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Risky Food Attitudes in Young Male and Female Athletes

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Abstract: Eating disorders (EDs) refer to a group of diseases characterized by a strong tendency toward chronicity, often involving distortions in body image distortion and other related symptoms The prevalence of EDs has increased in recent years, specifically in athletic populations. Therefore, the purpose of this study was to analyse risky eating attitudes in a sample of 1102 subjects from Seville (Spain): 142 women and 960 men aged between 15-25 years old. An online survey, designed using Google Forms, consisted of three questionnaires (EAT-26, SCOFF, and BITE), were completed individually and anonymously. With regards to the cut-off points, the percentage of positive cases with significant scores was 11.43% for EAT-26, 31.22% for SCOFF and 4.36% for BITE. The study found that the probability of testing positive for EDs is significantly higher in women than in men ($p < 0.001$). Specifically, the risk attitude for EDs in female athletes measured by the EAT-26 test is three times higher than in male athletes, while the risk attitude measured by the SCOFF test is twice as high in females. Risk attitude for EDs in athletes measured by the BITE test is 8 times higher in females than in males. This study's findings confirm several important assumptions made at the outset of the research. There is indeed a higher risk of EDs in athlete populations. Moreover, all three tests therefore show a higher frequency of possible events of EDs in women, with very similar percentages of difference between sexes. The tests also confirm the role played by the coaches in the prevention of EDs in sports and their capacity to reduce abnormal food-related behaviours. Thus, the future inclusion of these tests in the screening of athletes is highly recommended.

Keywords: eating disorders; risky eating attitudes; athletes; physical activity.

1. Introduction

Eating disorders (EDs) refer to a group of diseases characterized by a strong tendency toward chronicity, often involving distortions in body image distortion and other related symptoms. The current classification of EDs covers the following: Anorexia Nervosa -Restricting type- (AN-R), Anorexia Nervosa -Binge/Purging type- (AN-P), Bulimia Nervosa (BN), Binge Eating Disorder (BED) and Eating Disorders Not Otherwise Specified (EDNOS) [1]. EDs have become a priority health problem that primarily affects the younger population, with prevalence rates of 0.4% and 1-1.5% for AN and BN respectively (in both cases with a ratio male/female: 10/1). Moreover, the prevalence of BED is approximately 0.8% and 1.6% for adult men and adult women, respectively, while data regarding EDNOS vary considerably across different studies [1]. Notably, physical activity is considered a risk factor for the development of EDs and contributes to their maintenance, becoming present in more than 80% of cases during the most severe phases and in more than 50% at the onset of these disorders [2]. In fact, physical activity has a complex interaction with EDs, as it may involve a compulsive aspect that requires professional attention and is considered to be as an index of psychopathology in the general population [3].

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Numerous studies have highlighted the teightened incidence of EDs in the sports world [4]. For instance, research by Rosen, McKeag, Hough, and Curley (1986) [5], Rosen, and Hough (1988) [6] and Sundgot-Borgen (1994) [7] indicates that approximately 1% of females suffer from AN or BN, yet, among female athletes, 62% has some type of EDs, as assessed using the Michigan State University (MSU) Weight Control Survey and Eating Disorder Inventory (EDI). Within this subgroup of athletes, skiers and runners have the highest prevalence with percentages of 33% and 32% respectively [8]. Sánchez, Ibáñez and García [9], meanwhile, estimate that prevalence varies from 15 to 62% in elite sportswomen and that more than 90% are female adolescents instead of male. On the other hand, Ghazzawi et al. demonstrate that the variable of sex has no significant influence on ED rates and that other variables, including age and weight, do not reliable predict ED status either [10]. According to Dosil [11,12] and Toro et al. [13], the risk factors for EDs are the same as those for the general population, but are more severe in some sports. Additionally, a recurring theme in multiple different investigations is the great influence and impact that sport coaches have over the athletes [14].

Some authors, such as Rosen et al. [5], have argued that sports are often hotbeds of EDs. In fact, in instances of AN, exercise appears to be crucial not only at the onset of the disorder but also during its course-maintenance [2]. Many elite athletes exhibit varying degrees of food irregularities and dysfunctions. Furthermore, in the field of sports the prevalence of EDs is higher than in the general population [15], with a higher incidence seen in individual sports than in team sports [16]. Currently, the prevalence of EDs in sports is estimated between 4.2% and 39.2% [12].

EDs are highly prevalent in disciplines involving endurance, those that have weight-categories, or those where low weight confers a competitive advantage [17–21]. It should also be noted that EDs do not exclusively affects professional athletes; they also affect amateurs and laypersons who are particularly concerned about their appearance[22]. However, in certain sports, international-level competitors exhibit a higher prevalence of eating patology compared to recreational athletes [23]. Terms such as ‘anorexia athletica’, ‘sports anorexia’ or ‘hypergymnasia’, have been used to refer to the set of subclinical eating behaviours present in athletes, with common features such as low self-esteem, body image distortion, feelings of guilt, inefficiency, perfectionism and a sense of a lack of control, resulting in compensatory mechanism behaviours [24]. There are various disruptors of eating behaviour that are considered risk factors, which some authors categorise into biological, sociocultural or sport-specific factors [17], while others authors classify them according to the level of competition, the type of sport, age or sex [25]. Interestingly, while the prevalence of EDs in elite soccer players is roughly equal between male and female athletes, in non-elite athletes, women tend to have a higher prevalence. Moreover, perfectionism is a significant predictor of risk for both sexes [26].

Elite athletes who seek continuous improvement in their performance are more likely to engage in risky behaviours such as dietary restrictions [2], fasting, skipping meals frequently, laxative and/or diuretic use (or abuse), other purging behaviours and drugs use in order to reach and maintain their desired body shape [27,28]. Other risk factors include body dissatisfaction (which is linked to increasing pressures regarding food and weight in relation to performance and aesthetics), early sport specialisation, competitiveness, increased physical activity together with dietary restrictions, regular use of unhealthy weight loss methods, traumatic life events and derogatory comments from other athletes, and personality traits [4,8,29]. The most relevant personality traits are perfectionism, competitiveness and high expectations [27]. All this suggests, , collectively, these factors illustrate how sports introduce unique risk factors in addition to those found in the general population, increasing the likelihood of athletes developing EDs [4].

Experts have proposed two potential mechanisms that could explain the relationship between sports and EDs. The first is a possible relationship that links certain individuals with EDs (or those at high risk of developing EDs) with certain aspects of sports. These individuals may use sports to hide their condition by conforming to stereotypes associated with the sport, effectively using it as a continuous method for weight loss. The second mechanism suggests a causal relationship, as seen in ‘sports anorexia’ or pressure-induced weight loss, which occurs frequently in some sports. In this

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scenario, the vulnerability of certain people leads them to develop an ED by engaging in intense and excessive physical [2,8].

However, the information currently available on the relationship between sports and EDs is still insufficient and controversial, which is primarly due to the shortage of studies with athlete populations, the selection of inadequate or unrepresentative samples, the absence of strict diagnostic criteria and accurate measurements, and methodological weaknesses detected in many of the examined works [24]. It is due to these challenges and the increasing incidence of AN and BN among athletes, as well as the potential role that educators and coaches could play in early detection and prevention due to their unique position, that we felt motivated to undertake this study.

The main objective of this study was to identify EDs and/or risky behaviours that put young athletes (aged 15–25 years) at risk of developing EDs, while also considering the impact of gender. A second objective was to analyse the concordance between the applied questionnaires. The hypotheses were as follows: (a) the presence of possible cases of EDs is higher in the athlete population than in the general population, with a higher prevalence among women than among men; (b) pathological eating behaviours occur more frequently in certain types of sports (especially those in which it is essential to control weight); and (c) the role of the coach is essential, having a great influence over the risk of developing an ED.

2. Materials and Methods

This study is a cross-sectional descriptive study in which the key variables associated with the major risk factors for EDs have been collected and analysed.

2.1. Participants

The total sample comprised 1102 athletes from Sevilla (Spain), 142 women and 960 men, practitioners of different sports are shown in Table 1.

Table 1. Demographic data (n = 1102).

Sex	Women (n = 142) Men (n = 960)	
Age	15-20 years (n = 589)	Women (n = 79) Men (n = 510)
	20-25 years (n = 513)	Women (n = 63) Men (n = 450)
Sports classified by modality	Skill (martial arts, badmiton, bodyboard, horse riding, climbing, artistic gymnastics, rhytmic gymnastics, golf, skydiving, figure skating and table tennis) (n = 76)	Women (n = 13) Men (n = 63)
	Power (Calisthenics, Mountain biking, Snowboard, surf, gym and weightlifting) (n = 654)	Women (n = 77) Men (n = 577)
	Mixed (boxing, mountain biking, crossfit, basketball, handball, football, futsal, roller hockey, rugby, volleyball, waterpolo, paddle and tennis) (n = 251)	Women (n = 26) Men (n = 225)
	Endurance (running, canoeing, athletics, cycling and) swimming) (n = 121)	Women (n = 26) Men (n = 95)

The inclusion criteria were as follows: a) athletes (males and females); b) aged 15 - 25 years old (the most vulnerable range from an ED; more than 70% [30]); c) training ≥ 5 hours/week in a specific sport for more than 1 year; and d) having participated in at least one competition in the last year. All participants were informed about the nature of the research, anonymity was guaranteed, their participation was voluntary, and they gave the prescriptive written informed consent. This study was conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures were approved by the Ethical Committee of the University Pablo Olavide (no. 19_2013).

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2.2. Main variables

The following variables were considered: (a) sex; (b) age; (c) type of sport; and (d) weight and height (to calculate BMI = weight (kg)/height (m^2)). The variables sex, age, and type of sport were collected using a questionnaire. Body height was measured to the nearest 0.1 cm with a stadiometer (SECA, 119 Hamburg, Germany). Body weight was measured to the nearest 0.1 kg with a body composition analyser (Tanita TBF-300, Tokyo, Japan).

2.3. Instruments

2.3.1. Eating Attitudes Test (EAT-26)

This test was designed to assess abnormal eating attitudes. It is a self-administered instrument based on the first 26 items of the EAT-40 questionnaire, which has three subscales: diet, bulimia and concerns about eating, and oral control. The items are assessed by means of a Likert scale of 6 points with a score ranging between 0 and 78. The clinical cut-off point is set at 22. This is a highly valuable tool for its easy implementation, high reliability, sensitivity and cross-cultural validity [31,32]. The EAT-26 has a Cronbach's alpha of approximately 0.8.

2.3.2. Sick Control One (stone) Fat Food (SCOFF)

The SCOFF questionnaire is an ED screening instrument consisting of five dichotomous questions (yes/no) to assess the loss of control over eating, purging behaviours and body dissatisfaction. It has a scores range of 0-5 (No = 0; Yes = 1). A total score of ≥ 2 identifies people at risk of developing an ED. It is a useful questionnaire because it can detect potential cases of EDs, especially in primary care [33,34]. The Cronbach's alpha is around 0.44, while and Cohen's Kappa is roughly 0.554.

2.3.3. Bulimic Investigatory Test, Edinburgh (BITE)

This is a self-reported questionnaire designed to identify people with bulimic symptoms. It consists of 36 items divided into two subscales: the symptoms scale (which evaluates the number and intensity of symptoms, and it is comprised of 30 items; maximum score 30; cut-off point ≥ 20) and the severity scale (which measures the severity of the disorder according to the frequency of the pathological behaviours and is comprised of 6 items; maximum score: 39; cut-off point ≥ 5). A total score ≥ 25 suggests the presence of a severe ED. This test has a high specificity and easy applicability. It is very useful for the early detection of individuals with an ED in the general population. In addition, it is used to assess the severity of EDs and the response to treatment [35,36]. The BITE has a Cronbach's alpha of 0.96.

2.4. Procedure

An online survey, designed using Google Forms, consisted of three questionnaires (EAT-26, SCOFF, and BITE) that were completed individually and anonymously. Participants were informed about the confidentiality of their responses, as well as about the purpose of the study and its methodology. Its distribution was managed through Google Forms with the help of sports professionals. Thus, a total of 1,227 surveys were collected. Of these, 125 were rejected because they did not meet all the inclusion criteria or were not completed properly, which left a final sample of 1,102 participants.

2.5. Statistical analyses

Descriptive statistics for quantitative variables were presented using mean and standard deviation, while percentages were used for qualitative variables.

The Kolmogorov-Smirnov test was used to determine whether data fitted a normal distribution. As for comparisons, the nonparametric Mann-Whitney and Kruskal-Wallis tests were applied. To

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calculate the association between qualitative variables, the Chi-squared test was used, while the degree of association between quantitative variables was determined using the Spearman's non-parametric correlation coefficient (Rho). Statistically significant values were established at $p < 0.05$. Finally, in order to study the concordance between the applied instruments, the intra-class correlation coefficient was calculated.

The database was developed using Excel and statistical analyses were carried out using SPSS (version 21).

3. Results

The sample comprised 142 women (12.88%) and 960 men (87.11%). The mean body mass index (BMI) was 21.24 ± 2.47 in women and 23.4 ± 2.22 in men (with ranges of 16 - 30 and 17 - 33, respectively).

Regarding BMI, the difference between men and women was determined by conducting the Student t-test. In this case no significant differences were found ($p < 0.001$).

With regards to the detection of participants at risk (positive cases), according to the cut-off points of the questionnaires (EAT-26 ≥ 22; SCOFF ≥ 2; BITE ≥ 25), the most positive cases were found in females as it is shown in Tables 2–4. The distribution of positive cases by sex is summarized in Table 5.

Table 2. EAT-26-Positive cases (cut-off point ≥ 22) [1].

Sex	Positive cases	n	%
Women (n = 142)	No	108	76.1
(p < 0.001)	Yes	34	23.9
Men (n= 960)	No	868	90.4
(p < 0.001)	Yes	92	9.6

[1] EAT: Eating Attitudes Test-26.

Table 3. SCOFF-Positive cases (cut-off point ≥ 2) [1].

Sex	Positive cases	n	%
Women (n = 142)	No	78	54.9
(p < 0.001)	Yes	64	45.1
Men (n= 960)	No	680	70.8
(p < 0.001)	Yes	280	29.2

[1] SCOFF: Sick Control On Fat Food.

Table 4. BITE-Positive cases (cut-off point ≥ 2) [1].

Sex	Positive cases	n	%
Women (n = 142)	No	118	83.1
(p < 0.001)	Yes	24	16.9
Men (n= 960)	No	936	97.5
(p < 0.001)	Yes	24	2.5

[1] BITE: Bulimic Investigatory Test, Edinburgh.

Table 5. Sex distribution of positive cases.

Test	Men	Women	Total
EAT-26	n = 34 (27%)	n = 92 (73%)	n = 126
SCOFF	n = 64 (18.6%)	n = 280 (81.4%)	n = 344
BITE	n = 24 (50%)	n = 24 (50%)	n = 48
Total	n = 122 (23.55%)	n = 396 (76.45%)	n = 518

EAT: Eating Attitudes Test-26; SCOFF: Sick Control On Fat Food; BITE: Bulimic Investigatory Test, Edinburgh

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After finding that the data did not fit a normal distribution, by means of the Kolmogorov-Smirnov test, differences in the three scores (EAT-26, SCOFF and BITE) between males and females were analysed using the Mann-Whitney and the Kruskal-Wallis nonparametric tests. As result, statistically significant differences were found between sexes ($p < 0.001$).

The concordance between instruments (Table 6) was determined using the intra-class correlation coefficient, having obtained a positive correlation in all cases ($p < 0.001$).

Table 6. Inter-tests concordance

Test	EAT-26	SCOFF	BITE
EAT-26	-	W: 0.483 M: 0.362 Total: 0.437	W: 0.571 M: 0.347 Total: 0.470
SCOFF	-	-	W: 0.471 M: 0.210 Total: 0.350
BITE	-	-	-

EAT: Eating Attitudes Test-26; SCOFF: Sick Control On Fat Food; BITE: Bulimic Investigatory Test, Edinburgh; W: Women; M: Men.

The Chi-square test yielded significant results for all three risk tests for EDs in athletes, indicating an association between test and sex. Further examination of the Chi-squares by cells revealed that women with positive test results were the most significant group. This was also supported by the Standardised Residuals, which showed the highest values for women with a positive test outcome.

4. Discussion

The main objective of this study was to identify EDs and/or risky behaviours for the development of EDs in a population of young athletes. To the best of our knowledge, no previous studies have simultaneously applied the EAT-26, SCOFF, and BITE. By using all three, we hoped to obtain more valid results with a higher level of reliability.

The age range considered in this study is broader than that used in similar studies [35–39], and the mean age was slightly higher than is typical, albeit similar to the mean age in a study conducted by Behar et al. [40]. As Checa Olmos et al. (2023) have demonstrated, special attention should be paid to the early starting ages of high-performance sport because 77.7% of the young athletes present a risk of developing an ED due to a high body image distortion [41].

With regards to EAT-26, the percentage of positive cases was 11.43% (23.9% of women, 9.6% of men). Items with the most significant scores were 'I find myself preoccupied with food' and 'I am aware of the calorie content of food that I eat' with a frequency of 18% and 19%, respectively.

These findings are consistent with a recent study conducted by Goltz et al. [27], in which it was found that 27.6% of athletes (from a total sample of 156 athletes) had eating disturbances. The current results are also consistent with those reported in a study in which the influence of thinness on the onset of EDs in certain sports was analysed. As result, it was found that 9.5% of male athletes were at risk of developing AN [42]. This prevalence of ED risk is slightly higher than that reported in other studies: 15.47% of positive cases in women and 2.66% in men [38]; 19% in women [43]; and 17.3% in women [44]. It must be noted that some of these authors applied the EAT-40 instead of the EAT-26 used in this study. Nevertheless, there is a high correlation between the two versions of this instrument [45].

Using the SCOFF questionnaire, a higher percentage of positive cases emerged (45.1% for women and 29.2% for men), as compared with the EAT-26 (23.9% and 9.6% for women and men, respectively). The item with the highest score was related to the concern about the need to control food, with 38% of the participants responding affirmatively. This percentage is higher than that reported by Jáuregui et al. [38], with 22.80% of positive cases, but is similar to the results of Rueda et

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al. [34], in which the percentages were 39.4% and 33.3%, respectively. Both of these studies aimed to validate the SCOFF questionnaire, which has proven to be a good screening tool for the general population at risk of EDs and exhibits a high correlation with instruments such as the EAT-26, although it requires further confirmation of potential cases.

Using the third questionnaire used (BITE), we found that 16.9% of females and 4.4% of males were at risk of developing EDs (4.36% of the total sample). Notably, though, it is difficult to compared this result with that of previous studies since this is the first attempt to simultaneously use SCOFF, EAT-26, and BITE.

When comparing scores obtained with the three instruments, significant differences between men and women were observed. There was a positive correlation between the instruments ($p < 0.001$), consistent with the findings of Noma et al. [46]. In this case, only the relationship between SCOFF and EAT-26 scores was analysed and a strong association between each item of SCOFF and the items of EAT-26 was found. These findings allow us to confirm the value of both instruments as screening proposals.

When looking at the screening instruments used in different studies, it emerges that the most common method has been to use the EAT (the original version of 40 items and the reduced one of 26) and SCOFF together. The study found that the probability of testing positive for EDs is significantly higher in women than in men. Specifically, the risk attitude for EDs in female athletes measured by the EAT-26 test is three times higher than in male athletes, while the risk attitude measured by the SCOFF test is twice as high in females. Finally, risk attitude for EDs in athletes measured by the BITE test is 8 times higher in females than in males.

The prevalence of risk of EDs identified in our study seems to be high according to what is described in the literature, thus indicating that sport practices might be associated with a higher risk of developing an ED. In addition, the data suggest an increasing tendency toward risk behaviours, which is evident when comparing the present results with those obtained in previous studies, as several authors have already noted [2,10,24,27,34,39,41,47]. In addition, Arthur-Cameselle et al. suggest that the motivation to recover from EDs in individuals who play sports is higher than in the general population, which can be attributed to the negative effect that such disorders may have on individuals' sporting ambitions [48].

In 2001 it was reported that the presence of EDs in athletes in our country was around 23%. With respect to risk factors, no differences were found between athletes and the general population, with two exceptions: the public body exposure and the pressure from coaches [24]. On the other hand, authors such as Ghazzawi et al. observed in 2022 a prevalence of 34% of EDs in Jordanian athletes [10].

Our findings are corroborated by previous research on EDs in the sporting population. Although with a lower prevalence than that reported in the present study (30.8% vs. 45.1%), Goltz et al. [27] reported that athletes participating in sports with weight categories obtained the highest scores on the risk of EDs when applying the EAT-26. In contrast, we cannot compare these results as in our study, athletes participating in sports with weight categories were less than 2% of our sample.

Several authors have highlighted an association between excessive physical activity and an increased risk of developing an ED, thus reinforcing the idea of a causal relationship model of anorexia due to activity as proposed by Pierce et al. [49]. This model suggests that strenuous exercise can suppress appetite and food intake, leading to weight loss, which in turn increases motivation to engage in more exercise [50].

Coaches can also play a significant role in the prevention of eating disorders (EDs) in sports, as they often serve as role models and influencers for athletes, including in regard to food and nutrition. Research, such as that conducted by Vaughan, King, and Cottrell [51], as shed light on coaches' knowledge of and attitudes toward EDs. They found that nearly 91% of 236 coaches had encountered athletes with EDs. However, only 25% of these coaches believed that they could correctly identify an athlete with an ED, while only 1 in 3 (38%) felt comfortable expressing their concerns and asking the athletes about their health. In addition, the majority of coaches who participated in the survey (93%) stated that they should pay more attention to those athletes suffering from an ED.

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Given this essential role that coaches play, it is important to establish proper nutrition education programmes and training initiatives for coaches [52], thus enabling them to detect risky behaviours that may precede the development of EDs. In addition, coaches should be involved in ED prevention programmes and encouraged to use the questionnaires presented in this study (EAT-26, SCOFF, and BITE) as part of their efforts to support athletes' wellbeing and health.

5. Limitations

In spite of the insights it offers, it should be acknowledged that this study also suffers from certain limitations. First, the study relies on self-administered questionnaires, which are based on participants' responses. Self-reporting can introduce response biases and may not always accurately reflect participants' behaviours and experiences. Furthermore, since participation was entirely voluntary, it is possible that athletes with EDs (or at high risk of suffering from them) chose not to participate in the study.

Moreover, athletes were not asked about the period of competition at the time of data collection. This factor could be very useful considering that athletes are most at risk of developing an ED during the periods prior to competition, especially in those sports classified by weight or in those in which it is assumed that a low weight improves performance. In these types of sports disciplines, it is common to find athletes who are trying to reduce their weight before the competition by means of dietary restrictions and other risky behaviours, enabling them to join a lower weight category and to gain competitive advantages over their opponents [27,28]. This information would have enriched this study and the discussion of the results.

Another limitation is that the mix of sports was very heterogeneous, with a sample of 1102 subjects playing 35 different sports.

Finally, given that, generally speaking, research in this area has focused more on the prevalence of ED than on their prevention and treatment, we suggest the need for appropriate training of parents, coaches, physical trainers, teachers, and other personnel linked to sport and interested in healthy eating habits [34,53]. It would be interesting, in turn, to employ specific detection tools for EDs in the environment of the athlete population and to study their validity in a combined way [54,55]. This will be crucial to planning preventive interventions aimed to identify these disorders at an early stage and, if necessary, to begin a treatment as soon as possible. At the same time, we note that athletes, particularly those competing at advanced levels, should have access to supervised physical activity programmes led by professionals. Regular follow-ups should involve psychological and nutritional assessments to monitor their wellbeing.

6. Conclusions

This study's findings confirm several important assumptions made at the outset of the research. There is indeed a higher risk of EDs in athlete populations. Moreover, all three tests therefore show a higher frequency of possible events of EDs in women, with very similar percentages of difference between sexes. The tests also confirm the role played by the coaches in the prevention of EDs in sports and their capacity to reduce abnormal food-related behaviours. Thus, the future inclusion of these tests in the screening of athletes is highly recommended.

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