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Research article

Doping Attitudes and Covariates of Potential Doping Behaviour in High-Level Team-Sport Athletes; Gender Specific Analysis

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Abstract
Team sports are rarely studied with regard to doping behaviour and doping-related factors regardless of their global popularity. This study aimed to investigate doping factors and covariates of potential doping behaviour in high-level team-sport athletes. The subjects were 457 high-performing, national- and international-level athletes (21.9 ± 3.4 years of age; 179 females) involved in volleyball (n = 77), soccer (n = 163), basketball (n = 114) and handball (n = 103). Previously validated self-administered questionnaires aimed at evidencing sport factors, doping-related factors, knowledge on sport nutrition and doping, and attitudes to performance enhancement were used. The results indicated a higher doping likelihood in male athletes, with a significant gender difference for basketball and handball. In males, a higher doping likelihood is found for athletes who had achieved better results at junior-age level, those who regularly consume dietary supplements, and who perceive their sport as being contaminated by doping. A higher sport achievement at senior-age level is protective against potential doping behaviour in males. In females, a higher likelihood of doping is evidenced in those athletes involved in binge drinking, while a lower tendency for doping is evidenced in female athletes who possess better knowledge on sport nutrition. Knowledge about doping is very low and thus education about doping is urgently needed. An improvement of knowledge on sport nutrition might be a potentially effective method for reducing the tendency for doping in females. Future studies should consider other approaches and theories, such as theory of planned behaviour and/or social-cognitive theory, in studying the problem of doping behaviour in team-sports.

Key words: Performance-enhancing substances, knowledge, attitude, athletes.

Introduction

Doping in sports refers to the violation of one or more anti-doping rules, including the consumption of banned performance-enhancing substances (e.g. drugs) and/or application of prohibited techniques (Hughes, 2015). Doping behaviour corrupts the essence, image and value of sport, while negative effects of doping on athletes' health status are extensively reported (Massaldjieva et al., 2010; Petroczi, 2009; Zenic et al., 2013). Consequently, the global fight against doping in sports is highly prioritised.

There are two main approaches to global anti-doping efforts. First, the World Anti-Doping Agency (WADA), a global governing body, and accompanying laboratories have developed increasingly reliable diagnostic tools and protocols aimed at detecting doping in athletes (Guan et al., 2013; Jelkmann and Lundby, 2011; Jing et al., 2011). Second, sports society in general is particularly aware of the importance of identifying sport-specific, socio-demographic, cultural, educational and other factors associated with doping behaviour in athletes. Such factors are extensively investigated and incorporated into systematic anti-doping programmes with the mains idea to proclaim and encourage protective-, and control risk-factors of doping behaviour in athletes (Erickson et al., 2015; Kisaalita and Robinson, 2014; Sekulic et al., 2014). The first approach (i.e. identification and consequent penalisation of athletes who use doping) is repressive in its nature. On the other hand, the second one (i.e. identification of the protective/predictive factors of doping-behaviour) is rather preventive, aimed at establishing the negative attitude toward doping, and consequently more effective in developing general anti-doping environment in sport-society as a whole (Alaranta et al., 2006; Kondric et al., 2011; Peretti-Watel et al., 2005).

Studies conducted so far suggest that factors associated with doping behaviour in one group (type of sport, gender, even socio-cultural environment) are rarely equally associated with doping behaviour in other sport-specific groups (Furjan Mandic et al., 2013; Rodek et al., 2012; Sajber et al., 2013). That is, certain factors might be negatively related to doping behaviour in a particular sport, gender and/or socio-cultural environment, while the same factor might be inversely (or insignificantly) associated with doping behaviour in other circumstances (Rodek et al., 2013). For example, high sport competitive achievement (result) is found to be protective against potential doping behaviour for international sailing athletes (Rodek et al., 2012). Oppositely, the higher doping likelihood is found in more successful table tennis players (Kondric et al., 2010). Further, in some cases dietary supplementation is reported as being associated to higher likelihood of doping (Backhouse et al., 2013; Sekulic et al., 2014), while other studies found no association between dietary supplementation and doping behaviour (Rodek et al., 2012).

Team sports (i.e. basketball, soccer) are among the most popular sport activities in the world. Most of the studies that investigated team sports with regard to doping issues, reported testing methods and findings about analytical tools for evaluating the presence of doping in athletes' specimens (Campos et al., 2003; Krumbholz et al.,

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2014; Mareck et al., 2007). When studied factors potentially associated to doping behaviour, team-sport athletes were regularly observed as part of a larger group of athletes from different sports (Al Ghobain et al., 2016; Muwonge et al., 2015; Peretti-Watel et al., 2005). To the best of our knowledge, only one study investigated doping-behaviour and correlates of doping-behaviour in high-level team sport athletes (Sekulic et al., 2014). In that study authors reported more than 55% of studied rugby players as being prone to potential doping behaviour, with higher likelihood of potential doping behaviour in those who reported less smoking, less experience in rugby, and higher consumption of dietary supplements (Sekulic et al., 2014).

From this brief literature overview it is evident that, sport-specific analyses of factors associated with doping behaviour are necessary. What is particularly lacking are gender-specific analyses of the factors associated with doping behaviour in team sports. As a result, the main aim of this research was to explore: (i) the likelihood of doping behaviour; and (ii) gender-specific factors (covariates) associated with doping behaviour in team-sport athletes involved in volleyball, basketball, soccer (football) and handball (team handball). In addition, we examined within-sport differences (i.e. between males and females involved in the same sports) and between-sport differences (within genders) in the studied variables. Improved knowledge of this topic would allow development of the accurate anti-doping campaign, while targeting of the most vulnerable groups of athletes in these sports.

Methods

Participants

The participants were 457 athletes (179 females) involved in four sports: volleyball (n = 77; 39 females), handball (n = 103; 34 females), soccer (n = 163; 58 females) and basketball (n = 114; 48 females) from Kosovo. Although there are other team sports worth studying, in this investigation we have been focused on four most popular team-sports in the region. The sports were selected on a basis of three criteria: (i) Olympic sports, (ii) national-level league competition is organised both for males and females at senior (+18 years of age) and junior level, and (iii) Kosovar National teams are involved in international competitions (i.e. Kosovar national sport association is a member of International Federation). Kosovar athletes involved in competitions of the highest national level during the 2013–2014 competitive season (i.e. first division athletes) who were older than 18 years, were invited to participate in the testing by the Ministry of Culture, Youth and Sport of the Republic of Kosovo. None of the athletes refused to participate, and each team was tested in one day only to avoid communication between athletes. Therefore only those athletes who were present at the training on a testing day were included in investigation. The study complied with all ethical guidelines and received approval from the Institutional Ethics Review Board at the corresponding author's institution (EBO 10/09/2014-1).

Variables and measurement

All of the variables were collected by a previously validated questionnaires: (i) Questionnaire of Substance Use (QSU) (Zenic et al., 2010), (ii) knowledge on doping (KD) (Furjan Mandic et al., 2013; Sajber et al., 2013), (iii) knowledge on sport nutrition (KSN) (Kondric et al., 2013; Sekulic et al., 2014), and (iv) attitudes to performance-enhancing drugs (Performance Enhancement Attitude Scale – PEAS) (Morente-Sanchez et al., 2014; Petroczi et al., 2008)

The QSU includes questions on socio-demographics, sport-factors, cigarette smoking, alcohol drinking, consumption of dietary supplements and doping-factors. The socio-demographic data included: age (in years), gender and education level (responses included "Elementary school", "High school", "College/university degree"). Athletes were asked about their dietary supplementation ("Regularly", "Occasionally", "No"), cigarette smoking ("Non-smoker", ""Quitted", "From time to time, but not daily", "Daily smoking") and binge drinking ("No, never", Couple of times per year", "Once a month or so", "Once a week or so"). Sport factors were assessed by questions on: (i) the type of sport they were involved in ("Basketball", "Soccer", "Handball", "Volleyball"); (ii) their experience in that sport (in years); and (iii) competitive results achieved in (iiia) junior-age level (until 18 years of age), and (iiia) senior-age level (+18 years of age; both: "Regional level", National level", "National team/international level"). Doping-related factors were assessed by asking participants their opinions about: (i) the occurrence of doping in the sport they were involved in ("I don't think doping is used in my sport", "Not sure about it", "Occurs, but rarely", "Doping is often in my sport"), (ii) number of doping testing ("Never tested on doping", "Once or twice", Three times and more"), and (iii) their potential doping behaviour ("I would engage in doping if it would help me", "Not sure" and "I do not intend to engage in doping in future"). For the purposes of logistic analysis and calculating the odds ratios (ORs) (see the section on statistics), the athletes were divided into two groups: non-doping athletes (those who responded negatively to the question about potential doping behaviour; coded as 1) and doping athletes (those who responded positively; coded as 2). Those who answered "Not sure" were not included in these analyses.

The KD questionnaire consisted of 10 questions. Each question (statement) was in a "true (T) or false (F)" format; if the answer was correct, the athletes scored one point. The final results ranged from 0 to 10. The correct answers were based on WADA standards. The questions were as follows: (1) Diuretics are considered doping because of their influence on body weight reduction (F); (2) Doping control officers should notify athletes of their testing intentions a few hours prior to any testing (F); (3) If an athlete has an out-of-competition doping test, four weeks should elapse before their next doping test (F); (4) If a doping control officer does not provide valid proof of identity, an athlete can refuse to participate in the testing (T); (5) A "masking agent" is someone who helps an athlete hide their use of doping and is therefore equally responsible for doping offences (F); (6) The use of am-

phetamines in cycling has been related to several cases of death due to cardiovascular failure (T); (7) The use of amphetamines by women is related to male-like changes in body appearance (F); (8) Synthetic testosterone (i.e., steroids) increases the quantity of erythrocytes and is therefore common in endurance sports and not prevalent in strength/power sports (F); (9) Use of synthetic testosterone (i.e., steroids) inhibits the production of natural (endogenous) testosterone (T); (10) When an athlete reports undergoing official medical treatment, he/she cannot be tested for doping (F). Knowledge on doping side effects was asked by items 5, 6, 7, 8 and 9, while items 1, 2, 3, 4 and 10 targeted the knowledge on anti-doping regulations.

The KSN consisted of test questions using the same evaluation system as previously explained for KD. The KSN questions were as follows: (1) The negative side effects of excessive sweating are best cured by drinking pure water (F); (2) After a competition day is over, it is better to not eat for 4 hours after a competition (F); (3) Dark yellow urine is a sign of proper hydration of the body (F); (4) For the first meal after a match, chicken breast (white meat) and eggs are a better choice than pasta (F); (5) Dried fruit is an excellent source of carbohydrates (T); (6) Protein supplementation requires an increased intake of water (T); (7) Fresh fruit and vegetables are the best source of high-quality proteins (F); (8) Egg yolk and poultry are a valuable source of vitamins B and C (F); (9) Carbohydrate-laden meals should be avoided before matches because they encourage urination and therefore dehydration (F); (10) A decrease in body weight as a result of a single training day indicates dehydration (T). Items 1, 3 and 10 examined knowledge of hydration/dehydration; questions 2, 4 and 6 targeted knowledge of nutrition strategies aimed at recovery; and questions 5, 7, 8 and 9 were general questions about knowledge of nutrition. The KSN is based on recent literature in the field of sport nutrition (Maughan and Shirreffs, 2011; Purcell et al., 2013).

The PEAS questionnaire consisted of the following 17 questions: (1) Doping is necessary to be competitive; (2) Doping is not cheating since everyone does it; (3) Athletes often lose time due to injuries and drugs can help to make up the lost time; (4) Only the quality of performance should matter, not the way athletes achieve it; (5) Athletes in my sport are pressured to take performance-enhancing drugs; (6) Athletes who take recreational drugs use them because they help them in sport situations; (7) Athletes should not feel guilty about breaking the rules and taking performance-enhancing drugs; (8) The risks related to doping are exaggerated; (9) Athletes have no alternative career choices, but sport; (10) Recreational drugs give the motivation to train and compete at the highest level; (11) Doping is an unavoidable part of competitive sport; (12) Recreational drugs help to overcome boredom during training; (13) There is no difference between drugs and speedy swimsuits that are all used to enhance performance; (14) Media should talk less about doping; (15) The media blows the doping issue out of proportion; (16) Health problems related to rigorous training and injuries are just as bad as from doping; (17) Legalising performance enhancements would be beneficial for sports. For each question an athlete responded on a six-point scale from “strongly disagree” to “strongly agree”, resulting in theoretical scale ranging from 17 to 102.

Testing was conducted in groups of at least five athletes who were informed that the survey was strictly anonymous, they could refuse to participate, they could leave some of the questions and/or the entire questionnaire unanswered and that returning the completed questionnaire was considered consent to participate in the study. After testing, the questionnaires were placed in a sealed box that was opened the day after the testing. For those athletes who participated in the testing, the response rate was higher than 99%, and only three athletes returned the questionnaire unanswered.

For the purposes of this study, the questionnaires were translated into the Albanian language and the reliability of all questionnaires was tested among 17 athletes who had responded to the questionnaire twice in the time frame of two weeks. The percentage of equally answered statements in the QSU was 89%, with a test-retest correlation of 0.90 for KD, 0.86 for KSN and 0.90 for PEAS, demonstrating appropriate reliability of the measurement tool. Different types of validity for the questionnaires are extensively reported in previous studies (Kondric et al., 2013; Morente-Sanchez et al., 2014; Petroczi et al., 2008; Sajber et al., 2013; Sekulic et al., 2014)

Statistical analyses

All variables were checked for normality of the distribution by Kolmogorov Smirnov’s test. Further, statistics included counts and frequencies (for nominal and ordinal variables), and/or means and standard deviations (for continuous variables).

The differences for doping likelihood were assessed by calculating the odds ratio (OR) and 95% confidence interval (95%CI). ORs were calculated as follows:

$$OR = \frac{DA_1/NDA_1}{DA_2/NDA_2}$$

where DA presents athletes with positive attitude toward doping, NDA – athletes with negative attitude toward doping, and subscripted numbers present each of the compared groups (McHugh, 2009).

A t-test and analysis of the variance (F-test) were used to establish differences for continuous variables (age, experience, KD, KSN, PEAS) between genders and sports. Mann-Whitney test was used to establish differences for ordinal variables (i.e. Sport achievement/result, Smoking cigarettes, Binge alcohol drinking). The association between PEAS and potential doping behaviour as measured by SUM questionnaire was assessed by calculating Spearman’s rank order correlations. Simple logistic regressions were calculated to define the associations between covariates (socio-demographic-factors, sport-factors, doping-related factors, PEAS, KSN and KD) and a binomial criterion – doping likelihood (see above for details). Previous studies have found that athletes’ personal opinion about the presence of doping in sports as strongly associated doping behaviour in various sports, while WADA statistics have reported significant differ-

ences among sports in positive findings on doping substances (Kondric et al., 2011; Rodek et al., 2009; Sekulic et al., 2014; Zenic et al., 2010). Therefore, logistic regressions were calculated for three models: Model I – non-controlled for confounding factors, Model II – controlled for type of sport as a confounding factor, Model III – controlled for type of sport and opinion about the presence of doping in sport as confounding factors. Statistica version 12.0 (Statsoft, Tulsa, OK) was used for all calculations, and a significance level of 95% was applied.

Results

Despite some significant age differences (i.e. the volleyball athletes were somewhat older than the other athletes; F test: 10.62, $p < 0.01$), the athletes were actually of a similar age (21.31 ± 3.50 years, 21.06 ± 2.77 years, 23.61 ± 2.89 years, and 22.02 ± 3.92 years for basketball, soccer, volleyball and handball, respectively). The experience in sport was equal across sports (8.01 ± 4.01 years of experience on average; F test: 0.55, $p > 0.05$). Athletes involved in different sports achieved similar results for KSN (2.15 ± 1.40) and KD (4.02 ± 2.00), with no significant differences between sports (F test: 0.99 and 0.94, $p > 0.05$, for KD and KSN, respectively). The highest prevalence of doping likelihood was found for basketball (60% athletes who declared negative tendency toward doping in future), followed by handball (negative tendency: 61%), soccer (negative tendency: 63%) and volleyball (negative tendency: 67%).

There was no difference between genders in age (21.84 ± 3.51 and 21.98 ± 3.18, t-value: -0.41, $p > 0.05$), experience in sport (8.23 ± 3.75 and 7.70 ± 3.21, t-value: 1.80, $p > 0.05$), KD (2.11 ± 1.31 and 2.20 ± 1.67, t-value: 1.21, $p > 0.05$), and KSN (4.01 ± 2.20 and 4.04±1.90, t-value: 0.12, $p > 0.05$; for males and females, respectively). The PEAS score was higher in males than in females (46.12 ± 11.43 and 41.54 ± 14.11; for males and females, respectively; t-value: 2.11, $p < 0.05$). Female athletes were better educated (MW: 2.31, $p < 0.05$), and achieved a better sport result at senior level (MW: 2.13, $p < 0.05$). In overall, the 86% of athletes had never been tested for prohibited substances (doping), and about 60% believed that doping is not prevalent in their sport. Females are less convinced that doping is prevalent in their sport than males (MW: 2.01, $p < 0.05$) (Table 1).

Table 1. Frequencies (F) and percentages (%) for observed variables and differences between genders for ordinal variables (Mann Whitney test).

	Males		Females		Mann Whitney	
	F	%	F	%	Z value	p
Education					-2.31	0.01
Elementary school (1)	118	42.45	62	34.64		
High-school (2)	85	30.58	46	25.70		
College/University degree (3)	75	26.90	71	39.70		
Junior-age sport achievement/result					-1.21	0.22
Regional level (1)	174	62.59	102	56.98		
National level (2)	102	36.69	75	41.90		
National team/International level (3)	2	0.72	2	1.12		
Senior-age sport achievement/result					-2.13	0.03
Regional level (1)	78	28.06	36	20.11		
National level (2)	144	51.80	96	53.63		
National team/International level (3)	56	20.14	47	26.26		
Consumption of dietary supplements					-0.13	0.89
No, I don't consume it (1)	141	50.71	85	47.50		
Rarely/occasionally (2)	104	37.41	84	46.93		
Regularly (3)	33	11.87	10	5.59		
Smoking cigarettes					-0.04	0.96
No, I don't smoke (1)	279	96.37	170	95.00		
From time to time, but not daily (2)	6	2.15	5	2.80		
Daily smoking (3)	4	1.40	4	2.20		
Binge alcohol drinking					0.39	0.69
No, never (1)	240	86.33	157	87.70		
Couple a times a year (2)	20	7.20	12	6.70		
Once a month or so (3)	14	5.00	5	2.70		
Once a week or so (4)	4	1.40	5	2.80		
Number of doping testing					0.61	0.54
Never (1)	238	85.60	157	87.50		
Once or twice (2)	29	10.46	15	8.50		
Three times and mor (3)	11	3.94	7	4.00		
Doping in sport					2.01	0.04
Don't think that doping occurs in my sport (1)	160	57.55	125	69.83		
Not sure about it (2)	55	19.78	46	25.70		
Occurs, but rarely (3)	35	12.59	6	3.35		
Doping is often in my sport (4)	18	6.47	2	1.12		

Number in parentheses presents numerical values of each ordinal variable

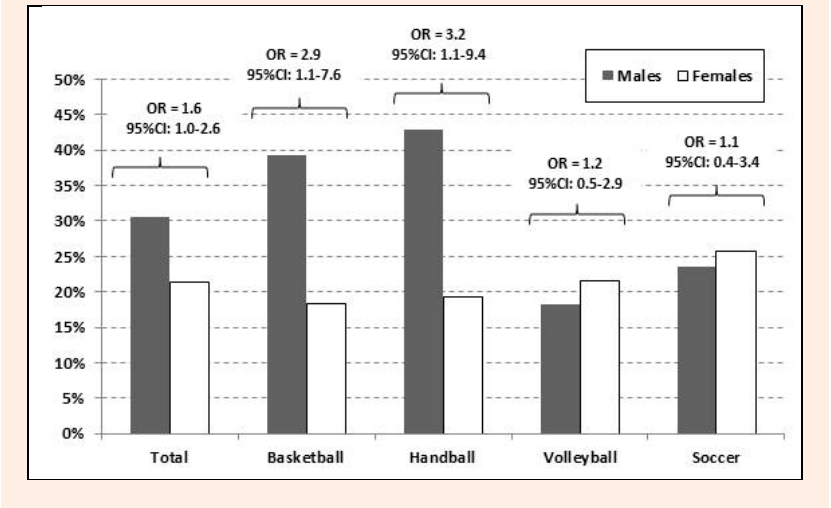

Figure 1. Potential doping behavior and odds ratio (OR) with 95% confidence interval (95%CI) between genders in total sample and for each sport separately.

Males were more prone to doping than females (OR: 1.6; 95%CI: 1.0-2.6). When observed for each sport separately, significant differences in odds toward potential doping behavior were found for basketball (OR: 2.9; 95%CI: 1.1-7.6), and handball (OR: 3.2; 95%CI: 1.1-9.4), with no significant difference between genders for soccer (OR: 1.1; 95%CI: 0.4-3.4), and volleyball (OR: 1.2; 95%CI: 0.5-2.9) (Figure 1).

The high correlation between PEAS and doping likelihood (0.87 and 0.89 for males and females, respectively; $p < 0.05$) indicated that those two variables share more than 70% of the common variance, and both actually identify attitudes to doping (i.e. performance-enhancing substances). When calculated for male athletes, logistic regressions indicated higher odds of doping behaviour in those who had achieved a National team/International level (i.e. highest) sport result at junior level (Model I: OR: 1.54, 95%CI: 1.11-2.31; Model II: OR: 1.55, 95%CI: 1.10-2.01; Model III: OR: 1.49, 95%CI: 1.11-2.00), who consume dietary supplements regularly (Model I: OR: 1.21, 95%CI: 1.03-1.78; Model II: OR: 1.20, 95%CI: 1.02-1.76; Model III: OR: 1.20, 95%CI: 1.02-1.77) and those who believe that doping is frequent in their sport (Model I: OR: 3.00, 95%CI: 1.41-2.79; Model II: OR: 2.53, 95%CI: 1.67-3.11). A lower likelihood is evidenced for those male athletes who had achieved a higher competitive result at senior level (Model I: OR: 0.65, 95%CI: 0.22-0.76; Model II: OR: 0.65, 95%CI: 0.23-0.99; Model III: OR: 0.61, 95%CI: 0.31-0.98) (Table 2).

In females, a higher likelihood of doping is evidenced for those who binge drink alcohol frequently/once a week or so (Model I: OR: 1.53, 95%CI: 1.04-2.98; Model II: OR: 1.52, 95%CI: 1.05-2.99; Model III: OR: 1.52, 95%CI: 1.06-3.00). A lower doping likelihood is found in older female athletes (Model I: OR: 0.87, 95%CI: 0.77-0.99; Model II: OR: 0.87, 95%CI: 0.75-0.99; Model III: OR: 0.86, 95%CI: 0.75-0.99) and those with better knowledge on sport nutrition (Model I: OR: 0.71, 95%CI: 0.58-0.88; Model II: OR: 0.71, 95%CI: 0.58-0.88; Model III: OR: 0.69, 95%CI: 0.56-0.87) (Table 3).

Discussion

This is one of the first studies to have specifically investigated factors associated with doping behaviour in females and males involved in team sports. The obtained results allow a meaningful comparison of potential doping behaviour and its covariates in these sports. Although the results allow a broad discussion of the problem, below we will mostly focus on those findings directly related to our study aims. Therefore, we will discuss: (i) prevalence and differences in doping likelihood between genders and sports; and (ii) gender-specific factors associated with potential doping behaviour. First, we will shortly overview the results obtained via the questionnaire that examined knowledge on doping.

Generally, knowledge on doping is low. In brief, the team-sport athletes observed herein achieved the lowest results of all athletes from the region (territory of former Yugoslavia) who had been previously tested with the same questionnaire, including swimmers, synchronised swimmers, and rugby union players (Furjan Mandic et al., 2013; Sajber et al., 2013; Sekulic et al., 2014). The first reason for the evident lack of knowledge on doping is the absolute absence of any systematic education about doping in sport in Kosovo. We have no doubt this is in fact a direct consequence of the lack of an effective overall public health policy in the country, as already highlighted in studies examining public health issues (Carkaxhiu et al., 2011; Tahiraj et al., 2016). Moreover, Kosovo had not been member of International Olympic Committee till 2014, doping controls in Kosovo are rare, and the majority of athletes included in this study had never been tested for prohibited substances. Altogether, this has resulted in poor knowledge of doping-related health hazards and international anti-doping protocols (i.e. testing regulations, athletes' responsibilities and rights).

Doping likelihood

The prevalence of doping likelihood (i.e. altogether, 63% of the athletes declared a negative tendency concerning doping) is within the expected values. In brief, previous

Table 2. Logistic regression results for categorical criterion – doping likelihood; male team-sport athletes.

	OR (95%CI)[a]	OR (95%CI)[b]	OR (95%CI)[c]
Age (continuous)	0.99 (0.92-1.07)	0.97 (0.89-1.05)	0.99 (0.91-1.07)
Experience (continuous)	0.97 (0.91-1.02)	0.98 (0.94-1.03)	0.98 (0.90-1.08)
KSN (continuous)	1.07 (0.95-1.20)	1.09 (0.97-1.19)	1.07 (0.97-1.21)
KD (continuous)	1.01 (0.96-1.09)	1.00 (0.95-1.05)	1.01 (0.96-1.08)
Education			
Elementary school	REF	REF	REF
High-school	1.80 (0.89-3.06)	1.95 (0.91-3.02)	1.99 (0.94-3.10)
College/University degree	0.81 (0.37-1.86)	0.82 (0.38-1.96)	0.92 (0.38-1.92)
Sport			
Basketball	REF		
Soccer	0.95 (0.07-4.77)		
Volleyball	0.41 (0.11-3.35)		
Handball	0.99 (0.32-5.61)		
Junior-age sport achievement/result			
Regional level	REF	REF	REF
National level	0.99 (0.34-1.65)	0.97 (0.35-1.71)	0.98 (0.36-1.65)
National team/International level	1.54 (1.11-2.31)	1.55 (1.10-2.01)	1.49 (1.11-2.00)
Senior-age sport achievement/result			
Regional level	REF	REF	REF
National level	0.98 (0.31-1.34)	0.89 (0.41-1.45)	0.89 (0.39-1.51)
National team/International level	0.65 (0.22-0.76)	0.65 (0.23-0.99)	0.61 (0.31-0.98)
Consumption of dietary supplements			
No, I don't consume it	REF	REF	REF
Rarely/occasionally	0.98 (0.81-1.45)	0.87 (0.80-1.39)	0.88 (0.79-1.37)
Regularly	1.21 (1.03-1.78)	1.20 (1.02-1.76)	1.20 (1.02-1.77)
Smoking cigarettes			
No, I don't smoke	REF	REF	REF
Quitted	1.01 (0.61-2.09)	0.99 (0.87-2.07)	0.96 (0.86-3.09)
From time to time, but not daily	1.02 (0.51-2.11)	1.14 (0.91-3.06)	1.21 (0.86-3.11)
Daily smoking	1.03 (0.50-2.12)	1.35 (0.89-4.09)	1.45 (0.90-4.11)
Binge alcohol drinking			
No, never	REF	REF	REF
Couple a times a year	1.08 (0.33-2.99)	1.09 (0.21-2.78)	1.00 (0.11-4.65)
Once a month or so	2.89 (0.86-4.22)	2.78 (0.87-4.55)	2.81 (0.81-5-01)
Once a week or so	2.91 (0.61-5.76)	2.81 (0.54-6.01)	2.78 (0.34-7.98)
Number of doping testings			
Never tested on doping	REF	REF	REF
Once or twice	0.88 (0.20-2.11)	0.99 (0.12-2.54)	0.80 (0.10-2.43)
Three times and more	1.00 (0.11-2.44)	1.15 (0.11-2.47)	1.00 (0.09-2.67)
Doping in sport			
Don't think that doping occurs in my sport	REF	REF	
Not sure about it	1.01 (0.66-2.00)	1.11 (0.60-2.01)	
Occurs, but rarely	1.50 (0.43-2.17)	1.34 (0.48-2.72)	
Doping is often in my sport	3.00 (1.41-2.79)	2.53 (1.67-3.11)	

[a] Nonadjusted general linear model; [b] Model adjusted for covariate "Sport"; [c] Model adjusted for covariates "Doping in sport" and "Sport"; KSN – knowledge on sport nutrition; KD – knowledge on doping

studies using the same questionnaire (i.e. QSU) reported a similar tendency among racquet sport athletes (Kondric et al., 2011), while a higher tendency was found among weightlifters (30% with no doping tendency) and rugby players (51% with no doping tendency) (Rodek et al., 2009; Sekulic et al., 2014). The lowest doping likelihood is reported for swimming, synchronised swimming and sailing (>80% self-reported no doping tendency) (Furjan Mandic et al., 2013; Sajber et al., 2013).

Studies conducted so far indicate several possible reasons for differences in attitudes to doping between sports. In some investigations, individual sports (i.e. track and field, cycling etc.) are highlighted as 'higher risk' activities than team sports (handball, basketball etc.) (Lazuras et al., 2010; Muwonge et al., 2015). In other studies, authors indicated factors of "independence of sport federations" and "frequency and quality of doping controls" as probable determinants of doping likelihood (Morente-Sanchez and Zabala, 2013). However, based on studies that investigated the problem in athletes from our region while using the same methodological approach and measurement tools (i.e. QSU), we may offer a somewhat different explanation for the variable tendency toward doping between sports.

In short, of those sports studied so far the highest tendency for doping is evident in sports with high anaerobic demands, which at the same time are activities with a big risk of injury, either because of the tackle character of the game (i.e. rugby) or the extremely high intensity of the workload (i.e. weight lifting) (Rodek et al., 2009; Sekulic et al., 2014). A somewhat lower tendency for doping is reported for intermittent anaerobic sports with a

Table 3. Logistic regression results for categorical criterion – doping likelihood; female team-sport athletes.

	OR (95%CI)[a]	OR (95%CI)[b]	OR (95%CI)[c]
Age (continuous)	0.87 (0.77-0.99)	0.87 (0.75-0.99)	0.86 (0.75-0.99)
Experience (continuous)	0.98 (0.88-1.09)	0.99 (0.89-1.12)	0.99 (0.88-1.11)
KSN (continuous)	0.71 (0.58-0.88)	0.71 (0.58-0.88)	0.69 (0.56-0.87)
KD (continuous)	0.77 (0.57-1.03)	0.77 (0.57-1.04)	0.76 (0.56-1.04)
Education			
Elementary school	REF	REF	REF
High-school	0.52 (0.19-1.37)	0.56 (0.19-1.41)	0.55 (0.11-1.38)
College/University degree	1.09 (0.25-4.72)	1.11 (0.25-4.35)	1.13 (0.22-4.49)
Sport			
Basketball	REF		
Soccer	1.08 (0.31-3.72)		
Volleyball	2.49 (0.81-7.70)		
Handball	1.77 (0.53-5.92)		
Junior-age sport achievement/result			
Regional level	REF	REF	REF
National level	1.37 (0.66-2.87)	1.54 (0.72-3.29)	1.51 (0.70-3.27)
National team/International level	2.92 (0.17-48.44)	1.96 (0.11-33.58)	2.04 (0.12-35.44)
Senior-age sport achievement/result			
Regional level	REF	REF	REF
National level	1.32 (0.47-3.71)	1.87 (0.62-5.62)	1.91 (0.62-5.91)
National team/International level	1.45 (0.48-4.41)	1.79 (0.52-6.19)	1.96 (0.54-7.10)
Consumption of dietary supplements			
No, I don't consume it	REF	REF	REF
Rarely/occasionally	2.26 (0.60-8.53)	2.13 (0.53-8.58)	2.10 (0.52-8.51)
Regularly	2.27 (0.58-8.92)	2.29 (0.60-8.78)	2.24 (0.58-8.62)
Smoking cigarettes			
No, I don't smoke	REF	REF	REF
From time to time, but not daily	0.84 (0.09-8.33)	1.12 (0.11-11.57)	1.16 (0.11-12.06)
Daily smoking	1.09 (0.66-12.35)	1.11 (0.58-13.41)	1.05 (0.51-14.52)
Binge alcohol drinking			
No, never	REF	REF	REF
Couple a times a year	0.47 (0.01-14.54)	0.44 (0.02-15.04)	0.45 (0.03-16.01)
Once a month or so	1.01 (0.04-12.51)	1.00 (0.06-13.75)	1.01 (0.04-14.07)
Once a week or so	1.53 (1.04-2.98)	1.52 (1.05-2.99)	1.52 (1.06-3.00)
Number of doping testings			
Never tested on doping	REF	REF	REF
Once or twice	0.98 (0.40-1.78)	0.96 (0.41-1.79)	0.99 (0.19-1.99)
Three times and more	1.02 (0.21-2.14)	1.00 (0.19-2.23)	1.01 (0.11-2.15)
Doping in sport			
Don't think that doping occurs in my sport	REF	REF	
Not sure about it	0.97 (0.42-2.26)	0.98 (0.42-2.31)	
Occurs, but rarely	1.76 (0.28-11.03)	1.41 (0.22-9.19)	
Doping is often in my sport	2.63 (0.16-21.12)	2.77 (0.15-23.43)	

[a] Nonadjusted general linear model; [b] Model adjusted for covariate "Sport"; [c] Model adjusted for covariates "Doping in sport" and "Sport"; KSN – knowledge on sport nutrition; KD – knowledge on doping

moderate injury risk (i.e. basketball, handball, soccer, volleyball, racquet sports) (Kondric et al., 2011; Kondric et al., 2013). Finally, athletes involved in low-injury risk activities (i.e. sailing, swimming, synchronised swimming) seem to be at the lowest risk of doping behaviour (Furjan Mandic et al., 2013; Rodek et al., 2012; Sajber et al., 2013). Of course, this list is neither exclusive nor complete but we believe that the number of investigations and the high competitive level of the athletes who were tested permit a meaningful comparison and, to some extent, justify the conclusions previously presented.

When observed for the total sample (i.e. not dividing by sports), the prevalence of potential doping behaviour is higher in males. This is in accordance with previous studies that reported male athletes as being generally more permissive of doping behaviour than females (Alaranta et al., 2006; Sas-Nowosielski and Swiatkowska, 2008). This is further supported by the findings of studies that directly examined differences between males and females involved in the same sport (Kondric et al., 2011; 2013; Sajber et al., 2013). Such gender differences in doping tendencies can be explained by two important factors: (i) the self-perception of the presence of doping in the sport; and (ii) factors of hesitation against doping.

Studies performed so far have regularly reported that one's personal opinion about the presence of doping in the sport is a strong predictor of doping behaviour (Rodek et al., 2013; Sajber et al., 2013). In our study, females are generally less convinced that doping is present in their sport. This logically reflects their own lower likelihood of doping behaviour in comparison to males. The second reason was recently highlighted in a study examining factors of hesitation in doping behaviour among male and female college-level athletes (Zaletel et

al., 2015). In that study, the authors reported that female athletes were more concerned about the negative consequences of doping behaviour (i.e. health-hazards, negative image in publics) than their male colleagues. This fear naturally contributes to their lower tendency to engage in doping (Zaletel et al., 2015).

While in basketball and handball males are more prone to doping, there was no significant gender-difference for potential doping behaviour in volleyball and soccer. The negative tendency for doping in volleyball is the highest of all studied sports, and this probably explains even the non-significant differences in doping tendency between genders for this sport. Meanwhile, the similar prevalence of doping likelihood in males and females involved in soccer is at least partially a consequence of the specific socio-cultural environment that characterises this sport. In short, soccer is generally perceived as a 'male sport', and of the more than 265 million players in the world, only 10% are women (FIFA). It is possible that this fact to some extent influence even a stronger tendency toward doping among female soccer players than among female athletes in other team sports observed herein.

Predictors of doping behaviour

Previous studies have regularly reported a higher doping likelihood in those athletes who are convinced that doping is present in their sport (Rodek et al., 2013; Sekulic et al., 2014; Zenic et al., 2010). This is mostly explained by socio-psychological theory of self-categorisation. In brief, individuals adopt the norms (and beliefs) of their fellow group members. Consequently, if an athlete believes that doping is present in their sport, it is more likely that he/she will be engaged in doping. Therefore, the findings of a higher doping likelihood in those male athletes who perceive their sport as contaminated by doping are in accordance with previous investigations (Kondric et al., 2011; Sekulic et al., 2014). On the other hand, we found no significant association between these two variables in female athletes. The fact we studied athletes from different team sports (i.e. note that potential doping behaviour varies among sports) probably resulted in a non-systematic association between the opinion about the presence of doping in sport and attitudes toward doping in females.

High consumption of dietary supplements in males is recognised as a risk factor for doping behaviour. This finding is in line with previous studies where athletes who were engaged in legal performance-enhancement practices (i.e. dietary supplementation) are recognised as an 'at-risk' group for making a transition towards doping (Backhouse et al., 2013; Sekulic et al., 2014). What is also important, a high tendency for doping is evidenced in males who had achieved a higher competitive result (sport achievement) at junior level. Those who achieve high sporting success at junior level are often considered as predisposed for future sport achievement at senior level. However, only a minority of those who were successful as juniors (at youth age; until 18yrs) achieve similar competitive success as seniors (+18 yrs.). The frustration, and consequent urge for doping, among those whose expectations were higher than their actual achievements are, in fact, logical. The higher doping likelihood among those males who consume dietary supplements fits into this specific chain reaction (figuratively speaking: high expectations on the basis of junior-level achievement – a lack of success at senior level – dietary supplementation – repeated failure to achieve – doping likelihood). Although somewhat hypothetical, this explanation is indirectly confirmed by another finding from this study – the lower doping likelihood of those who have succeeded at senior-level competitions.

The consumption of 'everyday substances' such as alcohol and cigarettes as a potential covariate of doping behaviour in athletes is studied since recently (Kondric et al., 2011; Rodek et al., 2009; Sajber et al., 2013). Our results showed a higher doping tendency in females frequently involved in binge drinking. Interestingly, such associations between alcohol and doping have been previously reported only among female athletes (Zenic et al., 2010).

Females who achieved higher scores on KSN are less likely to engage in doping in future. This is not the first study to report a lower doping likelihood in athletes who possess better knowledge on sport nutrition, and similar results were presented previously for tennis players (Kondric et al., 2013). Although we did not study it profoundly, it is possible that greater knowledge of sports nutrition (i.e., a higher KSN score) could in fact mean that an athlete eats properly and combines their training, diet and necessary dietary supplementation. As a result, their working capacity would be enhanced (Hoffman et al., 2009), and doping behaviour would be less probable.

Limitations and strengths of the study

The main study limitation is the cross-sectional study design. Accordingly, the results of the statistical analyses indicate an association, but causality cannot be determined. Additionally, the number of male athletes was somewhat greater than that of female athletes. As a result, achieving statistical significance of the calculated coefficients for female athletes was difficult. Additionally, this study is done in only one country of specific cultural and social background, and where doping controls are not common. Therefore, generalizability of the results is somewhat limited. Finally, questionnaires were self-administered and athletes could naturally lean to socially desirable answers. However, we believe that strict anonymity of the testing decreased the possibility that participants did not answer honestly.

This is one of the first studies that examined the problem of doping behaviours and it's covariates in team-sport athletes. Also, the studies done so far that used the same methodological approach allowed us to make a reasonable comparison with previous results. Therefore, we believe that findings, although not the final word on a problem contribute to the knowledge on a field. Knowing the strong connection between athletes with their coaches and physicians, similar analyses in athletes' supportive teams are necessary. Also, in future studies it would be important to consider other approaches and theories (i.e. theory of planned behaviour, social-cognitive theory) in

studying the problem of doping behaviour in team sports.

Conclusion

The doping knowledge among Kosovar team-sport athletes is very low. Therefore, systematic anti-doping education is urgently needed. It should include: (i) topics on doping health hazards; and (ii) anti-doping regulations and policy. While the first topic is important due to awareness of doping as health-threatening behaviour, the second one is necessary to objectively inform athletes about their responsibilities, while also introducing them to the set of rights they have with regard to the global anti-doping programme.

The highest risk of doping behaviour in males is found for those athletes who had been successful in their junior age and those who consume dietary supplements. Binge drinking is found as a risk factor for doping tendency in females. Therefore, in developing preventive programmes against doping, these most vulnerable groups of athletes should be specifically targeted. Our results suggest that an improvement of knowledge on sport nutrition might be a potentially effective method for reducing the tendency for doping in female team-sport athletes.

The results show that the associations between the studied factors and doping behaviour are different between males and females. Therefore, the gender-specific approach to exploring the covariates of doping behaviour is warranted.

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Key points

- The doping knowledge among Kosovar team-sport athletes is very low and systematic anti-doping education is urgently needed.
- The highest risk of doping behaviour in males is found for those athletes who had been successful in their junior age and those who consume dietary supplements.
- An improvement of knowledge on sport nutrition might be a potentially effective method for reducing the tendency for doping in female team-sport athletes.
- While the associations between the studied factors and doping behaviour are different between males and females, the gender-specific approach to exploring the covariates of doping behaviour is warranted.

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