Artigos Originais

Exercise addiction: a comparison between runners, cyclists, swimmers, and triathletes

Dependência ao exercício: uma comparação entre corredores, ciclistas, nadadores e triatletas

Adicción al ejercicio: una comparación entre corredores, ciclistas, nadadores y triatletas

Vitor Hugo Fermiano
Universidade Estadual de Maringá, Maringá, Paraná, Brasil
e-mail: fermiano1921@gmail.com

Cecília Segabinazi Peserico
Universidade Estadual de Maringá, Maringá, Paraná, Brasil
e-mail: ceciliapeserico@gmail.com

Emanuele Marie Teramoto
Caposse, Universidade Estadual de Maringá, Maringá, Paraná, Brasil
e-mail: emanuelecaposse@hotmail.com

Fabiana Andrade Machado
Universidade Estadual de Maringá, Maringá, Paraná, Brasil
e-mail: famachado_uem@hotmail.com

Abstract: The aim of the present study was to evaluate and compare exercise addiction (EA) between runners, cyclists, swimmers, and triathletes. Took part in this study 39 runners, 32 cyclists, 30 swimmers and 38 triathletes. Exercise Dependence Scale (EDS), and the Exercise Addiction Inventory (EAI) was used to evaluate the EA and classified the participants into: at-risk for EA, nondependent-symptomatic, and nondependent-asymptomatic.

Most participants were classified as nondependent symptomatic for EA. The EDS total score was significantly lower in the swimmers compared to the cyclists and triathletes and the EAI total score was significantly higher for cyclists compared to runners. Therefore, in both instruments, the majority of participants was nondependent symptomatic for EA.

Keywords: Individual Sports. Athletes. Dependence. Endurance training.

Resumo: O objetivo do presente estudo foi avaliar e comparar a dependência ao exercício (DE) entre corredores, ciclistas, nadadores e triatletas. Participaram do estudo 39 corredores, 32 ciclistas, 30 nadadores e 38 triatletas. As escalas *Exercise Dependence Scale* (EDS) e *Exercise Addiction Inventory* (EAI) foram usadas para a avaliação da DE e classificaram os participantes em três categorias: em risco de DE, não dependente sintomático e não dependente assintomático. A maioria dos participantes foram classificadas como não dependentes sintomáticos para DE. O escore da EDS foi significativamente menor nos nadadores comparado aos ciclistas e triatletas e o escore total da EAI foi significantemente maior nos ciclistas comparado aos corredores. Portanto, em ambos os instrumentos, a maioria dos participantes foi não dependente sintomático para DE.

Palavras-chave: Esporte individual. Atletas. Dependência. Treinamento de Endurance.

Resumen: El objetivo del presente estudio fue evaluar y comparar la adicción al ejercicio (AE) entre corredores, ciclistas, nadadores y triatletas. Participaron de este estudio 39 corredores, 32 ciclistas, 30 nadadores y 38 triatletas. La Escala de Dependencia al Ejercicio (EDS) y el Inventario de Adicción al Ejercicio (EAI) fueron utilizados para evaluar la AE y clasificaron a los participantes en tres categorías: en riesgo de AE, no dependiente-sintomático y no dependiente-asintomático. La mayoría de los participantes se clasificaron como no dependiente-sintomático para AE. La puntuación EDS fue significativamente menor en nadadores en comparación con ciclistas y triatletas y la puntuación EAI total fue significativamente mayor en ciclistas en comparación con corredores. Por lo tanto, en ambos instrumentos, la mayoría de los participantes eran sintomáticos no dependientes para AE.

Palabras clave: Deporte individual. Atletas. Dependencia. Rutina de entrenamiento.

Submetido em: 28/10/2023
Aceito em: 31/01/2023

Introduction

The benefits of regular physical exercise for health are well known, however the effects of excessive practice and its relationship with health damage, such as exercise addiction have been little investigated (LICHTENSTEIN *et al.,* 2021). Exercise addiction (EA) is characterized as an eagerness to perform exercise, resulting in uncontrollable behavior due to excessive exercise practice, with dependence manifested through physiological (tolerance and withdrawal) and/or psychological (*e.g.,* anxiety, irritability, and depression) symptoms (HAUSENBLAS; DOWNS, 2002; LANDOLFI, 2013). Thus, knowledge about EA is relevant, since it can trigger consequences that may be harmful for those considered "dependent" on physical exercise practice, and its identification is important for practitioners, athletes, and coaches who, recognizing the symptoms and consequences, can consider them in the future actions and help in controlling this addiction (DI LODOVICO *et al.*, 2019; NOGUEIRA *et al.,* 2018).

Although some studies have investigated EA in athletes from different modalities (*e.g.*, individual and team sports) (LICHTENSTEIN *et al.,* 2021; NOGUEIRA *et al.,* 2018; YOUNGMAN E SIMPSON, 2014), research with practitioners of individual modalities, such as running, cycling, and triathlon, are recent and scarce (LUKÁCS *et al.*, 2019; TORSTVEIT *et al.*, 2019; ZANDONAI *et al.,* 2020), and no studies have been carried out with swimming.

Nogueira *et al.* (2018) in a review study that analyzed the research with EA on running and aerobic modalities found that the prevalence of EA, evaluated by valid scales, differs widely among studies (*i.e.*, ranging from 3 to 42%); this variation between studies is explained by the authors mainly as due to the use of a variety of tools/instruments to measure EA. Concerning the main instruments to evaluate EA, the Exercise Dependence Scale (EDS) and/or the Exercise Addiction Inventory (EAI) are the most commonly used scales to evaluate EA (DI LODOVICO *et al.,* 2019; NOGUEIRA *et al.,* 2018). Specifically, the EDS classified the individuals in three categories, in which scores ≥

15 in three or more factors/subscales are categorized as 'at-risk for EA', scores between 7 and 14 in three or more factors/subscales are categorized as 'nondependent symptomatic', and three or more factors/subscales with scores ≤ 6 are categorized as 'nondependent asymptomatic" (HAUSENBLAS; DOWNS; 2002; ZANDONAI *et al.*, 2020). Concerning the EAI, individuals are categorized as 'at-risk' with *scores ≥ 24,* 'nondependent symptomatic' with *scores between 13 and 23 or nondependent symptomatic with scores between 0 and 12 (TERRY et al., 2004).*

Studies with endurance runners used the EDS (LUKÁCS *et al.*, 2019; TORSTVEIT *et al.*, 2019; ZANDONAI *et al.*, 2020) aiming to evaluate EA showed that the risk for addiction was associated with many factors, including training experience (ZANDONAI *et al.*, 2020), competitive level (SMITH *et al.*, 2010), and educational level (LUKÁCS *et al.*, 2019). Previous studies evaluated the EA of cyclists using EDS or EAI (COOK; LUKE, 2017; MAYOLAS-PI *et al.*, 2016; TORSTVEIT *et al.*, 2019). Mayolas-Pi *et al.* (2016) demonstrated that amateur cyclists were classified as at risk for EA in the assessment obtained by the EAI; in addition, damage to the benefits provided by cycling, both in terms of mental health and sleep quality, has been reported in the EA participants. Cook and Luke (2017) applied the EDS with cyclists of different levels and observed a prevalence of symptomatic nondependent practitioners, who are the individuals with are not at-risk for EA but presenting some symptoms related to EA.

Concerning triathletes, it was reported that the greater the distance in the competition and the number of weekly training hours, the greater the risk of EA (VALENZUELA; PALOMERO, 2017; YOUNGMAN; SIMPSON, 2014). Youngman and Simpson (2014) found that triathletes massively manifested EA symptoms; however, no association was found between training experience and the risk of EA.

It is important to mention that concerning the instruments that evaluated EA, no studies were found with individual modalities that used both the EDS and EAI to evaluate the participants. Therefore, considering that no studies have used the two validated scales concomitantly in the same study to assess the EA or verified the impact of the sport practice on the EA, the aim of the present study was to evaluate and compare EA between runners, cyclists, swimmers, and triathletes. The hypothesis is that there is a difference in the classification for EA between the modalities.

Methods

Participants

In total, 139 Brazilian athletes (44 women and 95 men) of individual modalities took part in this study. The inclusion criteria were men or women aged between 18 and 50 years who were inserted in regular training in the modalities running, cycling, swimming, and triathlon for at least four months, with a training frequency of three times per week and that participate in competitions at least regional level. Concerning the exclusion criteria, participants who did not answer to the instruments applied appropriately, such as leaving questions unanswered, were excluded from the final sample.

Thus, participated in this study 39 runners (11 women; 28 men), 32 cyclists (8 women; 24 men), 30 swimmers (18 women; 12 men) and 38 triathletes (7 women; 31 men). Concerning the mean ± SD age runners had 38.2 ± 8.9 years, cyclists 35.5 ± 9.0 years, swimmers: 33.0 ± 9.8 years, and triathletes: 39.8 ± 8.7 years. The training characteristics were training experience time of 112.9 ± 102.4 months in their respective modalities, weekly training frequency of 4.9 ± 1.6 days, weekly sessions of 6.8 ± 4.2, totaling 9.4 ± 6.6 hours of training per week.

The participants signed the informed consent and answered the anamnesis form with questions regarding characterization of the participant and their training (frequency and volume of weekly training), and the EA scales: Exercise Dependence Scale (EDS) and Exercise Addiction Inventory (EAI). Data were collected via the Google Forms platform and links to participants' responses containing the researcher's guidelines were sent by email and social media. Participation in the study was voluntary and informed consent was obtained; all participants were free to withdraw their consent at any time without penalty. The study was conducted in accordance with the Declaration of Helsinki, which establishes the fundamental ethical principles for research involving human subjects. The experimental protocol was approved by the University's Human Research Ethics Committee (4.905.818/2021) and this study was conducted in compliance with the Standards of Ethics in Sport and Exercise Science Research.

Exercise Dependence Scale (EDS)

The EDS is a 21-item, multidimensional, theory-based measure of EA symptoms (HAUSENBLAS; DOWNS, 2002; ALCHIERI *et al.*, 2015). The 21 items are scored on a 6-point scale, ranging from 1 (never) to 6 (always), and consist of seven factors/subscales (three questions for each factor) of EA: (1) tolerance (*i.e.*, need for increasing amounts of exercise to achieve the desired results or diminishing effect from the same amount of exercise), (2) withdrawal symptoms, (3) intention effects (*i.e.*, often taking on more exercise than intended), (4) lack of control over one's exercising, (5) time (*i.e.*, spending a great deal of time in exercise-related activities), and (6) reductions in other activities, and continuance (*i.e.*, exercising despite illness or injury).

The total scores for each EDS factor/subscale defined three severity ranges of EA: at-risk for EA, nondependent-symptomatic, and nondependent-asymptomatic. A higher score indicates more EA symptoms, in which participants are classified as at-risk when obtaining scores ≥ 15 in three or more factors/subscales; as nondependent-symptomatic with a score between 7 and 14 in three or more factors/subscales; and as nondependent-asymptomatic with three or more factors/subscales with scores ≤ 6 (HAUSENBLAS; DOWNS; 2002; ZANDONAI *et al.,* 2020). This scale shows excellent internal consistency (Cronbach's alpha = 0.95) and adequate test-retest reliability (r = 0.92) (HAUSENBLAS; DOWNS, 2002).

Exercise Addiction Inventory (EAI)

The EAI consists of six items based on six general components of EA: (1) salience (*i.e.*, exercise as the most important thing in life), (2) conflict (*i.e.*, conflicts have arisen between family and/or my partner about the amount of exercise), (3) mood modification (*i.e.*, exercise as a way of changing mood), (4) tolerance (*i.e.*, increased the amount of exercise in a day.), (5) withdrawal symptoms (*i.e.*, missing an exercise session leads to being moody and irritable.), and (6) relapse (*i.e.*, if cut down the amount of exercise, and then start again, always end up exercising as often as did before) (GRIFFITHS, 1996; SICILIA *et al.*, 2017). The responses are scored on a Likert-scale from 1 (strongly disagree) to 5 (strongly agree), in which higher scores indicated increased EA symptoms.

The total score is the sum of all items, and the participants are classified into three categories: a score ≥ 24 indicates at risk for EA, a score between 13 and 23 indicates a participant presenting some symptoms of EA, referred to as nondependent-symptomatic, and a score of 0–12 indicates a nondependent-symptomatic” individual (TERRY *et al.*, 2004). The EAI has been shown to have excellent psychometric properties (TERRY *et al.*, 2004), including good test-retest reliability (GRIFFITHS *et al.*, 2005), strong internal reliability, and good construct validity (TERRY *et al.*, 2004). The internal consistency of EAI is of 84% and the test-retest reliability is 0.85 (GRIFFITHS *et al.*, 2005).

Statistical analysis

All statistical analyses were performed using the software *Statistical Package for the Social Sciences* (SPSS® v.20, Inc., Chicago, IL, USA). Data normality was verified by Kolmogorov Smirnov test and the variables are presented as mean ± standard deviation (SD). To comparison between the groups scores was used the Anova one-way and Bonferroni post hoc and the chi-square test was performed to verify the association between the categories of athletes (groups) and the classification for EA. The significance level adopted was $p < 0.05$.

Results

Table 1 presents the results of training characteristics, such as training experience time, training frequency, training sessions, and exercise volume. Statistical differences were observed between groups for training experience time: runners vs. swimmers (p = 0.009) and cyclists vs. swimmers (p = 0.001). In addition, statistical differences were observed for training frequency and exercise volume between triathletes vs. runners (p < 0.001), triathletes vs. cyclists (p = 0.008 and p < 0.001, respectively), triathletes vs. swimmers (p < 0.001), and cyclists vs. swimmers (p = 0.004 and p = 0.038, respectively). For the training sessions it was observed significant differences between triathletes and other groups (p < 0.001). The triathletes showed higher values for training frequency, training sessions, and exercise volume in relation to the other groups.

Table 1. Comparison between athletes from different individual sports for variables related to training.

Variables	Runners (n = 39)	Cyclists (n = 32)	Swimmers (n = 30)	Triathletes (n = 38)	All (n = 139)
Training experience time (months)	93.1 ± 77.7	73.9 ± 70.6	171.8 ± 131.3*#	118.7 ± 105.6	112.9 ± 103.4
Training frequency (days·week-1)	4.4 ± 1.4	5.1 ± 1.4	3.8 ± 1.7#	6.2 ± 1.2*#†	4.9 ± 1.6
Training sessions (days·week-1)	5.5 ± 3.0	6.0 ± 2.9	4.8 ± 2.9	10.4 ± 4.8*#†	6.8 ± 4.2
Exercise volume (h·week-1)	6.8 ± 5.0	9.8 ± 5.2	5.8 ± 5.8#	14.3 ± 6.8*#†	9.4 ± 6.6

**p < 0.05 compared to runners;*
 # p < 0.05 compared to cyclists;
† P < 0.05 compared to swimmers.

Table 2 shows the EA scores evaluated by the EDS of athletes from different individual modalities. For the factors “intention effects” and “time” statistical difference were observed between swimmers and cyclists (p = 0.021 and p = 0.016, respectively) and triathletes (p = 0.002 and p = 0.022, respectively); additionally, a statistical difference was observed for "Time" between runners and cyclists (p = 0.037). For the EDS total score, significantly lower value was found in the swimmers compared to the cyclists (p = 0.024) and triathletes (p = 0.030).

Table 2. Exercise addiction scores evaluated by the EDS of athletes from different individual modalities.

Factors/Subscales	Runners (n = 39)	Cyclists (n = 32)	Swimmers (n = 30)	Triathletes (n = 38)	All (n = 139)
Tolerance	9.8 ± 2.7	11.7 ± 3.1	9.6 ± 4.4	11.1 ± 4.0	10.5 ± 3.7
Withdrawal effects	10.0 ± 3.3	11.4 ± 3.6	10.8 ± 4.1	11.5 ± 3.2	10.9 ± 3.5
Intention effects	9.7 ± 3.2	10.3 ± 3.0	7.7 ± 3.7#	10.7 ± 3.5†	9.7 ± 3.5
Lack of control	11.5 ± 3.4	13.0 ± 2.7	11.3 ± 3.8	12.6 ± 3.4	12.1 ± 3.4
Time	8.8 ± 3.0	11.1 ± 3.9*	8.3 ± 3.5#	10.9 ± 3.9†	9.8 ± 3.8
Reduction in other activities	9.7 ± 4.0	10.3 ± 3.0	8.0 ± 3.4	9.7 ± 3.9	9.5 ± 3.7
Continuance dependence	8.3 ± 3.7	8.2 ± 4.0	7.2 ± 4.0	8.6 ± 4.0	8.1 ± 3.9
EDS total score	67.8 ± 18.3	75.9 ± 15.7	62.8 ± 17.1#	75.1 ± 18.4†	70.6 ± 18.1

Note: Exercise dependence scale (EDS).
** p < 0.05 compared to runners.*
 # p < 0.05 compared to cyclists.
† p < 0.05 compared to swimmers.

Table 3 describes the values of the EAI scale; there was a significant difference only in the total score of cyclists in relation to runners (p = 0.045). On the EAI scale, the highest values in all groups were observed for the item "Tolerance". The EAI total score was significantly higher for cyclists compared to runners (p = 0.045).

Table 3. Exercise addiction scores evaluated by the EAI of athletes from different individual modalities.

Factors	Runners (n = 39)	Cyclists (n = 32)	Swimmers (n = 30)	Triathletes (n = 38)	All (n = 139)
Salience	2.8 ± 1.1	2.8 ± 1.2	2.4 ± 0.9	2.7 ± 1.0	2.7 ± 1.1
Conflict	2.8 ± 1.3	3.2 ± 1.4	2.5 ± 1.2	3.3 ± 1.4	2.9 ± 1.4

Mood modification	1.8 ± 1.1	1.9 ± 1.3	1.6 ± 0.9	1.8 ± 1.2	1.8 ± 1.1
Tolerance	3.2 ± 1.4	3.5 ± 1.5	3.3 ± 1.5	3.5 ± 1.1	3.4 ± 1.4
Withdrawal symptoms	2.9 ± 1.1	3.3 ± 1.3	2.5 ± 1.3	3.0 ± 1.3	2.9 ± 1.2
Relapse	3.0 ± 1.3	2.8 ± 1.5	2.6 ± 1.5	2.6 ± 1.2	2.7 ± 1.4
EAI total score	15.3 ± 4.8	18.5 ± 5.5*	15.4 ± 4.9	16.7 ± 4.8	16.5 ± 5.1

Note: Exercise addiction inventory (EAI).
** p < 0.05 compared to runners.*

Tables 4 and 5 present the absolute and relative frequencies for the classifications according to the EDS and EAI scales for the athletes of each modality, respectively. The most frequent classification in all groups of athletes (on both scales) was "Nondependent Symptomatic". No association was observed between the modality practiced by the athlete (runner, cyclist, swimmer, or triathlete) and the classifications for EA ($p > 0.05$).

Table 4. Absolute and relative frequency of exercise addiction classification categories obtained from the EDS scale.

		Runners (n = 39)	Cyclists (n = 32)	Swimmers (n = 30)	Triathletes (n = 38)	All (n = 139)
At-risk for exercise addiction	N (%)	2 (5.1)	3 (9.4)	0 (0)	7 (18.4)	12 (8.6)
Nondependent Symptomatic	N (%)	34 (87.2)	27 (84.4)	22 (73.3)	30 (78.9)	113 (81.3)
Nondependent Asymptomatic	N (%)	3 (7.7)	2 (6.3)	8 (26.7)	1 (2.6)	14 (10.1)

Table 5. Absolute and relative frequency of physical exercise dependence classification categories obtained from the EAI scale.

		Runners (n = 39)	Cyclists (n = 32)	Swimmers (n = 30)	Triathletes (n = 38)	All (n = 139)
At-risk for exercise addiction	N (%)	3 (7.7)	5 (15.6)	1 (3.3)	3 (7.9)	12 (8.6)
Nondependent Symptomatic	N (%)	25 (64.1)	22 (68.8)	21 (70.0)	26 (68.4)	94 (67.6)
Nondependent Asymptomatic	N (%)	11 (28.2)	5 (15.6)	8 (26.7)	9 (23.7)	33 (23.7)

Discussion

The aim of the study was to evaluate and compare EA between runners, cyclists, swimmers, and triathletes. The main finding was that most participants, regardless of modality, were classified as nondependent symptomatic. In addition, the highest EA total score was found for cyclists and triathletes, and the lowest values for runners and swimmers on both the EDS and EAI scales.

Concerning the training variables for each group of athletes, significant differences were observed for the training frequency, training sessions, and exercise volume when comparing the triathletes with runners ($p < 0.001$), cyclists ($p = 0.008$ and $p < 0.001$, respectively), and swimmers ($p < 0.001$) with a higher training volume for triathletes. It is noteworthy that the relationship between training volume and EA has already been demonstrated by Youngman e Simpson (2014), who observed that the greater the weekly hours of training, the greater the risk of EA; according to the authors, this fact is explained by conflicts caused by increased training volume and increased practice changing mood. However, although triathletes had a greater training volume when compared to cyclists and runners in our study, they did not present a higher score for EA when compared to cyclists and runners.

The present study reported similar total EDS scores for the groups evaluated (runners: 67.8 ± 18.3; cyclists: 75.9 ± 15.7; swimmers: 62.8 ± 17.1; triathletes: 75.1 ± 18.4), except for the swimmers, who presented significantly lower values ($p = 0.024$) compared to the cyclists and triathletes ($p = 0.030$). Concerning the EDS factors/subscales, the "intention effects" were lower in swimmers and significantly different from cyclists and triathletes ($p = 0.021$). Thus, these scores suggest that swimmers had a lower risk for EA symptoms than the other athletes. In the same way, the EAI results indicated similar scores for the groups (runners: 15.3 ± 4.8; cyclists: 18.5 ± 5.5; swimmers: 15.4 ± 4.9; triathletes: 16.7 ± 4.8), however, the value for cyclists was significantly higher compared to runners ($p = 0.045$). Furthermore, most athletes were classified as “nondependent symptomatic” in both EDS and EAI, for all groups (runners, cyclists, swimmers, and triathletes). The predominant classification of this study is similar to that verified in studies carried out with athletes of individual sports (LUKÁCS *et al.*, 2019; ZANDONAI *et al.*, 2020; YOUNGMAN; SIMPSON, 2014).

The scores for EA in our study are lower than those of other studies with athletes of individual modalities (MAYOLAS-PI *et al.*, 2017; SZABO *et al.*, 2013; YOUNGMAN; SIMPSON, 2014). Concerning the EA in runners, previous studies presented data for EA for these athletes (LUCKÁS *et al.*, 2019; SMITH *et al.*, 2010; SZABO *et al.*, 2013; ZANDONAI *et al.*, 2020). Zandonai *et al.* (2020) conducted a study with a sample of 229 Italian and 198 Japanese runners and used EDS to assess EA. As observed in the present study, the highest percentage of runners was classified as nondependent symptomatic; in Italy 86.9% were nondependent symptomatic, 8.7% were nondependent asymptomatic, and 4.4% were at risk for EA; in Japan, participants were equally classified as symptomatic (49%) and asymptomatic (51%), and none of them were considered as at-risk. It is worth mentioning that no other studies have analyzed EDS scores as in the present study, so direct comparisons against this scale are difficult.

Szabo *et al.* (2013) investigated EA with the EAI in 95 ultra-marathon elite runners and demonstrated a score of 20.1± 3.70, with 17% of the sample at risk of EA. This result is different from that found in the present study for the runners, since only 7.7% of the runners were classified as at-risk for EA and the EAI score (15.3 ± 4.8) was lower compared to Szabo *et al.* (2013). Luckás *et al.* (2019) evaluated 257 male and female amateur runners and showed that 8.6% had a prevalence of being at risk of EA similar to our results for runners (5.1% at risk on the EDS), with 53.6% were characterized as nondependent symptomatic and 37.8% as nondependent asymptomatic; the total EDS score was not presented by the authors.

Concerning the results for the cyclists, our findings are similar to those of Mayolas-Pi *et al.* (2017) who evaluated the risk of EA in 859 (751 men and 108 women) amateur endurance cyclists. The authors showed that 17% of the cyclists presented evidence of a high risk for EA and the majority (83%) of the sample presented a low risk for EA; in addition, the EAI scores of 17.9 ± 3.4 and 17.0 ± 4.1 for men and women, respectively, were similar to those found for the cyclists in the present study. Torstveit *et al.* (2019) examined EA with the EDS in 53 well-trained male cyclists, triathletes, and long-distance runners and reported an EDS total score lower (54.7 ± 10.4) than the score obtained in the present study for the total sample (EDS all = 70.6 ± 18.1). It important to mention that, different from our study, the authors divided the participants into 'lower EDS score' or 'higher EDS score', which limited comparisons between the studies.

The triathletes in the present study obtained different total scores on the EDS and EAI compared to other studies (VALENZUELA; ARRIBA-PALOMERO, 2017; YOUNGMAN; SIMPSON, 2014). Youngman e Simpson (2014) investigated EA using the EAI in 552 male triathletes and the results indicated that 0.9% were nondependent asymptomatic, 81.2% were nondependent symptomatic and 17.9% were at risk for EA, the EAI total score was 20.8 ± 3.3. In the present study we found a lower EAI score (16.7 ± 4.8) and only 7.9% of the triathletes at-risk for EA. Another study with triathletes was performed by Valenzuela e Arriba-Palomero (2017) who reported a lower EDS total score (57.2 ± 17.3) than the present study (EDS triathletes: 75.1 ± 18.4). In addition, while we found 18.4% of the triathletes at risk for EA, Valenzuela e Arriba-Palomero (2017) reported only 8.6% in this same classification (1.2% nondependent asymptomatic and 60.2% nondependent symptomatic).

It is important to note that no previous research investigated swimmers, however the scores presented by this group in the present study were lower when compared to other studies with different individual modalities as well as the classification for EA (MAYOLAS-PI *et al.*, 2017; SZABO *et al.*, 2013; YOUNGMAN; SIMPSON, 2014), that is, swimmers in the present study demonstrated a lower risk for EA than that found for athletes of other individual modalities.

Strengths and limitations

It is worth mentioning that the present study had some limitations, such as, the lack of information about the training program of the participants and variables related to body composition. Furthermore, as the studies on EA are concentrated on running, comparisons with other modalities were limited. Concerning the strengths of the present study, it is important to emphasize that for practical applications these results are relevant for athletes and coaches, since identifying symptoms and the risk of EA could help to avoid its aggravations and, consequently, negative impacts either on training, sports performance, and/or on personal life.

Conclusion

Therefore, it is concluded that in both instruments most participants were classified as nondependent symptomatic for EA, and the runners and swimmers had the lowest total scores for EA. It is suggested that future studies investigate a larger sample of swimmers, given the scarcity of studies with these athletes, as well as how other factors such as sex, age, experience, and training volume can influence EA in athletes.

References

ALCHIERI, J.C. *et al.* Exercise Dependence Scale*:* adaptação e evidências de validade e precisão. **Jornal Brasileiro de Psiquiatria.** Rio de Janeiro, v. 64, n. 4, p. 280-287, 2015. Available in: https://doi.org/10.1590/0047208500000009.

COOK, B.; LUKE, R. Primary and Secondary Exercise Dependence in a Sample of Cyclists. **International Journal of Mental Health Addiction***,* New York, v.15, n.2, p. 444-451, 2017. Available in: https://link.springer.com/article/10.1007/s11469-017-9745-z

DI LODOVICO, L.; POULNAIS, S.; GORWOOD, P. Which sports are more at risk of physical exercise addiction: A systematic review. **Addictive Behaviors,** Charleston, v. 93, p. 257–262, 2019. Available in https://www.sciencedirect.com/science/article/abs/pii/S0306460318308633.

GRIFFITHS, M. D.; SZABO, A.; TERRY, A. The exercise addiction inventory: a quick and easy screening tool for health practitioners. **British Journal of Sports Medicine**, London, v.39, n.6, e30, 2005. Available in: https://bjsm.bmj.com/content/39/6/e30.long

GRIFFITHS, M. D. Behavioral addiction: an issue for everybody? **Employee Counselling Today,** v. 8, n.3, p. 19–25, 1996. Available in: https://psycnet.apa.org/record/2009-19549-004.

HAUSENBLAS, H. A.; DOWNS, D. S. Exercise Dependence Scale-21 Manual, 2002.

HAUSENBLAS, H. A.; DOWNS, D. S. How much is too much? The development and validation of the exercise dependence scale. **Psychology & Health**, *v.17, n.*4, p. 387-404, 2002. Available in: https://www.tandfonline.com/doi/abs/10.1080/0887044022000004894.

LANDOLFI, E. Exercise addiction. **Sports Medicine,** Auckland, v.43, n.2, p. 111–119, 2013. Available in: https://link.springer.com/article/10.1007/s40279-012-0013-x.

LICHTENSTEIN, M. B. *et al.* The Prevalence of Exercise Addiction Symptoms in a Sample of National Level Elite Athletes. **Frontiers in Sports and Active Living**, Lausanne, v.3, 635418, 2021. Available in: https://www.frontiersin.org/articles/10.3389/fspor.2021.635418/full.

LUKÁCS, A. *et al.* Exercise addiction and its related factors in amateur runners. **Journal of Behavioral Addictions,** Budapest, v. 8, n. 2, p. 343–349, 2019. Available in: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7044555/pdf/jba-08-02-28.pdf.

MAYOLAS-PI, C. *et al.* Exercise addiction risk and health in male and female amateur endurance cyclists. **Journal of Behavioral**

Addictions, Budapest, v. 6, n. 1, p. 74–83, 2017. Available in: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5573003/pdf/jba-06-01-018.pdf.

NOGUEIRA, A. *et al.* Exercise Addiction in Practitioners of Endurance Sports: A Literature Review. **Frontiers in Psychology,** Lausanne, v. 9, 1484, 2018. Available in: https://www.frontiersin.org/articles/10.3389/fpsyg.2018.01484/full.

SMITH, D. *et al.* Exercise dependence and social physique anxiety in competitive and non competitive runners. **International Journal of Sport and Exercise Psychology,** London, v. 8, n. 1, p. 61-69, 2010. Available in: https://www.tandfonline.com/doi/abs/10.1080/1612197X.2010.9671934.

SICILIA, A. *et al.* Propiedades psicométricas del Exercise Addiction Inventory (EAI) en una muestra de estudiantes brasileños universitarios. **Universitas Psychologica**, Bogotá, v.16, n. 2, p.176-185, 2017. Avalaible in: https://doi.org/10.11144/javeriana.upsy16-2.ppea.

SZABO, A. *et al.* Exercise addiction in Spanish athletes: Investigation of the roles of gender, social context and level of involvement. **Journal of Behavioral Addictions**, Budapest, v. 2, n. 4, p. 249–252, 2013. Available in: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4154578/pdf/jba-02-249.pdf.

TERRY, A.; SZABO, A.; GRIFFITHS, M. The exercise addiction inventory: a new brief screening tool. **Addiction Research and Theory,** Ormskirk, v. 2, n. 5, p. 489-499, 2004. Available in: https://psycnet.apa.org/record/2004-20487-007.

TORSTVEIT, M. K. *et al.* Exercise dependence, eating disorder symptoms and biomarkers of Relative Energy Deficiency in Sports (RED-S) among male endurance athletes. **BMJ Open Sport &**

Exercise Medicine, London, v. 5, n. 1, e000439, 2019. Available in: https://bmjopensem.bmj.com/content/5/1/e000439.

VALENZUELA, P.L.; ARRIBA-PALOMERO, F. Risk of exercise addiction among male amateur triathletes and its relationship with training variables. **Revista internacional de Ciencias del Deporte,** Murcia, v. 13, n. 48, p.162-171, 2017. Available in: https://www.redalyc.org/pdf/710/71050358006.pdf.

YOUNGMAN, J.; SIMPSON, D. Risk for Exercise Addiction: A Comparison of Triathletes Training for Sprint-, Olympic-, Half-Ironman-, and Ironman-distance Triathlons. **Journal of Clinical Sport Psychology**, Wilmington, v. 8, n. 1, p.19-37, 2014. Available in: https://journals.humankinetics.com/view/journals/jcsp/8/1/article-p19.xml.

ZANDONAI, T. *et al.* A descriptive study of exercise dependence: a short report among Italian and Japanese runners. **Journal of Addictive Diseases**, v. 39, n. 1, p. 133–137, 2021. Available in: https://www.tandfonline.com/doi/full/10.1080/10550887.2020.1829450.

Publisher

Universidade Federal de Goiás. Faculdade de Educação Física e Dança. Publicação no Portal de Periódicos UFG. As ideias expressadas neste artigo são de responsabilidade de seus autores, não representando, necessariamente, a opinião dos editores ou da universidade.