questionnaire data differences in the pattern of use were also evident, with respect to the respondents country of representation. Use of phenylephrine was significantly higher amongst respondents from the UK and Australia when compared to those from Canada and the USA. This was surprising considering the high numbers of products available containing phenylephrine across all four nations (Appendix 3). The use of pseudoephedrine was most prevalent in the USA followed by Canada and Australia, with the UK respondents indicating significantly less use. This trend was mirrored when the use of products containing any substance that was part of the Monitoring Program were compared relative to the respondents country. Respondents from the UK had used significantly less products than those from the other three nations. Whilst the numbers of OTC products available in the UK, containing substances from the Monitoring Program and Specified Substance List are relatively low compared to Canada and the USA

proportionately there is a similar pattern in the products containing the various substances (Appendix 3) and therefore it is difficult to ascertain why use amongst the UK athletes was low. However, information with regards to the market share of particular products would be useful in elucidating both usage and availability.

Possibly the most important question with regards to OTC medication is the motivation for its use, in an attempt to differentiate between therapeutic use and use for performance enhancement. Not surprisingly a large proportion of respondents stated that their main reason for using OTC products was for the treatment of the symptoms associated with illness. Unfortunately a significant proportion of respondents declined to answer this question. It is difficult to make judgements with regards to non-responders, however it does suggest that there remains a degree of guardedness in terms of the use of such substances. If athletes are using these products for therapeutic reasons then such caution is unfounded however if their motivation is towards performance enhancement then more extensive monitoring may be necessary. Similar issues regarding respondents preferring not to divulge information regarding their motives for taking OTC drugs have been found in several recent studies (Chester *et al*., 2003a; Chester *et al*., 2005; unpublished). Nevertheless, the current research suggests that only a small proportion of athletes are using OTC products for their reputed ergogenic effects.

4.1.2 Knowledge and understanding

Knowledge and understanding regarding OTC prohibited substances is paramount amongst elite athletes since a positive test as a consequence of ignorance would have a significant effect on an individual's sporting career and reputation. It was clear that respondents had generally poor knowledge with regards to the legislation following a doping violation involving a banned OTC stimulant. Similarly their awareness of the Monitoring Program was poor whilst their awareness of the Specified Substance List was somewhat higher. Whilst the ability to identify substances contained in OTC medications as either prohibited or not would be most useful to athletes such knowledge was again limited amongst respondents. Such a general lack of awareness and understanding is concerning and reflects either current anti-doping education and information provision within sports or a lack of communication between WADA, NADOs, NGBs and ultimately athletes. Whilst there is paucity in research examining the efficacy of current anti-doping education the World Anti-Doping Code (WADC) states that "…Anti-Doping Organisations should plan, implement and monitor information and education programmes" (WADA, 2003; p. 50, section 18.2). Monitoring of anti-doping education programme may take

many forms including simple feedback information from athletes, however further research evaluating current education models would be useful in identifying good practice.

Comparisons in knowledge and understanding between younger athletes and older athletes inferred a slightly greater knowledge in the older age group. This finding was expected since exposure to anti-doping education is likely to be less in the younger age group. However, in contrast younger respondents demonstrated an awareness of the Specified Substance List. Nevertheless, it would seem that education directed at younger age groups at school and sports clubs is most likely to influence an individuals behaviour in terms of anti-doping. Indeed, such a measure has been highlighted by several researchers namely Haynes (1991), Radford (1991) and Chester (2000; unpublished). Such a move was supported by suggestions made by respondents with regards to improving anti-doping education.

Knowledge and understanding was poor across the various nations and whilst Australian respondents demonstrated statistically significant greater knowledge, in practical terms differences between nations were minimal. Knowledge and understanding within nations represents the effectiveness of anti-doping education led by both the respective NADO but also each individual NGB. It would seem that it is the responsibility of each NADO to service the needs of the NGB and indeed its athletes with regards to anti-doping education. When examining the knowledge and understanding with respect to the individual sports it is difficult to ascertain why differences may occur other than the fact that anti-doping is deemed a particularly important issue in certain sports. Sports that would appear to have a particular doping problem 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.

Reassuringly, almost all respondents, uncertain with regards to the status of a drug contained in an OTC medication, would seek advice in the first instance. Athletes' awareness of the seriousness of consuming a prohibited substance inadvertently would be the most likely motivation behind such a request for advice. In terms of who would be consulted, both WADA and individual NADOs were most frequently cited. Consulting a specialist organisation with a primary role in managing anti-doping measures would suggest that a large proportion of elite athletes demonstrate a considerable level of responsibility with regards to the use of OTC medication. Nevertheless, there remained a significant proportion of respondents that stated they would consult, in the first instance what were deemed to be less reliable sources, for advice. Indeed, younger athletes when

compared to older athletes were more likely to consult individuals such as their coaches, fellow athletes and team doctors and managers. Similarly, those individuals who had not been drug tested were more likely to approach an individual for advice when compared to those who had been drug tested. In terms of advice that had already been received in the preceding 12 months, team doctors, NGBs, fellow athletes and coaches were the most common channels.

Whilst it is clear that organisations such as WADA and NADO's sole responsibility is to promote drug-free sport and NGBs role is to adhere to the WADC and function under the direction of their NADO, it is unrealistic and impractical to expect all athletes to consult these organisations, in the first instance. 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. It is therefore essential that an important role of these organisations is to educate individuals to perform an expert role in anti-doping education and information provision. Team managers, team doctors and coaches are examples of individuals whose role is one of responsibility to the athlete in providing accurate, unbiased information. Education must therefore not only focus on the athlete but on all those with a responsibility to athletes. Education must also extend beyond that of simply information provision with regards to the Prohibited List but also provide explanation and arguments in support of the List and the WADC. In achieving this goal, education must include the ethics of sport and fair play in an attempt to promote not simply adherence to the WADC but also behaviour change.

The findings in the current study with regards to anti-doping education suggest that almost two thirds of athletes believe that it is sufficient within their sport. Those athletes from Australia held this viewpoint to a greater extent than those from other nations. Similarly those who had been drug tested on at least one occasion were most satisfied with anti-doping education. Interestingly, those sports whose representatives were least satisfied with their sports anti-doping education were triathlon, cycling, weight lifting and track and field athletics. With the exception of triathlon, these sports demonstrated the greatest knowledge and understanding amongst its athletes, albeit relatively poor. As discussed previously, as a consequence of the numbers of high profile drug cases related to a number of these sports they are perceived to have a particular drugs problem. This reputation may have a direct impact not only on their athletes' knowledge and understanding but also on their perception of current anti-doping education. A greater awareness may lead to athletes questioning current measures and procedures and giving rise to a higher demand for information.

Opinion with regards to the direction of anti-doping education relating to OTC medication was mixed; however almost half of all respondents suggested that a prohibited substance list should be indexed by product names or by ailment. Whilst this suggestion would be useful it is considered that a list consisting of products containing allowable substances that relate specifically to the therapeutic treatment of specific ailments would be most helpful.

4.1.3 Views and opinions

Respondents views generally report that OTC stimulants are performance enhancing, are not a risk to health, that their use is against the spirit of sport and that they should not be placed back on the List. This can be interpreted conventionally that athletes are simply expressing that only when OTC stimulants are used non-therapeutically it is against the spirit of sport and as such they should remain off the List, and there use within this framework is acceptable. Alternatively this could be interpreted that athletes are aware that the drugs are ergogenic and that they accept that their use for performance enhancement is against the spirit of sport, although believe they should be available for such a purpose. Whilst it is difficult to ascertain the premise behind the overall views held by respondents, there is a clear argument to continue monitoring these substances. Unless, athletes are deliberately using the substances contained in OTC medication for performance enhancement or using them for therapeutic purposes to such an extent that they may pose a health risk these substances should remain off the Prohibited List as a means to legitimise anti-doping measures. By monitoring substances, WADA takes a pro-active step in understanding the demands of the modern-day athlete.

4.1.4 Methodological issues

The major difficulty encountered in carrying out the current research project was the distribution of questionnaires to elite athletes across four nations. To access the target sample specific contacts were made in order to enlist the help of elite athletes. Individuals from NADOs with a role of managing anti-doping education were identified and they were instrumental in supporting the research both directly, by distributing the questionnaire to those athletes in the national testing pool and indirectly by providing their support to the project. The endorsement of the project from each NADO was critical in the success of direct approaches made by the research team to specific sports National Governing Bodies (NGB). Ultimately, however the project was reliant on athletes receiving the

questionnaire and then being sufficiently motivated to complete and return it. It was therefore evident that a study on such an international scale was reliant on the active involvement of several individuals at specific key stages. Unfortunately without the commitment of individuals not directly involved in the project at these important stages the prospect of a satisfactory sample size and ultimately a valid project was unlikely.

The use of the Internet as a research methodology in a survey-based project was attractive for a number of reasons. To access potentially a large sample across four nations and to obtain an acceptable response rate was unlikely using traditional postal methods. In addition, the need to enlist the help of independent individuals, with access to athletes' contact details and the time constraints of data collection, meant that in practical terms postal methods were deemed unfeasible. Despite the common use of Internet-based surveys and the clear benefits of such a methodology in large-scale studies there remains scepticism with regards to the design issues of such research. In many respects however the current research was designed to avoid many of the validity issues relating to survey-based research. The requirement of a specific, individually targeted sample meant that the likelihood of problems relating to identification of sample and with establishing a valid indication of response rate was not encountered. The Internet survey software employed, also ensured anonymity of respondents and therefore fulfilled the ethical requirements of the project. The format of the Internet-based questionnaire also reduced the problems often encountered with postal questionnaires with respect to respondent errors and questionnaire completion. Nevertheless, several issues still remain in terms of the accessibility of potential respondents to the Internet (Perry *et al*., 2005) and that more frequent Internet users are likely to be over-represented in on-line surveys (Hewson *et al*., 2003).

Despite a seemingly low response rate in the current study (8.8%) according to the literature it would appear to be typical of such research methodologies. Indeed, according Hewson *et al*. (2003) Internet-based survey response rates may vary between six and 75 percent. Nevertheless, since respondents were targeted directly via email and encouraged to respond through their NADO or NGB it is disconcerting that the response rate was so low in spite of the fact that anti-doping issues are reputed to be of such importance to athletes.

Despite the number of advantages in using an Internet-based questionnaire for the current research, the use of traditional postal methods was employed in instances where the electronic distribution of questionnaires was not possible. Since the maximum number of respondents was critical to the success of the project the use of the two separate

methodologies was justified since it allowed an increased number of responses. Analysis of demographic data collected from the two methodologies was analysed to determine any differences in respondent characteristics. Since no statistically significant differences were found it was considered that both samples were equitable and therefore could be grouped for further in depth analysis.

With regards to the characteristics of the sample it was inevitable that differences were evident between numbers of respondents representing different sports and different countries. As a consequence of the varying sizes of athlete testing pools representing each country and the varying numbers participating in the specific sports at the highest level, representation across these moderator variables differed. It is likely however, that the involvement of individuals representing the various NADOs and NGBs at the data collection stage and the varying communication systems in place within these organisations had a greater impact on the disparity in respondent's representation of the various groups. Whilst greater control at the data collection stage would have been preferable it was clear that in a study involving worldwide data collection, this would have been impractical.

Unfortunately, the nature of the Monitoring Program was such that data could not be used to compare accurately the differences between respondents' country of representation and sport. Analysed samples from a particular laboratory do not necessarily represent those athletes' samples from a particular country and since all WADA accredited laboratories are not involved an overall picture of samples containing substances that are part of the Monitoring Program could not be gained. Also, as a consequence of this, the comparison of data pertaining to different sports would not be valid.

4.2. Summary of major findings

The current research has generated several key findings with regards to the use of OTC drug use amongst elite athletes across four major sporting nations:

i. Athletes who had used OTC products containing substances present on the Monitoring Program over the preceding 12 months accounted for 38 percent of all respondents.
ii. A small proportion of athletes used OTC products for their reputed ergogenic properties.

iii. Athletes demonstrated limited knowledge relating to the penalty incurred following a doping violation involving a banned OTC stimulant; the terms Monitoring Program and Specified Substance List; and the status of substances in relation to the Prohibited List.

iv. If unsure of the prohibitive nature (or otherwise) of a OTC product almost all athletes would consult someone for advice.

v. Both WADA and individual NADOs were the choice by many athletes in terms of whom they would consult for advice, however a significant proportion of younger athletes stated that they would consult an individual such as their coach, training partner or team doctor.

vi. Athletes representing cycling and triathlon were most likely to be dissatisfied with anti-doping education within their sport.

vii. The development of a list according to ailment, highlighting OTC products that do [not] contain prohibited substances was deemed an appropriate measure to improve the information available to athletes.

viii. Data from the Monitoring Program supports that of the questionnaire with regards to pseudoephedrine use, however data that pertains to phenylephrine is difficult to interpret.

ix. As a whole, athletes were of the opinion that: OTC stimulants were not performance enhancing; they posed a risk to health; their use was against the spirit of sport; and yet should remain off the Prohibited List.

4.3. Further research and recommendations

Results reported from the Monitoring Program have produced several questions regarding the nature of the use of substances targeted. As a consequence of the quantitative nature of the scheme and the fact that only a select number of laboratories are involved, it is difficult to make any firm conclusions from the results. It would therefore seem apparent that the Monitoring Program as it currently operates would best serve the anti-doping movement if it were expanded. The involvement of a greater number of laboratories would provide a clearer picture of the use of selected substances worldwide. The selection of laboratories should not reflect geographical spread around the world but the availability of those substances monitored. Analysis of further data pertaining to the products specified at the time of sampling would be useful to support laboratory results and the overall aims of the Monitoring Program. The Program would also benefit from a qualitative arm that would establish answers to questions regarding the intent of use of particular substances. Without additional information to support the data from the

Monitoring Program valid arguments to support reclassification of particular substances cannot be made.

Furthermore, the current research would suggest that awareness of the Monitoring Program amongst elite athletes is low. It would seem reasonable that communication between WADA and NADOs be increased with regards to the Monitoring Program and its function within anti-doping. Similarly, it is evident that athletes and NGBs require educating about the differential roles of the Prohibited List, Specified Substance List and Monitoring Program. Whilst it may be argued that the Monitoring Program functions covertly, informing the Prohibited List and open only to WADA and personnel from anti-doping organisations, it is recommended that it is performed overtly demonstrating transparency of anti-doping measures and the rationale for the addition or removal of substances from the Prohibited List.

Since knowledge and understanding regarding issues relating to OTC drugs and anti-doping issues was poor, the effectiveness of current education schemes may be questioned. Whilst such schemes are not mandatory the value of education in anti-doping is undisputed. Evaluation of an education programme is critical to its success. However in order to influence current methods, more formalised empirical data collection and dissemination of results regarding the effectiveness of current information and education provision by NADOs and NGBs is required. Such research would establish the impact of education programmes and how they may be improved.

Since all those involved in sport must take responsibility in promoting drug free sport it is clear that such individuals that hold a supporting role to athletes have a duty in providing accurate and unbiased advice to athletes. Anti-doping education must therefore focus, not only on athletes, but all those with a supporting role in sport. It is also clear that in fulfilling this important role, individuals such as coaches and team managers require education that is focussed not only on simply adherence to the rules but also on the ethical basis of drug free sport in an attempt to provide understanding.

From the research it is evident that elite athletes require further assistance in terms of the use of OTC medication in their quest to avoid inadvertently testing positive for a prohibited substance. The production of a list of allowable products categorised according to ailment would help athletes to use OTC preparations legitimately and safely. Such a list would be developed by the individual NADO for use by home and visiting athletes and would be both widely advertised and accessible.

4.4. Intended dissemination of results

Following the approval and the review of manuscripts by WADA the project results will be disseminated through publication in an appropriate peer reviewed journal. Further dissemination of the research will be achieved through the presentation of data at appropriate national and international scientific conferences as approved by WADA. Under the instruction and with the guidance of WADA it is expected that an executive summary document will be produced for distribution to those NADOs involved in the research project (i.e. the Australian Sports Anti-Doping Authority, the Canadian Centre for Ethics in Sport, UK Sport and the United States Anti-Doping Agency).

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Appendix 1. Questionnaire

QUESTIONNAIRE ON OVER-THE-COUNTER DRUG USE

The World Anti-Doping Agency (WADA) was established in 1999 as an independent body to promote and coordinate anti-doping strategy in sport internationally. January 2004 saw the advent of the first World Anti-Doping Code and along with this came a revised prohibited substances list. Amongst other changes, the new 2004 list saw the removal of some of the stimulants, which are found in over-the-counter (OTC) preparations. Over-The-Counter drugs include all those that can be purchased OTC at a pharmacy without a doctor's prescription. The purpose of this questionnaire is to assess the use of OTC drugs amongst athletes since the introduction of the 2004 prohibited list. Additional questions are included to gather important information on athletes' knowledge of prohibited substances and views on changes to the list. It is your input that will enable us together to tackle the issues within anti-doping.

Please answer each of these questions honestly, using your current knowledge and without discussing your answers with others. Please tick the appropriate boxes corresponding to your response or write your answers in the space provided.

Be assured that your answers will be confidential and remain totally anonymous.

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Section 1 – Respondent details

1) Sex: ☐ **Male** ☐ **Female** ☐

2) What is your date of birth (dd/mm/yy)?_____ ☐

3) What is your primary sporting event?

☐ **Hockey** ☐ **Rowing**

☐ **Cycling** ☐ **Gymnastics**

☐ **Volleyball** ☐ **Triathlon**

☐ **Weight Lifting** ☐ **Swimming**

☐ **Canoeing** ☐ **Track & Field Athletics** ☐

4) Which country do you represent? ☐ **Australia** ☐ **Canada**

☐ **UK** ☐ **USA** ☐

5) During the last 12 months how many times were you drugs tested?

a) In competition: _____ ☐

b) Out of competition: _____ ☐

Section 2 – Knowledge and understanding of prohibited substances

6) What is the maximum time you would be banned, for a first violation of the anti-doping rules involving a banned stimulant (contained in an OTC cold preparation) during in-competition testing?

_____ ☐

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7) Do you know the meaning of the following terms with regards to the World Anti-Doping Code?

a. 'Monitoring Programme'? **Yes** ☐ **No** ☐

b. 'Specified Substance List'? **Yes** ☐ **No** ☐

8) Which of the following, if any, are on the current WADA prohibited substances list?

(Tick 'yes' if the substance appears on the list, 'no' if not and 'don't know' if unsure)

	Yes	No	Don't Know		Yes	No	Don't know
L-methylamphetamine	☐	☐	☐	**ephedrine**	☐	☐	☐
phenylephrine	☐	☐	☐	**pseudoephedrine**	☐	☐	☐
theophylline	☐	☐	☐	**methylephedrine**	☐	☐	☐
caffeine	☐	☐	☐	**codeine**	☐	☐	☐

Section 3 – Use of over-the-counter drugs

9) Which OTC drugs, if any, have you used in the last 12 months for the treatment of symptoms associated with a cough or cold?

Please specify:

i. **Brand and ailment e.g., *Sudafed Decongestant Elixir*, *Beechams Cold and Flu***
ii. **Method of administration e.g., *oral capsules*/sachets, *nasal spray***
iii. **Any additional information regarding the medicine e.g., *max strength, non-drowsy***

_____

_____

_____

10) a. Do you suffer from hay fever? **Yes** ☐ **No** ☐

b. If you answered yes to this question which OTC drugs, if any, have you used in the last 12 months for the treatment of hay fever?

Please specify:

i. **Brand details e.g., Zirtek Allergy, Benadryl Plus Allergy And Congestion Relief**
ii. **Method of administration e.g., eye drops, nasal spray, oral tablets/syrup**
iii. **Any additional information regarding the medicine e.g., max strength, non-drowsy, one a day**

_____

_____

_____

11) If you do use OTC drugs, what is *your* main reason for using them?
(tick only one box)

a. Treatment of symptoms associated with illness (e.g. cough or cold) ☐

b. For potentially enhancing performance ☐

c. Both of the above (a. and b.) ☐

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12) a. If you were unsure whether a substance was on the prohibited substance would you consult anyone for advice?

Yes ☐ No ☐ ☐

b. If yes, whom would you consult in the first instance? *(tick only one box)*

Fellow athlete/training partner ☐

Coach ☐

Team Manager ☐

Team Doctor ☐

National Governing Body ☐

WADA ☐

Other ☐ Please specify:_ ☐

13) Have you received advice about OTC drugs from any of the following? If not, please go to question 15 (tick as many boxes as appropriate)

i. Fellow athlete/training partner ☐ ☐

ii. Coach ☐ ☐

iii. Team Manager ☐ ☐

iv. Team Doctor ☐ ☐

v. Governing body ☐ ☐

vi. Other ☐ Please specify:_____ ☐

14) If you have been offered advice, please specify for each occasion:

i. What substance you were advised on

ii. The advice given

iii. Who the advice was given by

_____ ☐

_____ ☐

_____ ☐

_____

15) a. Do you believe that the education in your sport regarding doping control is sufficient? ☐

Yes ☐ **No** ☐

b. In what area(s) with regards to OTC drugs would you like more information? ☐

_____ ☐

_____ ☐

_____ ☐

_____

_____

Section 4 – Views and opinions

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16) Please indicate to what extent you agree (or otherwise) with the following statements.

Please tick the appropriate boxes according to whether you strongly agree, agree, neither agree or disagree, disagree and strongly disagree:

a. OTC stimulants are **not** performance enhancing

Strongly agree	Agree	Neither agree or disagree	Disagree	Strongly disagree
☐	☐	☐	☐	☐

☐

b. OTC stimulants **are** a potential risk to the health of athletes

Strongly agree	Agree	Neither agree or disagree	Disagree	Strongly disagree
☐	☐	☐	☐	☐

☐

c. Use of OTC stimulants **is** against the spirit of sport

Strongly agree	Agree	Neither agree or disagree	Disagree	Strongly disagree
☐	☐	☐	☐	☐

☐

d. OTC stimulants removed from the WADA Prohibited List in January 2004 should be put back on the List (namely caffeine, phenylephrine, phenylpropanolamine, pseudoephedrine and synephrine)

Strongly agree	Agree	Neither agree or disagree	Disagree	Strongly disagree
☐	☐	☐	☐	☐

☐

Please use the remainder of the space overleaf to add any further comments about the questions that you have answered or the topics that have been covered.

Please return the questionnaire by email/or in the envelope provided

ON BEHALF OF THE RESEARCH TEAM AND WADA
THANK YOU FOR TAKING THE TIME TO ANSWER THIS QUESTIONNAIRE

liverpool JMU

WORLD ANTI-DOPING AGENCY
play true

Appendix 2. Monitoring Program statistics

The percentage of positive urine samples for several of those OTC stimulants currently being monitored by those laboratories involved in the Monitoring Program, relative to the total number of samples analysed, are presented in figures one to four.

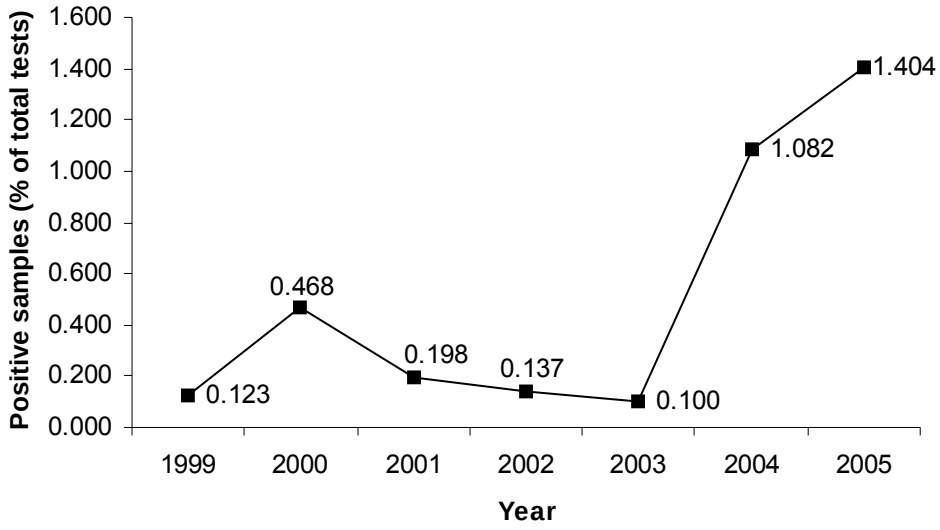

Figure 1: Percentage of samples testing positive for pseudoephedrine (>25µg/ml) from those tested at labs (n = 6) involved in the Monitoring Program

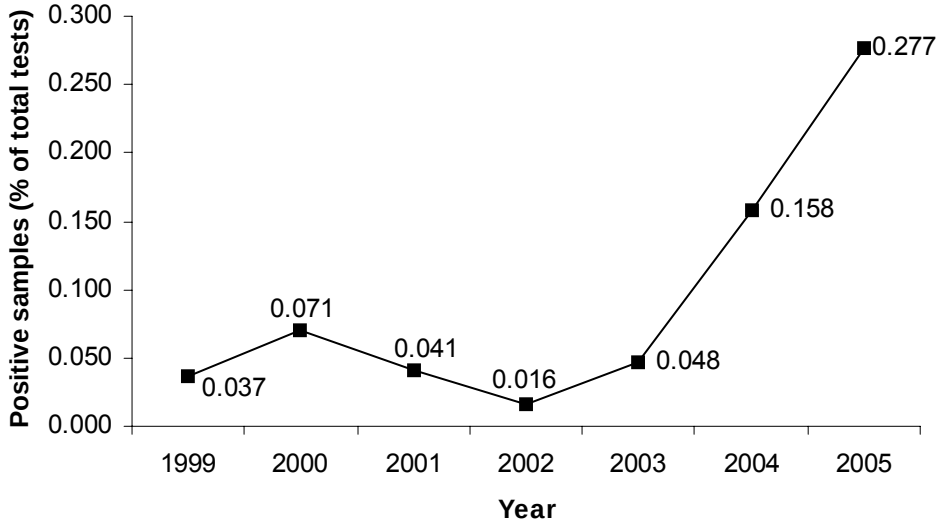

Figure 2: Percentage of samples testing positive for caffeine (>12µg/ml) from those tested at labs (n = 6) involved in the Monitoring Program

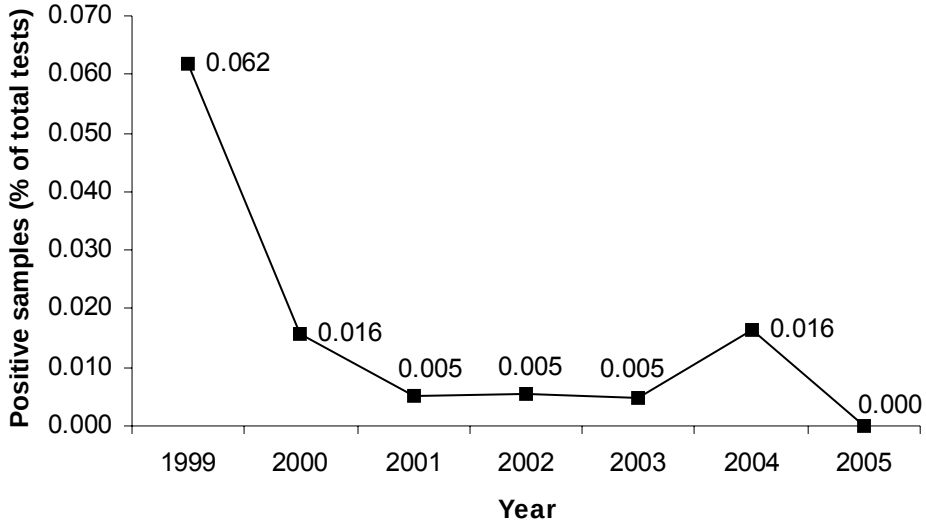

Figure 3: Percentage of samples testing positive for phenylpropanolamine (>25µg/ml) from those tested at labs (n = 6) involved in the Monitoring Program

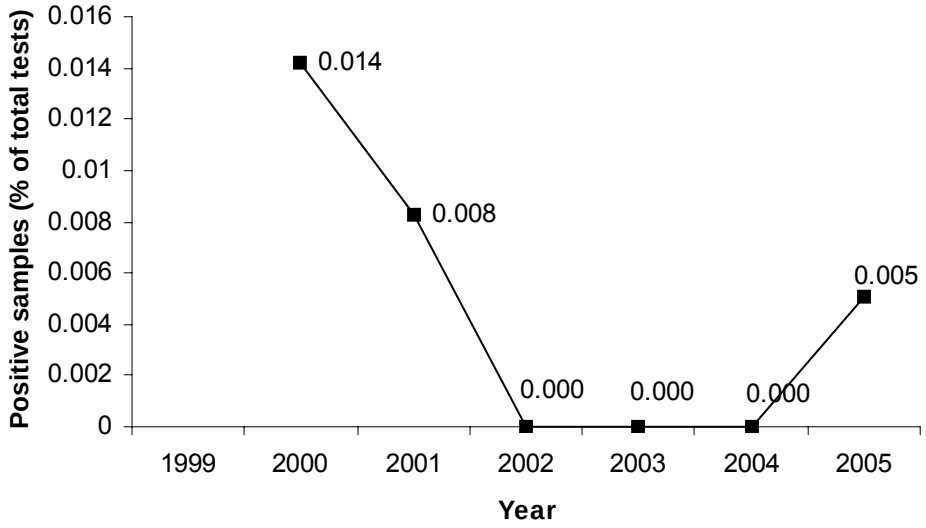

Figure 4: Percentage of samples testing positive for phenylephrine (>1µg/ml) from those tested at labs (n = 6) involved in the Monitoring Program

In addition to those OTC stimulants highlighted in figures one to four, synephrine is also currently monitored (Table 1). Samples tested positive for synephrine have been analysed by only two laboratories in 2004 (Tokyo and Oslo) and three laboratories in 2005 (Tokyo, Oslo and Los Angeles). In 2003, the year prior to the introduction of the Monitoring Program no positive samples were recorded for synephrine by those laboratories involved.

Table 1: Percentage of samples testing positive for synephrine from those tested at labs (n = 3) involved in the Monitoring Program*

Laboratory	**Positive samples per year (% of total tests)**		
	2003	**2004**	**2005**
Beijing	0	0	0
Bogota	0	0	0
Oslo	0	6.6	8.71
Madrid	0	0	0
Tunis	0	0	0
Los Angeles	0	0	0.002
Tokyo	0	23.7	47.3
Total	0	1.95	4.69

*Additional note from the Tokyo laboratory:

Presence of synephrine in test samples is attributed to the typical intake of foodstuffs and beverages containing orange skin etc.

Appendix 3. Internet search of availability OTC products

Table 1: Availability of OTC products containing selected substances across the four nations*

Substance	Country			
	Australia (% of total products)	**Canada (% of total products)**	**UK (% of total products)**	**USA (% of total products)**
Caffeine	4 (6.8)	104 (18.4)	26 (27.1)	18 (5.9)
Phenylephrine	12 (20.3)	96 (17.0)	19 (19.8)	63 (20.7)
Phenylpropanomaline	0	0	0	0
Pseudoephedrine	21 (35.6)	222 (39.3)	30 (31.3)	178 (58.4)
Synephrine	0	0	0	0
Ephedrine	3 (5.1)	29 (5.1)	1 (1.0)	16 (5.2)
Cathine	0	0	0	0
Codeine	19 (32.2)	114 (20.2)	20 (20.8)	30 (9.8)
Total	59	565	96	305

*Searches used the respective government health/proprietary website search engine for each nation.