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Use of Performance-Enhancing Substances Among Young Moroccan Athletes: Between Biochemical and Psychological effects

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Abstract

Doping is now a global problem that has spread even to small sports clubs thanks to the uncontrolled availability of doping substances. The aim of this study was to examine various aspects of sports practice and the possibility of access to doping substances. To this end, a descriptive questionnaire survey adapted to the Moroccan context was carried out in sports clubs on a sample of 230 athletes aged between 15 and 30 belonging to 15 sports clubs in the Rabat-Salé-Kenitra region. The results showed a predominance of the male gender, with 70.2% male participants and 29.8% female participants. Age distribution revealed that the most represented age groups were 17 (28.6%) and 18 (33.3%). In terms of educational level, all participants had at least a secondary school education, with 83.3% of athletes being high school students. A positive correlation was observed between the age of the athletes and their level of schooling, suggesting a positive influence of sports participation on schooling. The study also showed that basketball (17.9%), handball (16.7%), and soccer (48.8%) were the three most popular sports. Furthermore, the most common competitions were national (26.2%) and provincial (21.4%), while international participation was limited (3.6%). On the other hand, the responses obtained showed a low incidence of doping among participants, with 100% of responses being negative to questions on the use of prohibited substances. Although the majority of participants had received information on doping, they expressed a lack of confidence in their knowledge of the subject. Coaches were identified as the main source of information on doping (70%). These results underline the importance of doping awareness and education in sport, particularly among young athletes.

Keywords: Doping, Sports clubs, Doping substance, School level, Morocco.

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1. Introduction

Doping in sport is a major problem affecting many areas of sport worldwide. It involves the use of banned substances or methods designed to artificially enhance athletic performance. Doping constitutes an ethical and moral violation of the principles of sport, as it distorts competition by giving an unfair advantage to certain athletes. Indeed, the high price of victory in modern sports brings with it a number of negative consequences, among which doping or the use of banned drugs or sporting methods is particularly worrying ([1] ; [2]). Over the years, sports doping has become a growing concern for sports organizations, regulatory authorities, and sports fans alike. Scientific and medical advances have led to the development of increasingly sophisticated doping substances and techniques, making it difficult to detect and prevent this harmful practice [3]. The motivations behind doping are varied. Some athletes seek to improve their performance in order to achieve outstanding results, gain access to top-level competitions, or win financial rewards. Pressure from peers, sponsors, or even coaches may have an impact on others. Whatever the reason, doping endangers athletes' health and harms the integrity and fairness of sport [4]. From a medical point of view, the use of such drugs, often unjustified and uncontrolled, can be dangerous

for an athlete's health and life. In modern sporting competitions, deaths caused by the use of banned substances by athletes are quite common. In addition to causing considerable harm to the health and lives of athletes, the use of these funds is contrary to the moral and ethical standards of the sporting movement and the main task of modern sport ([5] ; [6]). Despite the measures taken, doping in sport remains a persistent challenge. Technological advances and doping practices are constantly evolving, requiring ongoing vigilance and international cooperation in the fight against this scourge. Scientists note that this problem involves a close relationship between medical, social, educational, political, moral, ethical, economic, and legal aspects. The main efforts of sports and medical science are generally aimed at studying the effect of substances banned in sport on the athlete's body, finding and improving the means of their detection, biochemical components and reducing the cost of doping control ([7] ; [8]). The aim of the present study is to describe the current situation of doping use by members of sports clubs in the Rabat-Salé-Kenitra region, while assessing athletes' knowledge of doping substances and their aptitude for doping during competitions.

2. Materials and Methods

2.1 Characteristics of the study region

According to the most recent census of 2014, the Rabat-Salé-Kénitra region ranks second in terms of population, just after the Casablanca-Settat region. Its population stands at 4,580,866, representing 13.53% of the country's total population. The region's average annual growth rate over the period 2004-2014 was 1.31%, in line with the national average of 1.25%. However, it should be emphasized that this regional average mask significant disparities between the region's different provinces and prefectures (Figure 1).

2.2 Sports infrastructure statistics for the Rabat-Salé-Kénitra Region

The Rabat-Salé-Kénitra region boasts a significant sports infrastructure, mainly concentrated in Rabat. There are a total of 190 sports facilities, including 53 dedicated to soccer, 33 basketball courts, 24 volleyball courts, 12 swimming pools, and 26 handball courts. There are also 13 athletic fields and 21 sports halls (Table 1).

2.3 Study population

The investigation was carried out on a sample of 230 athletes aged between 15 and 30 belonging to 15 national sports clubs approved by the national federation and spread over the Rabat-Salé-Kenitra region.

2.4 Registration and exclusion criteria

The inclusion criteria were to be registered with one of the Moroccan sports federations for the period 2022-2023 and to be aged over 15 and under 30, and the exclusion criteria were to be people who did not meet the registration criteria or who had a problem preventing them from completing the questionnaire.

2.5 Study Instrument

A questionnaire was used in the present study, based on one developed in collaboration between the World Anti-Doping Agency, the University of Dublin, the University of Ulster, and the Irish Sports Council [10]. The latter has been translated into Arabic and adapted to the Moroccan context.

2.6 Statistical Analysis

The results were analyzed using statistical software. The Pearson test was used for qualitative variables and variance tests at a threshold of 5% for quantitative variables.

3. Results and discussion

3.1 Characteristics of the Sample Studied

3.1.1 Gender of participants

Given that the sampling was random, the predominance of males over females is apparent. In fact, out of a sample of 230 participants, we recorded percentages of 70.2% male and 29.8% female (Table 2). This result is in line with the literature, which confirms that spots are more popular with men than with women [11].

3.1.2 Age of Participants

According to figure 2, which illustrates the age distribution of the sample studied, we note that 33.3% of participants are 18 years old, while 28.6% are 17 years old. On the other hand, 11.9% are aged 19 and 7.1% are aged 20. While 3.6% of participants are aged 15 and 21, respectively. On the other hand, the lowest percentage (1.2%) is found among participants aged 23 and 27.

3.1.3 Participants' educational level

From the results shown in Table 3, we can see that all participants have at least a secondary school education (7.1%). While 83.3% of sportsmen and women are high school students, 9.5% are in higher education. In addition, we found a correlation between the age of sportsmen and women and their level of schooling, confirming that playing sports has a positive influence on school attendance (Table 4). This finding is consistent with a number of studies suggesting that regular sporting activity can contribute to better performance at school. Indeed, physical activity can promote concentration, memory, creativity, and cognitive abilities, which can benefit students learning and academic success [12]. In addition, other studies have shown that participation in sports activities can reduce stress, improve mood, and promote mental well-being, which may indirectly have a positive impact on schooling by reducing factors that could hinder academic performance [13]. Yet another study has made the link between engagement and motivation in sport and its influence on education, with the authors concluding that participation in sport can stimulate engagement and motivation in students, which can enhance motivation to succeed in all aspects of life, including academics [14]. Also, students who regularly participate in sports activities can develop organizational, planning, and time management skills, which can also translate into better management of school tasks [15].

3.1.4 Nationality of participants

Given that the clubs consulted for this study are Moroccan, we emphasize that all participants are of Moroccan nationality (Table 5).

3.2 Population distribution by practiced sport

3.2.1 Sports practiced by participants

According to the results collected, it is clear that almost half of the participants practice Football (48.8%), as this is the most practiced sport worldwide [16]. Handball and basketball are played by 16.7% and 17.9%, respectively. While the sports least practiced by participants in the study are, Athletics (10.7%) and combat sports (6%) (Table 6). In relation to the gender-sport relationship (Table 7), it is important to note that 40.48% of men and only 8.33% of women play soccer. Similarly, 9.52% and 7.14% of men play handball and athletics, respectively. While the female gender is represented by 7.14% and 3.57%, respectively, for the two sports. While they dominate basketball with 10.71%, they are totally absent from combat sports. This relationship may be influenced by various social, cultural, and individual factors. Gender stereotypes often play a role, associating certain sports with a specific gender [17]. For example, soccer is often perceived as a masculine sport, while dance is considered feminine. In addition, access to sporting opportunities can differ between men and women, with inequalities in access to facilities, teams, or sports programs. Individual preferences and interests also influence the choice of sport. Attitudes are changing, favoring a greater diversity of sporting choices and encouraging gender equality in sports. Differences in participation and representation may exist depending on the level of competition, with variations in media visibility and career opportunities [18].

3.2.2 Number of years practicing the chosen sport

Respondents' answers on the number of years they have been practicing their chosen sport ranged from 1 to 15 years. From Figure I.2, we see that most sportsmen and women have spent 3 to 5 years in a given sport, giving rise to percentages varying from 20.2% recorded by those who have practiced the sport for 3 and 4 years. While 21.4% of the study population declared that they had been practicing their chosen sport for 5 years. On the other hand, 11.9% and 6% of respondents have been practicing their sport for one and two years, respectively (Figure 3). However, several studies have revealed a concrete relationship between the length of time a person spends practicing a sport and their well-being. On the other hand, it has been shown that the type of sport practiced and the number of years practicing were positively associated with emotional repair. In contrast, the number of years spent practicing sports was negatively associated with emotional attention. Male athletes who trained more and competed at a higher level were more likely to show higher emotional repair [19]. Again, studies have found that athletes who practice for a long time have higher emotional intelligence than non-athletes, particularly in terms of assertiveness, understanding their own emotions, evaluating others, and controlling their emotions [20].

3.2.3 Highest level of competitive participation

We note that athletes questioned about their highest level of competitive participation stated that they had competed at the national (26.2%), provincial (21.4%), interprovincial (25%), and club (23.8%) levels. On the other hand, only 3.6% had competed at international level, an extremely low rate when compared with the number of years they had been practicing the sport (Figure 4).

3.3 Information on awareness and uptake of doping in sport

3.3.1 Taking Doping Substances

One hundred percent of participants answered negatively to the questions "Have you ever inadvertently taken substances banned in sport?" and "Have you ever unknowingly taken substances whose use is prohibited?", confirming that doping is not a first-round choice for athletes (Table 8). The answer to these questions may vary according to participants' experience and knowledge. Some participants may answer positively, indicating that they have already inadvertently taken prohibited substances. This may be due to a lack of knowledge about prohibited substances present in products or medications they have used or to negligence in checking ingredients. Other participants may respond negatively, stating that they have never inadvertently taken banned substances in sports. This may indicate their caution and vigilance regarding the substances they consume or use. Some participants may be unsure of their answer, don't remember, or don't know if their past consumption has involved banned substances. This may be due to a lack of awareness of prohibited substances or a faulty memory. In fact, the truthfulness of the answers depends on the participants' honesty and understanding of banned substances in sports. Answers may also vary according to specific anti-doping testing protocols and the rules of the sports organization concerned. The aim of asking this question is to gather information about participants' experiences with prohibited substances in order to better understand the challenges of complying with anti-doping rules and to promote ethical and fair sporting practice [21]. The hypothesis of non-knowledge of doping substances is confirmed when asked about the reception of information on doping and doping substances. Indeed, 34.5% of participants stated that they had not received any information on doping, while 65.5% of this sample confirmed that they had received information on the subject (Table 9). These findings are comparable to those of a Saudi Arabian study on receiving doping-related information. Indeed, 65% of 1142 male athletes aged 24 admitted to having received advice on banned substances [22]. In contrast, a four-year survey conducted in Switzerland shows growing public awareness of doping issues and increasing support for a comprehensive anti-doping strategy in Switzerland [23]. While the majority of respondents (70%) claimed that their coach had given them information on doping, 20% claimed that they had received it from family members. A further 10% of respondents admitted to self-training (Table I.9). On the other hand, these respondents state that despite having received information on doping and doping substances, they are not confident in their knowledge on the subject. This is expressed by percentages ranging from 77.4% of those who are not confident in their knowledge of doping to 22.6% of those who are confident in their information on doping (Table 10). Analysis of the Pearson correlation between perception and confidence in information acquired about doping in relation to respondents' level of education reveals a positive correlation between the two. This is because educational level has a direct influence on a person's intellectual level. This will protect the individual against false information about doping (Table 11).

Figure 1: Provinces and Prefectures of the Rabat-Salé-Kénitra Region [9]

Table 1: Sports infrastructure statistics for the Rabat-Salé-Kénitra Region [9]

	VolleyBall	HandBall	BasketBall	FootBall	Base nautique	Salle de Sport	Piscines	Stade de l'athlétisme	Stade de Rugby	Total
Rabat-Salé-Kenitra	24	26	33	53	3	21	12	13	5	190
Rabat	16	15	19	16	2	9	4	6	4	91
Kénitra	2	4	6	13	1	2	2	1	-	31
Khémisset	1	2	1	12	-	2	1	2	-	21
Salé-Aljadida et Salé-Médina	2	2	2	5	-	4	2	2	1	20
Sidi Kacem	1	2	3	4	-	2	2	2	-	16
Skhirate-Témara	2	1	2	3	-	2	1	-	-	11

Table 2: Gender distribution of the sample studied

Gender	Percentage
Male	70,2 b
Female	29,8 a
Total	100

Means in the same column with the same letter are not significantly different from each other at the 5% significance level.

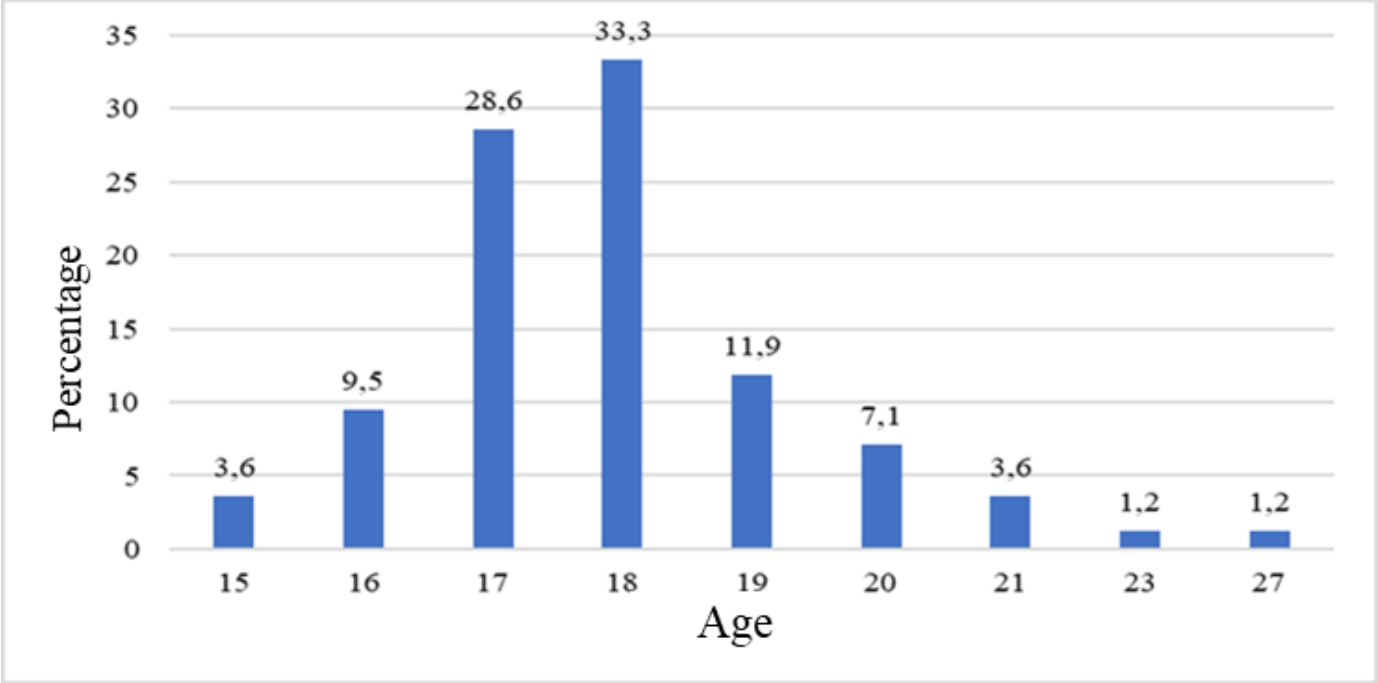

Figure 2: Age distribution of the sample studied

Table 3: Level of schooling of participants answering questionnaires

Academic level	Percentage
Literate	00,0 a
Primary	00,0 a
Middle school	07,1 b
High school	83,3 c
Higher education	09,5 b
Total	100

Means in the same column with the same letter are not significantly different from each other at the 5% significance level.

Table 4: Comparison between age groups of athletes and their grade level.

Academic level	Percentage	Age category
Literate	00,0 a	---
Primary	00,0 a	---
Middle school	07,1 b	15
High school	83,3 c	[16-20]
Higher education	09,5 b	[20-27]
Total	100	

Means in the same column with the same letter are not significantly different from each other at the 5% significance level.

Table 5: Breakdown of the study sample by nationality

Nationality	Percentage
Moroccan	100
Foreign	0

Means in the same column with the same letter are not significantly different from each other at the 5% significance level.

Table 6: Distribution of the study sample according to sports practiced.

Sport	Percentage
Football	48,8 c
Handball	16,7 b
Basketball	17,9 b
Athletics	10,7 ab
Combat sports	06,0 a
Total	**100**

Means in the same column with the same letter are not significantly different from each other at the 5% significance level.

Table 7: Relationship between gender and sports practiced

		Gender	
		Male	**Female**
		%	**%**
Sport	Football	40,48 c	08,33 c
	Handball	09,52 b	07,14 c
	Basketball	07,14 ab	03,57 b
	Athletics	07,14 ab	10,71 cd
	Combat sports	05,95 a	00,00 a

Means in the same column with the same letter are not significantly different from each other at the 5% significance level.

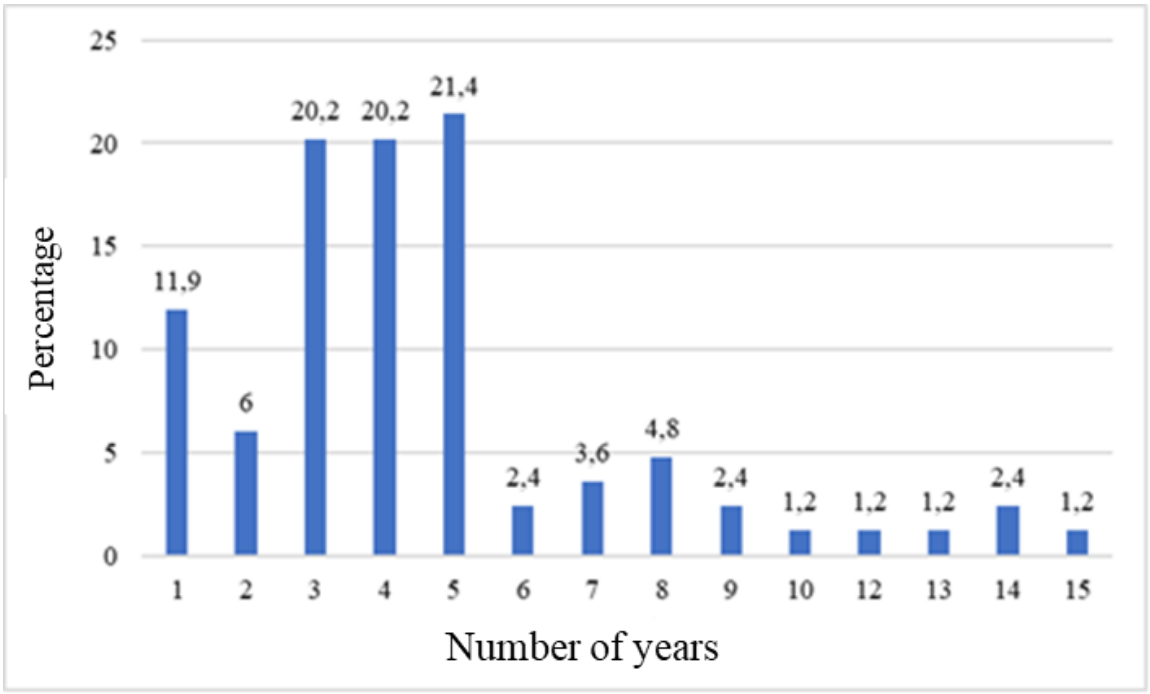

Figure 3: Percentage of years spent in the chosen sport

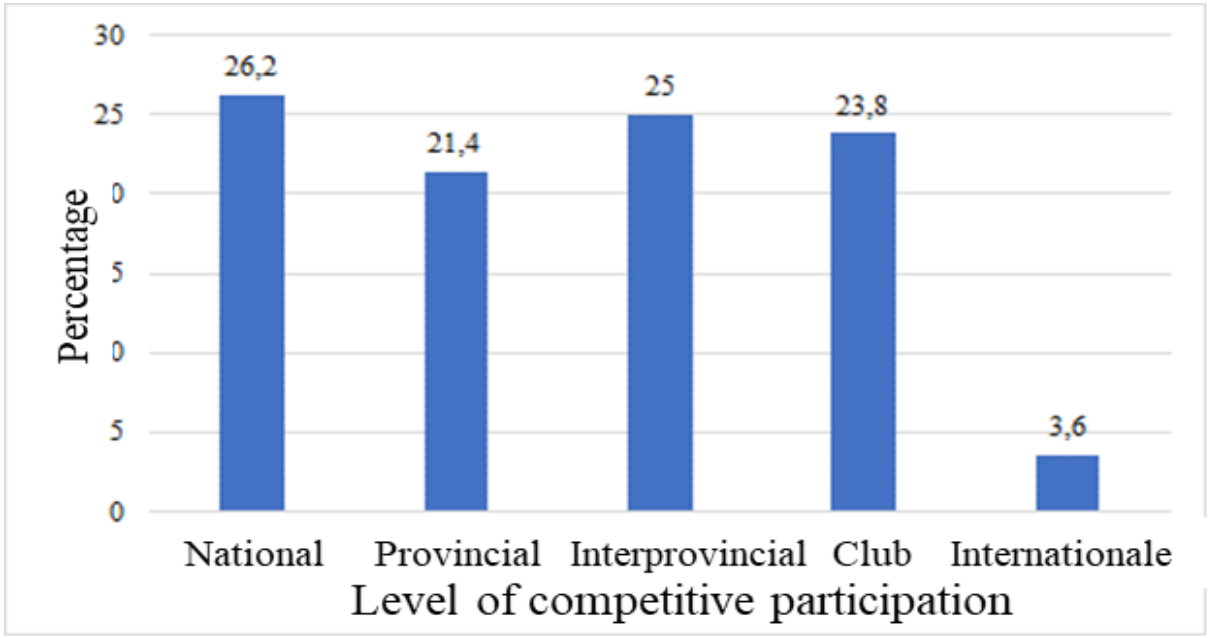

Figure 4: Level of competitive participation in sports

Table 8: Percentage of responses to the question about taking doping (consciously or accidentally) in sports

Confidence in information about doping	Percentage
No	77,4 b
Yes	22,6 a

Table 9: Sources of information on doping and doping substances

Source of information on doping and doping substances	Percentage
Trainer	70 c
Family member	20 b
Self-training	10 a

Means in the same column with the same letter are not significantly different from each other at the 5% significance level.

Table 10: Percentage of confidence in information acquired about doping

Answers	Percentage
No	65,5 b
Yes	34,5 a

Means in the same column with the same letter are not significantly different from each other at the 5% significance level.

Table 11: Pearson correlation product

		Q1	Q2
Academic level	Pearson correlation	0,541	0,461
	Sig. (2-tailed)	0,864	0,528
Q2	Pearson correlation	0.326	1
	Sig. (2-tailed)	0.612	----------

Q1: Have you received information about banned substances in sports?
Q2: Are you confident in your knowledge of substances banned in sports?

4. Conclusions

In conclusion, this study provided a detailed overview of various aspects related to sports participation in the study population. The results revealed a predominance of the male gender over the female gender among the participants. In addition, a positive correlation between age and educational level was observed, highlighting the positive influence of sports participation on school attendance. The most popular sports were soccer, handball, and basketball, while athletics and combat sports were less popular. Participants reported taking part mainly in national and provincial competitions. The study also highlighted a knowledge gap regarding doping in sport, despite the receipt of information, and a positive correlation between perception and confidence in doping information and educational attainment. These results underline the importance of raising athletes' awareness and knowledge of doping issues. In sum, this study provides valuable information to better understand the practice of sport in this specific population and can serve as a basis for the development of education and awareness programs aimed at promoting healthy and responsible sporting practices.

References

[1] J. L. T. Blanco, (2022). Doping in sport and cardiovascular risk. Journal of the Spanish Federation of Sports Medicine and the Confederation of Sports Medicine, 39(212), 302-305.

[2] J. W. Devine, (2023). Against Doping in Sport. Technology Ethics: A Philosophical Introduction and Readings.

[3] F., Lauritzen, & G. Holden, (2022). Intelligence-based doping control planning improves testing effectiveness: Perspectives from a national anti-doping organisation. Drug Testing and Analysis.

[4] S., Scoffier-Mériaux, F., d'Arripe-Longueville, T., Woodman, V., Lentillon-Kaestner, & K. Corrion, (2021). High-level athletes' motivation for sport and susceptibility to doping: The mediating role of eating behaviours. European journal of sport science, 21(3), 412-420.

[5] M., Filomena, & A. Ascione, (2020). New technology and no drugs in sport: Gene doping regulation, education and research. SPORT SCIENCE, 14(Supplement 1), 18-23.

[6] M., Belkhaoud, A., Rkhaila, M., Saga, B., Dahou, M., Aouji, M., Khattabi, H., Hami, A., Habsaoui, (2023). Doping in Sports, from Chemical to Genetic: A Technological Evolution or a Threat to Sport's Future? International Journal of Chemical and Biochemical Sciences, 23(3) (2023): 86-97.

[7] S., Lopez, J., Meirelles, V., Rayol, G., Poralla, N., Woldmar, B., Fadel,... & L., Pizzatti, (2020). Gene doping and genomic science in sports: where are we?. Bioanalysis, 12(11), 801-811.

[8] J., Horcajo, D., Santos, J. J., Guyer, & R., Mateos, (2020). A meta-cognitive approach to doping in sports: The effects of thought validation on attitudes related to doping. Journal of Sports Sciences, 38(19), 2242-2252.

[9] Ministry of Youth and Sports, (2013). La Région de Rabat-Salé-Kénitra, Monographie générale. Page 1-62.

[10] A., Moran, S., Guerin, K., Kirby, & T., MacIntyre, (2008). The development and validation of a doping attitudes and behaviour scale. World Anti-Doping Agency & The Irish Sports Council.

[11] G., Pfister, & S. J., Bandy, (2015). Gender and sport. Routledge handbook of the sociology of sport, 220-230.

[12] S., Méry, (2012). Excellence sportives et scolarité : de nouveaux enjeux pour l'école primaire. Paris : L'harmattan. P 19

[13] E., Norouzi, M., Gerber, F. F., Masrour, M., Vaezmosavi, U., Puehse, & S., Brand, (2020). Implementation of a mindfulness-based stress reduction (MBSR) program to reduce stress, anxiety, and depression and to improve psychological well-being among retired Iranian football players. Psychology of Sport and Exercise, 47, 101636.

[14] C. A., Heaney, N. C., Walker, A. J., Green, & C. L., Rostron, (2015). Sport psychology education for sport injury rehabilitation professionals: a systematic review. Physical therapy in sport, 16(1), 72-79.

[15] R., Bailey, (2018). Sport, physical education and educational worth. Educational Review, 70(1), 51-66.

[16] H., Sarmento, M. T., Anguera, A., Pereira, & D., Araújo, (2018). Talent identification and development in male football: A systematic review. Sports medicine, 48, 907-931.

[17] D., Amado, D., Sanchez-Oliva, I., Gonzalez-Ponce, J. J., Pulido-González, & P. A., Sánchez-Miguel, (2015). Incidence of parental support and pressure on their children's motivational processes towards sport practice regarding gender. PloS one, 10(6), e0128015.

[18] J., Van Sterkenburg, & A., Knoppers, (2004). Dominant discourses about race/ethnicity and gender in sport practice and performance. International review for the sociology of sport, 39(3), 301-321.

[19] G., Rodriguez-Romo, C., Blanco-Garcia, I., Diez-Vega, & J., Acebes-Sánchez, (2021). Emotional intelligence of undergraduate athletes: The role of sports experience. Frontiers in Psychology, 12, 3.

[20] D., Lepir, S., Lakić, and V., Takšić, (2018). Relacije bavljenja sportom i emocionalne inteligencije na srednjoškolskom uzrastu. Primenj. Psihol. 11, 285–300. doi: 10.19090/pp.2018.3.285-300

[21] A., Petróczi, & E., Aidman, (2009). Measuring explicit attitude toward doping: Review of the psychometric properties of the Performance Enhancement Attitude Scale. Psychology of Sport and Exercise, 10(3), 390-396.

[22] M., Al Ghobain, MS, Konbaz, A., Almassad, et al. (2016). Prévalence, connaissance et attitude de l'usage de substances interdites (dopage) chez les sportifs saoudiens. Subst Abuse Treat Prev Policy 11, 14.

[23] H., Stamm, M., Lamprecht, M., Kamber, B., Marti, & N., Mahler, (2008). The public perception of doping in sport in Switzerland, 1995–2004. Journal of sports sciences, 26(3), 235-242.