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Analysis of knowledge and attitudes of the students of health and professional studies regarding the use of stimulative substances in sports

Analiza znanja i stavova studenata zdravstvenih studija o upotrebi stimulativnih supstanci u sportu

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Abstract

Backrogund/Aim. Since the beginning of competitive sports, athletes have been trying to improve their abilities by taking various substances. The problem of using prohibited substances is not strictly tied to elite athletes; it is also present in the general population. The aim of this study was to test the knowledge and attitudes of the students regarding the use of stimulative substances and dietary supplements in sports. **Methods.** A cross-sectional study was performed among students at the College of Health and Professional Studies in Belgrade, Serbia. The data was collected by filling in an especially designed questionnaire. **Results.** Knowledge of prohibited substances and methods was characterized as "good" with 24.2% of respondents, namely 8.09% of males and 16.1% of females; knowledge of the adverse effects of prohibited substances and methods on health was demonstrated by 17.7% (9.03% of male respondents and 8.72% of female respondents). **Conclusion.** Student population is not knowledgeable enough about the problems of prohibited substances use and their negative effects on one's health. The comparative analysis of our and European researches on knowledge, attitudes and uses of prohibited substances show a rather uniform prevalence rate. Not being aware of the adverse effects shows the need to further educate students.

Key words:
doping in sports; students; dietary supplements; sterioids; knowledge; surveys and questionnaires.

Apstrakt

Uvod/Cilj. Sportisti oduvek u takmičarskom sportu pokušavaju da poprave svoje sposobnosti uzimanjem različitih supstanci. Problem korišćenja nedozvoljenih supstanci nije vezan isključivo za elitne sportiste, već je prisutan i u opštoj populaciji. Cilj rada bio je ispitivanje znanja i stavova studenata u vezi sa upotrebom stimulativnih supstanci i dijetetskih suplemenata u sportu. **Metode.** Istraživanje je sprovedeno kao studija preseka kod studentske populacije u Visokoj zdravstvenoj školi strukovnih studija u Beogradu. Podaci su prikupljani popunjavanjem posebno dizajniranog upitnika. **Rezultati.** Dobro znanje o nedozvoljenim supstancama i metodama, pokazalo je 24,2% ispitanika (8,09% muškog pola i 16,1% ženskog pola), a o neželjenim efektima zabranjenih supstanci i metoda na zdravlje, znanje je pokazalo 17,7% ispitanika (9,03% muškog pola i 8,72% ženskog pola). **Zaključak.** Populacija studenata nema dovoljno znanja o problemu upotrebe nedozvoljenih supstanci i njihovim negativnim posledicama po zdravlje. Komparativna analiza našeg i evropskih istraživanja znanja, stavova i upotrebe nedozvoljenih supstanci ukazuje na približno ujednačene stope prevalencije. Nepoznavanje neželjenih efekata ukazuje na potrebu za dodatnom edukacijom studenata.

Ključne reči:
doping u sportu; studenti; ishrana, dopune; steroidi; znanje; ankete i upitnici.

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Introduction

Testosterone was synthesized in laboratory in 1931 for the first time, thus allowing clinical experiments with this hormone [1]. Its use has been around for more than 80 years, and there is much more experience behind the use of testosterone than for some newer medicines physicians prescribe today. The use of stimulative substances with the aim of building up muscle mass and improving sports results spread like wildfire among sports competitors during the sixties and seventies of the last century. During that time, stimulative substances were unknown outside the locker rooms and little was done to prevent their use. Today, the anti-steroid movement is very strong. Hardly a day passes without some information being published about the dangers connected to their use. At the same time, the use of steroids aimed at improving physical performances has never been higher. The fact that doping is no longer limited to elite athletes is particularly dangerous. Numerous studies report on doping use being found among the young in amateur and school sports. Many of them use anabolic steroids rather to improve their body looks than to have more success in competitions [2–8].

In the last couple of years, there was a significant shift in researches on doping – from discovery and secondary prevention to primary prevention through education [9]. Important components of these basic prevention strategies are: to identify target groups, to evaluate their knowledge and attitudes concerning doping as well as to determine efficient initial basis for intervention [10]. These studies focus on individuals who do sports and who might benefit from using these substances, on coaches whose task is to provide safety in sports, which is in direct connection to the success of their athletes and on physicians and pharmacists whose medical advice might influence the knowledge of and attitudes towards the use of stimulative substances [11].

Numerous researches were performed among the adolescents in order to obtain data on the stimulative substance misuse, their knowledge of the adverse effects, and their attitudes towards taking prohibited substances. The largest number of researches was performed among the American adolescents, namely the ones doing sports. In the USA, 375,000 of male respondents and 175,000 of female respondents [12] used anabolic-androgenic steroids (AAS) at least once. Other authors who performed their researches in the USA state that the percentage of the AAS users is 6.6% [13]. In Europe, a research performed in six European countries showed that the percentage of high school children using the AAS is 2.1% [14].

The aim of this research was to test the knowledge, attitudes and behaviours of the students at the College of Health and Professional Studies in Belgrade, Serbia regarding the use of stimulative substances and dietary supplements in sports.

Methods

A cross-sectional study was performed at the College of Health and Professional Studies during the summer semester of 2015/16. The size of the respondent group was determined based on the initial parameters: power of the study – 80%, probability of type I error (α) – 0.05, minimum difference in the values of the observed variables – 20%. The research included 321 students at various years of their studies, randomly selected; 34% of which were males. All of the respondents attend College of Health and Professional Studies, which makes 16.2% of the total number of students. The average age of respondents was 21.2 ± 2.1 years (minimum 19, maximum 38, median 24.0 years). The average subject age per gender was not statistically significantly different ($t = 1.344$; $p > 0.05$).

Three departments were included in the survey with 87 (27.1%) medical radiologists, 143 (44.5%) physiotherapists and 91 (28.3%) laboratory technicians. As for their year of studies, there were 89 (27.7%) first-year students, 112 (34.9%) second-year students, and 120 (37.4%) third-year students. It was determined that 87 (27.1%) respondents were born in Belgrade and 234 (72.9%) were from the provinces.

Majority of students were involved in some type of sports activities: volleyball 18.7%, basketball 15.6%, football 14.3% and body building 10%. Prohibited substances were used by 3.7% of male respondents and 2.2% of female respondents. The respondents had 20 minutes before their classes to voluntarily and anonymously fill in the questionaires. All students had the same questions and answered them in the same manner. They were guaranteed discretion for their voluntary and anonymous participation. In order to test the comprehensibility of the questions given, the questionnaire had been validated on a small sample of 12 respondents before being made a part of the research. The questions the students had found incomprehensible were paraphrased and the final version of the questionnaire was determined. The questionnaire contained multiple-choice questions and the respondents answered by circling answers. The exception was the question about the types of stimulative substances and dietary supplements used by them. This question was answered by naming the substance or supplement being used.

Instruments

Surveying the respondents was done by the anonymous epidemiological questionnaire. The respondents gave answers to short questions (both open-ended and closed-ended questions) by writing down relevant information or by choosing from the provided answers. Main research questions were sorted into following four categories: a) sociodemographic data (gender, age, place of birth, family income, sport the respondent is engaged in, current year of studies, exam pass rate and satisfaction with oneself being a student); b) general perception, knowledge of doping substances and methods and knowledge of adverse effects of doping to one's health [9–11]; c) general doping attitudes measured by the Performance Enhancment Attitude Scale (PEAS) [15]. Doping attitude is defined as a predisposition of an individual to use prohibited doping substances and methods. The scale consists of 17 attitude statements which

are measured on a six-point Likert-type scale, ranging from strongly disagree (1/to strongly agree/6). No neutral middle point is offered, and all 17 items are scored in the same direction; d) use of substances and/or supplements in order to enhance sports performance or improve physical appearance.

Statistical data processing

The incomplete questionnaires (9 in total) were not processed. The collected data was reviewed and coded, then processed and presented in tables and charts along with a commentary of the aforementioned, depending on the nature of the observed variable. Description of numerical characteristics in our paper was performed by using classical methods of descriptive statistics, namely by arithmetic mean and median of mean values and as for measures of variability by standard deviation, coefficient of variation and standard error as well as by minimum and maximum values. Relative numbers are used in all tables.

Distribution of numeric variables in our paper was checked by using the Kolmogorov-Smirnov test (normal distribution was tested). The variables that met this criterion, that is, that had normal distribution, were further analysed by parametric methods; non-parametric methods were used on those that did not meet the said criterion.

The analysis of results, depending on the nature of variables themselves, was performed by the Pearson's chi-squared test, in the form of goodness-of-fit test and contingency tables, in order to compare the differences between frequencies of non-parametric characteristics, namely for one or two characteristics.

We used Student's *t*-test for two sets of data to compare the means of the parametric characteristics. As a non-parametric addition to the independent samples, we applied the Rank Sum Test, and to the dependent samples, we used the Wilcoxon signed-rank test.

When performing the linkage analysis of the characteristics, we used methods of one-tailed parametric correlation and regression as well as the non-parametric correlation, depending on the data distribution.

For analysis purposes, three scores were defined: score 1 represents the points won on that part of the questionnaire concerning general knowledge of doping where higher number of points meant greater knowledge, score 2 for the knowledge of side effects where higher number of points meant greater knowledge of effects, and score 3 concerning the attitude towards doping (substances and supplements for strength enhancement) where higher number of points meant more pronounced positive attitude towards doping.

In all analytical methods applied the significance level was set at 0.05.

Program SPSS 20.0 of the Department for Medicinal Statistics and Informatics, Faculty of Medicine in Belgrade, was used to make a data base and process the data.

Results

Students' knowledge of and attitudes towards the use of prohibited substances and supplements in sports

"Good knowledge" was demonstrated by 31.2% of the respondents for general knowledge of doping and by 34.2% of the respondents for knowledge of doping and doping side effects.

The descriptive statistical values for calculated scores are shown in Table 1.

The average score comparison according to gender of our respondents showed there was a statistically highly significant difference in all three scores; the scores for general knowledge of doping and knowledge of doping side effects were higher in the female respondents, whereas the male respondents had higher average scores for attitudes towards doping (Table 2).

Table 1

Descriptive statistical values for calculated scores for 321 respondents

Variable	Minimum–Maximum	Med	Mean ± SD
General knowledge of doping	0.00–16.00	12.00	11.34 ± 2.63
Knowledge of doping side effects	0.00–23.00	14.00	13.82 ± 4.77
Attitudes towards doping	17.00–74.00	34.00	35.48 ± 13.99

Med – median; SD – standard deviaton.

Table 2

Score comparison per gender (109 males and 212 fameles)

Gender	Mean ± SD	SE	*t*	*p*
General knowledge of doping				
male	10.75 ± 2.46	0.23		
female	11.64 ± 2.67	0.18	2.914	0.004**
Knowledge of doping side effects				
male	12.46 ± 4.56	0.43		
female	14.51 ± 4.74	0.32	3.715	0.000**
Attitudes towards doping				
male	39.12 ± 14.29	1.36		
female	33.60 ± 13.48	0.92	3.402	0.001**

SD – standard deviation; SE – standard eror; *p* – statistical significance.

Average score comparison per department of our respondents showed there was a statistically significant difference in the scores achieved for general knowledge of doping and attitudes towards doping: laboratory technicians had the highest average scores, that is, the greatest knowledge of doping, and physioterapists had the poorest general knowledge. The medical radiologists had the lowest score for attitudes towards doping which means that they had the most pronounced negative attitude towards doping, and the highest score was achieved by the physioterapists who, therefore, had the least pronounced negative attitude towards doping. There was no statistically significant difference in knowledge of doping side effects scores per department (Table 3).

The analysis of the average score values per subjects' study year showed that there was a statistically significant difference only in the attitudes on doping score, wherein the subjects in the second and the third year of studies had lower, and the first-year students had the highest average values. No statistically significant differences between study years were recorded in the score values of the general knowledge and knowledge of doping side effects (Table 4).

The analysis of the average score values regarding the habit of engaging in sports showed that there was no statistically significant difference in the average values among three observed scores.

The results of the score comparison regarding a way of engagement in sports activities are shown in Table 5.

Table 3

Score comparison per department

Study department	n	Mean ± SD	95% CI		Minimum–Maximum	f	*p*
			Bottom limit	Upper limit			
General knowledge of doping							
medical radiologist	87	11.59 ± 2.52	11.06	12.13	0.00–14.00		
physiotherapist	143	10.75 ± 2.80	10.39	11.42	0.00–15.00		
laboratory technician	91	11.70 ± 2.39	11.20	12.20	6.00–16.00	2.819	0.049*
Total	321	11.34 ± 2.63	11.05	11.63	0.00–16.00		
Knowledge of doping side effects							
medical radiologist	87	14.50 ± 3.92	13.66	15.34	0.00–23.00		
physiotherapist	143	13.80 ± 5.06	12.96	14.64	0.00–20.00		
laboratory technician	91	13.49 ± 5.00	12.15	14.23	0.00–21.00	1.676	0.189
Total	321	13.82 ± 4.77	13.29	14.34	0.00–23.00		
Attitudes towards doping							
medical radiologist	87	31.21 ± 12.62	28.52	33.90	17.00–67.00		
physiotherapist	143	38.57 ± 14.45	36.18	40.96	17.00–74.00		
laboratory technician	91	34.70 ± 13.45	31.90	37.50	17.00–68.00	8.005	0.000**
Total	321	35.48 ± 13.99	33.94	37.01	17.00–74.00		

SD – standard deviation; CI – confidence interval; *p* – statistical significance.

Table 4

Score comparison per study year (from the first to third year)

Study year	n	Mean ± SD	95% IP for the average		Minimum–Maximum	f	*p*
			Bottom limit	Upper limit			
General knowledge of doping							
first year	89	11.05 ± 2.66	10.49	11.61	4.00–15.00		
second year	112	11.16 ± 2.92	10.61	11.70	0.00–15.00		
third year	120	11.72 ± 2.27	11.31	12.13	3.00–16.00	2.073	0.127
Total	321	11.34 ± 2.63	11.05	11.63	0.00–16.00		
Knowledge of doping side effects							
first year	89	13.66 ± 5.01	12.60	14.71	0.00–20.00		
second year	112	14.21 ± 4.68	13.33	15.09	0.00–23.00		
third year	120	13.57 ± 4.69	12.72	14.42	0.00–21.00	0.586	0.557
Total	321	13.82 ± 4.77	13.29	14.34	0.00–23.00		
Attitudes on doping							
first year	89	38.91 ± 15.57	35.63	42.19	17.00–73.00		
second year	112	33.90 ± 13.78	31.32	36.48	17.00–67.00		
third year	120	34.41 ± 12.55	32.14	36.68	17.00–74.00	3.798	0.023*
Total	321	35.48 ± 13.99	33.94	37.01	17.00–74.00		

SD – standard deviation; IP – interpercentile range; *p* – statistical significance.

Table 5

Score comparison according to the role of engaging in sport activities

Role in sport activites	Mean ± SD	SD	SE	t	*p*
General knowledge of doping					
first team member	19 ± 11.36	1.89	0.43		
recreationally active	248 ± 11.19	2.66	0.16	0.274	0.784
Knowledge of doping side effects					
first team member	19 ± 13.10	4.40	1.01	0.423	0.673
recreationally active	248 ± 13.59	4.87	0.30		
Attitudes on doping					
first team member	19 ± 34.57	12.31	2.82		
recreationally active	248 ± 36.01	13.85	0.87	0.438	0.662

SD – standard deviation; SE – standard error; *p* – statistical significance.

Table 6

Score comparisons with regards to the question:
"Do you think that use of substances to improve efficiency in sports is unethical?"

Scores answers to the question	n	Mean ± SD	SE	t	*p*
General knowledge of doping					
yes	250	11.42 ± 2.57	0.16		
no	69	11.01 ± 2.87	0.34	1.153	0.250
Knowledge of doping side effects					
yes	250	14.19 ± 4.70	0.29		
no	69	12.59 ± 4.88	0.58	2.478	0.014*
Attitudes on doping					
yes	250	30.18 ± 11.31	0.84		
no	69	34.04 ± 15.62	1.88	-3.115	0.002**

SD – standard deviation; SE – standard error; *p* – statistical significance.

General perception of the use of substances and/or supplements for the increase of strength and muscle definition in sports

The results shown in Table 6 represent the score comparisons with regards to the question: "Do you think that use of substances to improve efficiency in sports is unethical?"

The analysis of the average score values regarding the attitude on the ethics of the use of substances to improve efficiency in sports in our subjects, showed that there was a statistically significant difference in the average score values for the knowledge of the side effects of and attitudes towards doping; therefore, the subjects who considered that the use of substances for improvement purposes was unethical, also knew more about them, but at the same time they had more distinct negative attitude on doping. The score values for general knowledge of doping did not significantly differ from the answers to the question: "Do you think that use of substances to improve efficiency in sports is unethical?"

Furthermore, answering the question about the sources they like using the most to obtain information on doping, our subjects stated that most commonly they obtain information on doping from books (71%), their pharmacists (71.3%), which was followed by personal trainers (69%), personal physician (67.2%), and the internet (65.3%). The interesting thing is that learning about doping from parents was not even within the top five stated sources, with only 55.4% of the answers. When the average values of three analysed scores of the first three sources were compared, no statistically significant difference were observed.

Discussion

The results of this research provided certain information on attitudes and knowledge of students from three study departments (physiotherapeutists, laboratory technicians and medical radiologists) regarding the problem of the use of stimulative substances in sports. The research may be of importance due to the population covered by the research, since it is the young population whose priority was success or better appearance, while their health was of secondary importance.

In scoring the answers to questions on general knowledge of doping and knowledge of side effects, the answers were rated cumulatively.

Blank et al. [16] stated that in their research they received almost identical results. The comparison of general knowledge as well as knowledge of side effects depending on the gender of our subjects, showed that female subjects presented greater general knowledge on prohibited substances and greater knowledge on adverse effects to the organism than the male subjects. Students' attitudes regarding the use of stimulative substance and dietary supplements showed higher average values in male respondents, which indicated that they have less distinct negative attitude towards doping than female respondents. The female respondents had greater knowledge of the problems related to doping and side effects when compared to the male respondents.

As opposed to our research, Blanket al. [16] concluded in their research that there was a correlation between gender and knowledge, which could be connected to the fact that there was also a correlation between gender and higher parti-

cipation in sports activities. Male subjects were more engaged in sports and showed better results in terms of knowledge. Experience in the use of stimulative substances in the preceding period had not significantly affected knowledge. It would seem logical that someone who used stimulative substances has greater knowledge of all such substances.

The comparison of the average score values among the study departments of our respondents showed that the students from the laboratory technicians department had the highest average values i.e., the highest general knowledge of doping while the physiotherapists had the poorest.

The "good knowledge" limit point was set at 80% of correct answers to the asked questions [15]. In comparison between general knowledge and the use of stimulative substances, one third of the non-using respondents and respondents using stimulative substances showed "good knowledge" and the limit point was a result of greater general knowledge of doping among the non-using respondents. In comparison between general knowledge and the use of stimulative supplements, the non-using and supplement using respondents showed "good knowledge" and worse knowledge, respectively, and the limit point was a result of greater general knowledge of doping side effects among the respondents not using supplements.

Comparing the knowledge of the adverse effects and the use of the strength increase substances, the non-using respondents showed better knowledge than the respondents using prohibited substances, and the limit point was a result of approximately equal number of correct answers to the questions regarding the respondents' general knowledge. Comparing the knowledge of adverse effects and the use of supplements, the non-using respondents showed better knowledge than the respondents using supplements, and the limit point was a result of greater general knowledge of doping side effects among the respondents not using supplements.

Other researchers found bigger differences in knowledge the section of general knowledge of doping and between in the section of knowledge of doping side effects [16].

These values of knowledge scores were a strong invitation for further research on the factors which affect general knowledge of doping and knowledge of side effects, which ought to be included in the pre-emptive measures for educational purposes.

Knowledge and attitudes of student population regarding the problem of doping in sports were research subjects of certain authors. Melia et al. [17] conducted a survey of five Canadian regions including 107 schools in order to determine the prevalence of the use of anabolic-androgenic steroids, their attitudes and knowledge about doping. The results showed that many of them used prohibited substances in the year prior to the survey, and that a significant number of respondents stated that they were using other substances in attempts to improve sports results. The results were alarming and unexpected for teachers, healthcare and sports professionals.

In score values for general knowledge and knowledge on side effects, no statistically significant differences were recorded between the study years; nevertheless, the difference was registered in the score increase between the study years. This surely indicated that a *curriculum* content was not sufficient for a significant change of the required knowledge.

In analysis of the attitudes towards the use of stimulative substances and dietary supplements, we found higher average values in the male respondents. So, the female respondents had greater knowledge of the problems related to prohibited substances as well as side effects, and the male respondents had less distinct negative attitude towards doping than the female respondents.

The results on the attitude scale largely depended on statements, and this may lead to underestimated results since the respondents hesitated to respond honestly. Even in conditions of anonymity, respondents may respond in a manner they believe to be socially desired or expected. Correlations found in this research are significant, but not sufficient, which indicates the fact that there are other unidentified factors which could contribute to a greater knowledge and attitudes regarding the use of stimulative substances.

Our respondents' study years showed that a statistically significant difference exists only when comparing score values for the attitudes, where the students in the second and the third year of studies had lower, and the first-year students had the highest average values. Such a result means that poorly expressed negative attitude on doping at the beginning of the studies is slowly corrected and improved in the subsequent study years, where students have more and more distinct negative attitude on doping, and the physiotherapists had the highest values, as they have the least negative attitude on doping.

The analysis of the average score values for the attitude of our respondents on the ethics of use of substances to improve efficiency in sports, showed that there was a statistically significant difference between the average score values of the knowledge on side effects and attitudes. Students, who considered that the use of substances for improvement was unethical, also knew more about their side effects and had a distinctly more negative attitude on doping. General knowledge of the prohibited substances did not significantly affect perception of ethics.

The students with greater general knowledge on prohibited substances showed better general perception in understanding frequency of use of the substance to improve efficiency in sports. Adoption of the new global Anti-Doping Code in 2015 resulted in altered rules. Today, it is clear that one cannot possibly test all sports in the same manner and that changes ought to be made to the manner as well as to the approach to the fight against doping. People and their perception of doping are much more important than new analytical methods. The basis of the doping problem is primarily harmfulness of the effects to certain organ systems caused by the use of doping substances; young people should be especially warned about this [18].

Most common sources used by our students to obtain information on doping, although their selection did not affect the knowledge and attitudes about doping, were printed media, books, pharmacists and personal trainers as well. Slightly smaller but still significant number of reports that

were personal physician and internet. The interesting thing is that learning about doping from parents was not even within the top five stated sources.

In their research, Blank et al. [16] stated that the majority of respondents sought information on the prohibited substances on the internet in publications and the least often from physicians. As for the supplements, a high number of the respondents considered that they had insufficient information on supplements and the majority of the respondents stated that they obtained information from multiple sources. The students who obtained information from a single source mainly referred to media as the source of data on dietary supplements. The internet was the main source of information about dietary supplements for students in Poland [18]. Since a large number of respondents obtain information from the media and from friends, the greatest attention should be paid to promotion of proper use of dietary supplements, which should be conducted by physicians and pharmacists. According to foreign research, 72% of physicians and 89% of medical nurses recommend the use of dietary supplements [19].

There are numerous research studies on the parents' role in the behaviour and attitude modulation in terms of prevention of a high-risk behaviour related to sexual behaviour and smoking [20]. Nevertheless, there are no studies to deal with the parents' impact on the behaviour of children in connection with some other forms of high-risk behaviour, such as doping. A purpose of such researches would be to assess parents' knowledge and attitudes depending on the child's age, as a first step towards proposing educational and preemptive intervention. Parents were neglected in doping prevention literature; now, with doping interventions shifting towards prevention and education, this type of assessments is needed as well as assessments in order to determine knowledge and current education status of target groups, such as parents. Based on the previous research, emphasis of future educational campaigns should be put on the contents about doping effects on health.

It is important to point out that results obtained in this research are significant, but not sufficient which indicates that there are other unidentified factors which could contribute to greater knowledge and better attitudes regarding the use of stimulative substances.

This study has some limitations, such as: the research was not performed in all departments of the College of Health and Professional Studies; questionnaires were completed under the tutor's supervision, which naturally resulted in higher rate of desirable answers. Beside that the survey was anonymous, the respondents personally handed in the completed questionnaires to the person performing the survey.

Conclusion

The use of stimulative substances is not only a problem of elite sportsmen, but it also exists in the general population and represents a general social problem.

The results obtained from the student population with regard to the attitudes on the use of prohibited substances, knowledge and informedness of doping adverse effects, justify further similar researches.

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