

Exercise Addiction in Athletes and Leisure Exercisers: The Moderating Role of Passion

RICARDO DE LA VEGA¹, IRINI S. PARASTATIDOU², ROBERTO RUÍZ-BARQUÍN³ and ATTILA SZABO^{4,5*}

¹Department of Physical Education, Sport and Human Movement, Autonomous University of Madrid, Madrid, Spain

²Department of Physical Education and Sport Science, Aristotle University of Thessaloniki, Thessaloniki, Greece

³Department of Developmental and Educational Psychology, Autonomous University of Madrid, Madrid, Spain

⁴Institute of Health Promotion and Sport Sciences, Eötvös Loránd University, Budapest, Hungary

⁵Institute of Psychology, Eötvös Loránd University, Budapest, Hungary

(Received: January 19, 2016; revised manuscript received: April 6, 2016; second revised manuscript received: May 16, 2016; accepted: May 16, 2016)

Background and aims: Recently, empirical research has linked obsessive passion to the etiology of exercise addiction, and the conceptual reason behind the fact that the latter is more prevalent in athletes than leisure exercisers has been challenged. The aim of this study was to determine the link between exercise addiction and harmonious passion, obsessive passion, and dedication to sports, in the context of athletic levels. *Method:* A sample comprised of low- and high-level competitive athletes and non-competitive leisure exercisers ($n = 313$) was examined, in a cross-sectional design, in which participants completed the Spanish validated versions of the Exercise Addiction Inventory (Sicilia, Alías-García, Ferriz, & Moreno-Murcia, 2013) and Passion Scale (Chamarro et al., 2015). *Results:* Obsessive passion and dedication to sports emerged as strong predictors of exercise addiction. Competitive athletes scored higher than leisure exercisers on all measures. Athletes competing at low and high levels only differed in dedication to their sports from each other. Team-sports athletes reported greater harmonious and obsessive passions, and dedication to sports, but not different exercise addictions, than people taking part in individual sports. *Conclusions:* The concept of exercise addiction is not a plain and independent construct and may *not* reflect a psychological dysfunction in the athletic population. Athletes could interpret exercise addiction screening-items differently from non-athletes. Athletes in team sports report greater passion and dedication than those practicing individual sports.

Keywords: commitment to exercise, competition, elite athlete, exercise dependence, sport

INTRODUCTION

Epidemiological studies have shown that a physically active lifestyle yields numerous health benefits (Bellocco, Jia, Ye, & Lagerros, 2010; Lee et al., 2011). It is factual knowledge that regular exercise is linked to better mental health (Clow & Edmunds, 2013). Therefore, it is not surprising that many individuals use exercise as a means of coping with stress (Berczik et al., 2012). However, sports and exercise – ironically – may also be a source of stress (Stevens, Loudon, Yow, Bowden, & Humphrey, 2013). The need for high volume of exercise and a loss of control over it is referred to as “exercise addiction” (Berczik et al., 2014; Szabo, 2010).

Exercise addiction

Numerous terms have been used to define persistent exercise abuse and/or overdose. The most common are: “obligatory exercise” (Pasman & Thompson, 1988; Steffen & Brehm, 1999), “exercise dependence” (Ogden, Veale, & Summers, 1997; Symons Downs, Hausenblas, & Nigg, 2004; Veale, 1987), and “exercise addiction” (Griffiths, 1997; Szabo, 2010). Moreover, each conceptualization has been associated with different quantitative instruments, such as the Obligatory Exercise Questionnaire (Pasman & Thompson, 1988), Exercise Dependence Scale (Symons Downs et al., 2004), and the Exercise Addiction Inventory (EAI; Terry,

Szabo, & Griffiths, 2004). Griffiths (1997) based exercise addiction research on the modified model of the general components of addictions (Brown, 1993). Furthermore, Terry et al. (2004) used this model for the theoretical framework in developing the EAI. According to Griffiths (1997), an exercise addict (a) experiences withdrawal symptoms every time one is forced to reduce or cut down exercise, (b) feels that the activity is the most important in one’s life, (c) experiences conflict with the self and others due to the too much exercise, (d) feels a sense of euphoria during or after exercising, (e) needs to increase exercise volume to achieve the former euphoric effect, and (f) returns to the former patterns of excessive exercise, after a longer period of reduced exercise or abstinence.

Exercise addiction was often confounded with commitment to exercise (Szabo, 2010), which inherently involves a certain degree of passion for and dedication to the activity. New theoretical surmise (Szabo, Griffiths, de la Vega, Mervó, & Demetrovics, 2015) posits that the elite or competitive athlete may conceptualize the symptoms of

* Corresponding author: Dr. habil. Attila Szabo, PhD; Associate Professor (Reader) and Deputy Director, Institute of Health Promotion and Sports Sciences, Faculty of Education and Psychology, Eötvös Loránd University, Bogdánfy u. 10, H-1117 Budapest, Hungary; Phone: +36 70 243 7123; E-mail: szabo.attila@ppk.elte.hu

exercise addiction differently from non-competitive leisure exercisers, or non-athletes. This presumption is supported by the consistent finding in the literature that higher level of athletic involvement is associated with higher scores of exercise addiction (Pierce, McGowan, & Lynn, 1993; Szabo, de la Vega, Ruiz-Barquín, & Rivera, 2013). It should be stressed that instruments employed in the assessment of exercise addiction were almost exclusively developed with non-athletes (Szabo et al., 2015).

Exercise addiction and competition level

Research suggests that the risk for exercise addiction increases with the level of sport competition. Szabo et al. (2013) found that elite ultra-marathon runners reported higher levels of exercise addiction than university athletes. Similar results were found for competitive and recreational runners (Pierce et al., 1993), for professional and amateur triathletes (Blaydon & Lindner, 2002; Youngman & Simpson, 2014), for triathletes and leisure exerciser population (Youngman, 2007), and for sport science students and general exercising population (Szabo & Griffiths, 2007), with the former – in each dyad – reporting higher scores of exercise addiction scores than the latter. In line with the recent argument, these differences may not demonstrate greater psychological morbidity in athletes in contrast to non-athletes, but rather differences in interpretations (Szabo et al., 2015) that could be further substantiated through the examination of other measures such as passion and dedication to the athletic activity.

Passion

Passion toward an activity is a notion that refers to engaging in a beloved activity that one finds important, and invests time and energy into it. Vallerand et al. (2003) introduced a dual model of passion that comprises two different types of passion toward an activity: harmonious and obsessive. According to Vallerand (2008), passion toward an activity is formed when one likes the activity, freely selects to engage in it, and when internalizes the activity into the self. Harmonious passion is formed when the activity is internalized into the self in an autonomous mode, when one flexibly engages in the activity, which is positively related to positive affect, while it is negatively linked to negative affect (Stenseng, Rise, & Kraft, 2011; Vallerand et al., 2003, 2006; Vallerand & Miquelon, 2007). On the other hand, obsessive passion manifests itself when one internalizes the beloved activity in a controlled way, when the engagement in the activity is rigidly controlled, while it is positively related to negative affect (Stenseng et al., 2011; Vallerand et al., 2003, 2007; Vallerand & Miquelon, 2007). In addition, an obsessively passionate person attaches great importance to activity contingencies, such as self-esteem and escape from problems, which makes it difficult for one to stop the passionate activity (Vallerand, 2010).

Exercise addiction and passion

The scholastic literature on the link between exercise addiction and passion is limited. Obsessive passion was found to

be positively related to exercise addiction in endurance sports and other leisure activities (Schipfer & Stoll, 2015; Stenseng et al., 2011). Recently, Paradis, Cooke, Martin, and Hall (2013) revealed that obsessive passion was related to all dimensions of exercise addiction (time, reduction in other activities, tolerance, withdrawal, continuance, intention effects, and lack of control), which was not the case for harmonious passion that was only related to time and tolerance. It was shown that harmoniously passionate exercisers can increase the time spent on exercise, without decreasing the time spent on other important life activities, which is not the case for obsessively passionate exercisers, who spend too much time on exercise, while taking time away from other important life activities (Paradis et al., 2013). A recent research has revealed that obsessive passion bears a stronger relationship to exercise addiction than does harmonious passion (Parastatidou, Doganis, Theodorakis, & Vlachopoulos, 2014).

Passion and level of competition

Research on athletic involvement and passion is limited. An earlier study found that highly competitive athletes, scoring high on obsessive passion, demonstrated higher levels of well-being than athletes scoring high on harmonious passion (Amiot, Vallerand, & Blanchard, 2006). In contrast, low competitive athletes scoring high on obsessive passion showed lower levels of well-being than those scoring high on harmonious passion. Later, Vallerand (2008) recommended that more research is needed on passion and addiction in competitive athletes. Nevertheless, since then no research has been conducted to examine the relationship between types of passion and athletic involvement.

Purpose and hypotheses

The aim of this study was to examine the relationship between exercise addiction and harmonious passion, obsessive passion, as well as dedication to sport in competitive athletes and leisure exercisers. We also tested the hypotheses that exercise addiction will be different in competitive and non-competitive athletes as well as in athletes, or exercisers, involved in team and individual sports.

METHODS

Participants

Only individuals who reported regular exercise or sport, for at least three times a week, were recruited in the study. After assuring that they meet the criteria for participation in the investigation, researchers used a personal- as well as group-verbal solicitation in recruiting athletes for the research. Participants were recruited from three major elite sport associations, including football and athletics, as well as from a large university ($n = 313$). Participants took part in 17 different sports. However, they represented predominantly (85%) seven sports, including gymnastics ($n = 81$), athletics ($n = 73$), football ($n = 50$), duathlon ($n = 26$), swimming ($n = 25$), triathlon ($n = 24$), and basketball

($n = 12$); the other 22 athletes were from 10 other different sports. Most of the participants were engaged in individual sports ($n = 244$), while a little more than one-fifth of them ($n = 69$) practiced team sports. Nearly, two-third of the participants were men ($n = 204$, mean age = 31.1 years, $SD \pm 10.1$) and a little more than one-third were women ($n = 109$, mean age = 28.6 years, $SD \pm 7.4$). A posteriori, participants were grouped on the basis of their sport competition status, as competitive ($n = 174$, athletes) or non-competitive ($n = 139$, leisure exercisers). The athletes were further subgrouped, on the basis of their level of competition, into (a) national/international ($n = 30$) and (b) local/regional ($n = 144$). This grouping resulted in three levels of athletic involvement: (a) non-competitive, leisure exercisers (mean age = 31.5 years, $SD \pm 9.3$; mean exercise time per week = 7.1 hr, $SD \pm 3.3$) and (b) local/regional athletes (mean age = 29.3 years, $SD \pm 8.7$; mean exercise time per week = 9.5 hr, $SD \pm 3.7$), and national/international athletes (mean age = 28.7 years, $SD \pm 11.3$; mean exercise time per week = 11.6 hr, $SD \pm 7.0$). Participants took part in the study in their natural training environment by completing paper and pencil questionnaires.

Materials

A demographic questionnaire was used to determine participants' gender, age, weekly hours of exercise, type of exercise, and level of athletic involvement (competitive or leisure, if competitive, the level of competition). The re-validated Spanish version (Sicilia, Alfas-García, Ferriz, & Moreno-Murcia, 2013) of the 6-item EAI (Terry et al., 2004) was used to assess the risk for exercise addiction. The EAI is rated on a 5-point Likert scale, ranging from *strongly disagree* to *strongly agree*, and it comes with good psychometric properties (Griffiths et al., 2015; Monók et al., 2012; Terry et al., 2004), which were demonstrated in the present-adopted Spanish version too (Sicilia et al., 2013). The internal reliability of the Spanish EAI was repeatedly demonstrated to be (Cronbach's α) .70 (Griffiths et al., 2015; Sicilia et al., 2013), which fits into the α range of .61–.80 that was reported for the EAI in a recent five nation comparative studies (Griffiths et al., 2015).

Another used instrument was the Spanish adopted version of Passion Scale (SPS; Chamarro et al., 2015) that was developed and psychometrically validated on the basis of the revised English Passion Scale (Marsh et al., 2013). The scale measures harmonious and obsessive passion using two 6-item subscales that are rated on a 7-point Likert scale, ranging from *very much disagree* to *very much agree*. The SPS also includes another 5-item subscale, which measures the "passion criteria" for the practiced activity, that is reflected by self-reported time investment, affiliation, importance, involvement, and identity in the context of the athletic activity. An example item is: "This activity is part of who I am." We will refer to this subscale as *dedication* to the sports activity. The psychometric properties of the SPS are good, especially in physically active individuals or athletes who served as a large part of the validation study (Chamarro et al., 2015). The internal reliability of the SPS is $\alpha = .81-.87$.

Procedure

Following the reading and signing of a written informed consent form, the participants completed the set of questionnaires, in their habitual training environments, in the presence of one of the experimenters. Data collection lasted over a period of three months. The gathered data were entered into Excel files, then imported into the Statistical Package for Social Sciences (SPSS) software (Version 22.0) for the subsequent data analyses.

Statistical analyses

Two multivariate analysis of variances (MANOVAs) were used for testing the hypotheses that the level of athletic involvement (i.e., competitive and non-competitive) and the form of athletic involvement (i.e., individual and team) will differentiate the participants in terms of exercise addiction risk scores, harmonious- and obsessive-passion scores, and dedication to the sport. Subsequently, a multiple regression analysis was used to examine the association between exercise addiction, passion (both harmonious and obsessive), and dedication to the sport.

Ethics

All participants were volunteers who read and signed an informed consent form. Ethical permission for the study was obtained from the Universidad Autonoma de Madrid, Madrid, Spain. The study was conducted in full accordance with the ethical principles for research with human subjects of the Helsinki Declaration (World Medical Association, 2008), as well as in concordance with the published guidelines for ethical considerations in research involving human participants (British Psychological Society, 2010).

RESULTS

Internal reliabilities of the questionnaires used

In spite of the fact that the Spanish versions of the EAI and the Passion scale were psychometrically validated earlier (Chamarro et al., 2015; Sicilia et al., 2013) in this study, we recalculated internal reliabilities in the samples studied, which were (Cronbach's α) .68 for EAI, .71 for harmonious passion, .79 for the obsessive passion, and .83 for "dedication" (originally called "criteria passion"; Chamarro et al., 2015).

Level of athletic involvement (competitive and non-competitive)

A 2 (gender: men and women) by 3 (level of athletic involvement: leisure exercisers, local/regional athletes, national/international athletes) by 4 (dependent measures: exercise addiction, harmonious passion, obsessive passion, and dedication) MANOVA resulted in only one statistically significant multivariate main effect for athletic involvement [Pillai's Trace = .216, $F(6, 610) = 9.2$, $p < .001$, $\eta^2_p = .108$],

and no gender main effect or interaction. The MANOVA was followed up with univariate tests and Scheffé post-hoc tests, which showed that the differences between the three levels of athletic involvement (groups) were statistically significant in all four dependent measures ($p < .001$, see Table 1). The post-hoc tests revealed that competitive athletes differed from leisure exercisers in all four dependent measures ($p < .05$, at least, Table 1). The two groups of competitive athletes only differed from each other in dedication, with national/international athletes showing greater dedication ($p = .016$) than local/regional athletes.

Form of athletic involvement (individual and team)

Another 2 (type of sport: individual and team) by 4 (the dependent measures) MANOVA also yielded the statistically significant multivariate main effect [Pillai's Trace = .172, $F(4, 308) = 16.0$, $p < .001$, partial eta squared (η^2_p) = .172]. The follow-up univariate tests revealed that team-sports athletes scored statistically significantly higher on both harmonious and obsessive passions, as well as dedication ($p < .001$) than individual athletes, while the exercise addiction scores did not differ between the two (Table 2).

A multiple regression was conducted to see if harmonious passion, obsessive passion, and dedication predicted exercise addiction. Initially, a test of the standardized residuals was carried out, which showed that the data contained no outliers (Std. Residual Min. = -3.07, Std. Residual Max. = 2.58). Further tests performed to determine if the data met the assumption of collinearity, indicated that multicollinearity was not a concern (harmonious passion: tolerance = .56, variance inflation factor (VIF) = 1.79; obsessive passion: tolerance = .62, VIF = 1.60; and dedication:

tolerance = .40, VIF = 2.48). Data met the assumption of independent errors (i.e., Durbin-Watson value = 1.41). Data also met the assumption of non-zero variances [harmonious passion: variance (s^2) = 32.2; obsessive passion: $s^2 = 52.7$; and dedication: $s^2 = 32.2$]. Using the "enter" method, a statistically significant regression equation was found [$F(3, 309) = 66.6$, $p < .001$, $R^2 = .39$, and $R^2_{adjusted} = .39$]. In predicting exercise addiction scores, it was revealed that obsessive passion ($B = 0.48$, $p < .001$), and dedication ($B = 0.22$, $p = .002$) were statistically significant predictors, while harmonious passion was not a significant predictor ($B = -0.02$, $p > .05$). The proportion of variance ($R^2_{standardized}$) explained in exercise addiction was .37 by obsessive passion and .25 by dedication.

DISCUSSION

Three noteworthy findings emerge from this investigation: (a) obsessive passion and dedication to the athletic activity are predictors of the reported exercise addiction scores; (b) competitive athletes differ from non-competitive leisure exercisers in exercise addiction, in both harmonious and obsessive passions, as well as in dedication; and (c) athletes participating in team sports report greater passion and dedication to the activity than athletes involved in individual sports.

Link between exercise addiction, obsessive passion, and dedication

The first finding, that obsessive passion and dedication are both positive predictors of exercise addiction, may seem somewhat controversial. Obsessive passion is defined as a

Table 1. Means and standard deviations of four dependent measures in groups at three levels of athletic involvement

Groups (level of athletic involvement)	EA	HP	OP	DD
Leisure exercisers ($n = 139$)	18.0 (4.7) ^{a,b}	29.1 (6.1) ^{a,b}	15.1 (7.2) ^{a,b}	23.4 (5.7) ^{a,b}
Local/regional athletes ($n = 144$)	19.3 (3.8) ^a	33.3 (4.6) ^a	19.6 (6.6) ^a	27.9 (4.6) ^{a,c}
National/international athletes ($n = 30$)	20.6 (3.4) ^b	33.9 (4.0) ^b	22.2 (5.7) ^b	30.9 (3.1) ^{b,c}
<i>F</i>	8.6	19.3	19.7	35.0
<i>p</i>	>.001	>.001	>.001	>.001
Effect size (η^2_p)	.053	.111	.115	.186

Note. *F*, *p* values, and effect sizes (partial eta squared, η^2_p) are also shown in the last three rows. Identical letters identify the groups which differed from each other ($p < .05$, at least), based on Scheffé post-hoc tests, in the dependent measures. EA = exercise addiction, HP = harmonious passion, OP = obsessive passion, and DD = dedication.

Table 2. Means and standard deviations of four dependent measures in the individual-sports athletes and in team-sports athletes

Groups (form of athletic involvement)	EA	HP	OP	DD
Individual-sports athletes ($n = 244$)	18.8 (4.4)	30.6 (5.6)	16.9 (7.1)	25.2 (5.6)
Team-sports athletes ($n = 69$)	19.0 (4.0)	34.4 (4.9)	21.2 (6.9)	29.9 (4.4)
<i>F</i>	.1	25.1	19.5	42.8
<i>p</i>	>.05 (NS)	>.001	>.001	>.001
Effect size (η^2_p)	.000	.075	.059	.121
Effect size (<i>d</i>)	.05	.72	.61	.93

Note. *F*, *p* values, and effect sizes (partial eta squared, η^2_p and Cohen's *d*) are also shown in the last four rows. EA = exercise addiction; HP = harmonious passion, OP = obsessive passion, DD = dedication, and NS = not significant.

rigid and also controlled involvement in the athletic activity, which may hinder positive feelings or the rewards associated with the engagement in the activity (Stenseng et al., 2011). In contrast, dedication mirrors an affinity, deep commitment, internally motivated involvement, and self-identity (Chamarro et al., 2015) in the activity. In spite of the apparent contrast, the two factors positively correlate with each other (Marsh et al., 2013). In fact, the factor that we use here as “dedication” was used for testing the construct validity of the Passion Scale (Marsh et al., 2013). However, this factor yields important information on its own as a measure of deep commitment to the activity. Our finding that both obsessive passion and dedication appear to be predictors of exercise addiction scores, suggests that the latter is not a “plain” construct and that it may be subject to different interpretations, as we will discuss it in the following in the context of athletic involvement.

The current findings agree and strengthen the previous reports linking exercise addiction to obsessive passion (Paradis et al., 2013; Schipfer & Stoll, 2015; Stenseng et al., 2011). It also fully agrees with the results of Parastatidou et al. (2014) showing that obsessive passion manifests a stronger relationship to exercise addiction than harmonious passion. Indeed, in the present inquiry, harmonious passion was virtually unrelated to exercise addiction. This finding may not be surprising if one considers that harmonious passion mirrors the joyful (subjective) experience in which exercise, or the athletic activity, is perceived as a form of life satisfaction enriching the harmony with other significant life activities (Vallerand, 2010; Vallerand et al., 2003).

Dedication to the athletic activity as a unique construct in relation to exercise addiction was not studied to date. If the construct is compared to “commitment” to exercise and athletic activity (but in our view, is more thorough than commitment), our findings agree with the past research. For example, in two earlier studies, higher scores of commitment to running were associated with greater addiction (Chapman & De Castro, 1990; Farrell & Thompson, 1998). Given the close link between passion and dedication, their relationship to exercise addiction is not surprising, which also implies that the former two boost the exercise addiction scores even in lack of psychological dysfunction. If exercise addiction, by definition, is linked to an escape from stress (Egorov & Szabo, 2013) and has to result in some negative outcome to be considered morbidity (Szabo, 2010), then high scores of exercise addiction in passionate and dedicated athletes may represent a “false alarm” in assessment. Indeed, in accord with the new conjecture (Szabo et al., 2015) that the interpretation of the items aimed at gauging exercise addiction may vary among individuals, especially athletes, our results show that passion and dedication may be two of the many possible moderators that may also include social physique anxiety (Cook et al., 2015), eating disorders (Müller, Loeber, Söchtig, Te Wildt, & De Zwaan, 2015), and/or trait anxiety and depression (Weinstein, Maayan, & Weinstein, 2015).

Competitive athletes versus leisure exercisers

One robust finding in this investigation was that athletes participating in sport competitions score higher on exercise

addiction, harmonious passion, obsessive passion, and dedication than non-competitive leisure exercisers. These results are in concordance with past reports from the literature (Blaydon & Lindner, 2002; Pierce et al., 1993; Youngman & Simpson, 2014). Incidences of high risk for exercise addiction range between 7% and 42% in the athletic population, while the figure is around 3% in the non-competitive leisure exercisers (Szabo, 2010; Szabo et al., 2015). The finding that competitive athletes exhibit greater passion and dedication than leisure exercisers is somewhat obvious, and it is in sharp contrast with the paralleling high exercise addiction scores. The only explanation for this finding, supporting the surmise of Szabo et al. (2015), is that competitive athletes assign a different interpretation to the items assessing exercise addiction than leisure exercisers who served as subjects in the validation of the instruments. In fact, a high score of exercise addiction may complement the high level of passion and dedication in the elite athlete in a positive perspective. The latter is a sensitive index of the level athletic involvement or competition, since national/international athletes only differed from local/regional athletes in their level of dedication to their sport.

Team versus individual sports

Our findings show that both harmonious and obsessive passions as well as dedication is higher in team-sports athletes than in individual sports. This finding is in partial accord with the results of Vallerand et al. (2003) who found that harmonious passion was higher in team sports than in individual sports. A partial explanation for this finding is that in addition to the physical and psychological characteristics of the athletic activity found in individual sports, the team sport also involves a social context that may impact both forms of passion. For example, winnings and celebrations, good cooperation, or coordination and motivation may be linked to harmonious passion, while expectations from others, training tasks and challenges, perceived athletic roles, and responsibilities may be associated with higher levels of obsessive passion. The finding that dedication was also higher among team athletes in contrast to the individual athletes deserves future attention in research. At this time, the only explanation we see is that team members and collective roles and responsibilities may foster a deeper dedication, in that the latter is not only geared toward the athletic activity but also toward the coaches and the teammates.

Limitations

One limitation of the study is that it did not test a random representative sample that renders the generalizability of the novel findings tentative. Another limitation is that no specific athletic activities were targeted, while between-sports differences in the dependent measures may exist. Future studies should adopt a sport-specific approach in studying the exercise addiction and passion relationship. Finally, national/international athletes were few ($n = 30$). Nevertheless, recruitment at that high level is extremely difficult.

CONCLUSIONS

This study shows that obsessive passion and dedication to athletic activity are strong predictors of exercise addiction, while harmonious passion is unrelated to the latter. The study also provides strong evidence for differences between athletes and non-competitive leisure exercisers in exercise addiction, in both harmonious and obsessive passions as well as in dedication to the activity. Finally, the study also reveals that athletes participating in team sports report greater passion and dedication to their adopted activity than athletes involved in individual sports. The high scores of exercise addiction in competitive athletes appear to be mere artifacts since they are accompanied by high scores of passion and dedication to sports. Accordingly, the instruments used for assessing exercise addiction in leisure exercisers may not be appropriate in the examination of competitive athletes.

Funding sources: No financial support was received for this study.

Authors' contribution: RdIV designed and coordinated the research, ISP wrote the Introduction section and performed the bulk of the statistical analyses; RR-B helped in data collection, data recording, and data verification; AS participated in the design and wrote the Methods, Discussion, and Conclusions sections of the report.

Conflict of interest: The authors have no conflict of interest, of any kind, to declare.

REFERENCES

- Amiot, C., Vallerand, R. J., & Blanchard, C. M. (2006). Passion and psychological adjustment: A test of the person-environment fit hypothesis. *Personality and Social Psychology Bulletin*, 32(2), 220–229. doi: [10.1177/0146167205280250](https://doi.org/10.1177/0146167205280250)
- Bellocco, R., Jia, C., Ye, W., & Lagerros, Y. T. (2010). Effects of physical activity, body mass index, waist-to-hip ratio and waist circumference on total mortality risk in the Swedish National March Cohort. *European Journal of Epidemiology*, 25(11), 777–788. doi: [10.1007/s10654-010-9497-6](https://doi.org/10.1007/s10654-010-9497-6)
- Berczik, K., Griffiths, M. D., Szabo, A., Kurimay, T., Kokonyei, G., Urbán, R., & Demetrovics, Z. (2014). Exercise addiction – The emergence of a new disorder. *Australasian Epidemiologist*, 21(2), 36–40.
- Berczik, K., Szabo, A., Griffiths, M. D., Kurimay, T., Kun, B., Urbán, R., & Demetrovics, Z. (2012). Exercise addiction: Symptoms, diagnosis, epidemiology, and etiology. *Substance Use & Misuse*, 47(4), 403–417. doi: [10.3109/10826084.2011.639120](https://doi.org/10.3109/10826084.2011.639120)
- Blaydon, M. J., & Lindner, K. J. (2002). Eating disorders and exercise dependence in triathletes. *Eating Disorders*, 10(1), 49–60. doi: [10.1080/106402602753573559](https://doi.org/10.1080/106402602753573559)
- British Psychological Society. (2010). *Code of human research ethics*. Retrieved from http://www.bps.org.uk/sites/default/files/documents/code_of_human_research_ethics.pdf
- Brown, R. I. F. (1993). Some contributions of the study of gambling to the study of other addictions. In W. R. Eadington & J. A. Cornelius (Eds.), *Gambling behavior and problem gambling* (pp. 241–272). Reno, NV: University of Nevada.
- Chamarro, A., Penelo, E., Fornieles, A., Oberst, U., Vallerand, R. J., & Fernández-Castro, J. (2015). Psychometric properties of the Spanish version of the Passion Scale. *Psicothema*, 27(4), 402–409. doi: [10.7334/psicothema2015.80](https://doi.org/10.7334/psicothema2015.80)
- Chapman, C. L., & De Castro, J. M. (1990). Running addiction: Measurement and associated psychological characteristics. *Journal of Sports Medicine and Physical Fitness*, 30(3), 283–290.
- Clow, A., & Edmunds, S. (2013). *Physical activity and mental health*. Champaign, IL: Human Kinetics.
- Cook, B., Karr, T. M., Zunker, C., Mitchell, J. E., Thompson, R., Sherman, R., Erickson, A., Cao, L., & Crosby, R. D. (2015). The influence of exercise identity and social physique anxiety on exercise dependence. *Journal of Behavioral Addictions*, 4(3), 195–199. doi: [10.1556/2006.4.2015.020](https://doi.org/10.1556/2006.4.2015.020)
- Egorov, A., & Szabo, A. (2013). The exercise paradox: An interactional model for a clearer conceptualization of exercise addiction. *Journal of Behavioral Addictions*, 2(4), 199–208. doi: [10.1556/JBA.2.2013.4.2](https://doi.org/10.1556/JBA.2.2013.4.2)
- Farrell, J. M., & Thompson, T. (1998). Exercise commitment and addiction: A fine line. *Journal of Applied Recreation Research*, 23(1), 63–75.
- Griffiths, M. D. (1997). Exercise addiction: A case study. *Addiction Research*, 5(2), 161–168. doi: [10.3109/16066359709005257](https://doi.org/10.3109/16066359709005257)
- Griffiths, M. D., Urbán, R., Demetrovics, Z., Lichtenstein, M. B., de la Vega, R., Kun, B., Ruiz-Barquín, R., Youngman, J., & Szabo, A. (2015). A cross-cultural re-evaluation of the Exercise Addiction Inventory (EAI) in five countries. *Sports Medicine-Open*, 1(1), 5–7. doi: [10.1186/s40798-014-0005-5](https://doi.org/10.1186/s40798-014-0005-5)
- Lee, D., Sui, X., Ortega, F. B., Kim, Y. S., Church, T. S., Winett, R. A., Ekelund, U., Katzmarzyk, P. T., & Blair, S. N. (2011). Comparison of leisure-time physical activity on cardiorespiratory fitness as predictors of all-cause mortality in men and women. *British Journal of Sports Medicine*, 45(6), 504–510. doi: [10.1136/bjism.2009.066209](https://doi.org/10.1136/bjism.2009.066209)
- Marsh, H. W., Vallerand, R. J., Lafrenière, M.-A. K., Parker, P., Morin, A. J. S., Carbonneau, N., & Paquet, Y. (2013). Passion: Does one scale fit all? Construct validity of two-factor Passion Scale and psychometric invariance over different activities and languages. *Psychological Assessment*, 25(3), 796–809. doi: [10.1037/a0032573](https://doi.org/10.1037/a0032573)
- Monók, K., Berczik, K., Urbán, R., Szabo, A., Griffiths, M. D., Farkas, J., Magi, A., Eisinger, A., Kurimay, T., Kökönyei, G., Kun, B., Paksi, B., & Demetrovics, Z. (2012). Psychometric properties and concurrent validity of two exercise addiction measures: A population wide study. *Psychology of Sport and Exercise*, 13(6), 739–746. doi: [10.1016/j.psychsport.2012.06.003](https://doi.org/10.1016/j.psychsport.2012.06.003)
- Müller, A., Loeber, S., Söchtig, J., Te Wildt, B., & De Zwaan, M. (2015). Risk for exercise dependence, eating disorder pathology, alcohol use disorder and addictive behaviors among clients of fitness centers. *Journal of Behavioral Addictions*, 4(4), 273–280. doi: [10.1556/2006.4.2015.044](https://doi.org/10.1556/2006.4.2015.044)
- Ogden, J., Veale, D., & Summers, Z. (1997). The development and validation of the exercise dependence questionnaire. *Addiction Research*, 5(4), 343–355. doi: [10.3109/16066359709004348](https://doi.org/10.3109/16066359709004348)
- Paradis, K. F., Cooke, L. M., Martin, L. J., & Hall, C. R. (2013). Too much of a good thing? Examining the relationship between passion for exercise and exercise dependence.

- Psychology of Sport and Exercise*, 14(4), 493–500. doi: [10.1016/j.psychsport.2013.02.003](https://doi.org/10.1016/j.psychsport.2013.02.003)
- Parastatidou, I., Doganis, G., Theodorakis, Y., & Vlachopoulos, S. (2014). The mediating role of passion in the relationship of exercise motivational regulations with exercise dependence symptoms. *International Journal of Mental Health and Addiction*, 12(4), 406–419. doi: [10.1007/s11469-013-9466-x](https://doi.org/10.1007/s11469-013-9466-x)
- Pasman, L., & Thompson, J. K. (1988). Body image and eating disturbance in obligatory runners, obligatory weightlifters, and sedentary individuals. *International Journal of Eating Disorders*, 7(6), 759–769. doi: [10.1002/\(ISSN\)1098-108X](https://doi.org/10.1002/(ISSN)1098-108X)
- Pierce, E. F., McGowan, R. W., & Lynn, T. D. (1993). Exercise dependence in relation to competitive orientation of runners. *Journal of Sports Medicine and Physical Fitness*, 33(2), 189–193.
- Schipfer, M., & Stoll, O. (2015, July). Exercise-addiction/exercise-commitment-model (EACOM). Paper presented at the 14th European Congress of Sport Psychology, Bern, Switzerland.
- Sicilia, Á., Alias-García, A., Ferriz, R., & Moreno-Murcia, J. A. (2013). Spanish adaptation and validation of the Exercise Addiction Inventory (EAI). *Psicothema*, 25(3), 377–383. doi: [10.7334/psicothema2013.21](https://doi.org/10.7334/psicothema2013.21)
- Steffen, J. J., & Brehm, B. J. (1999). The dimensions of obligatory exercise. *Eating Disorders*, 7(3), 219–226. doi: [10.1080/10640269908249287](https://doi.org/10.1080/10640269908249287)
- Stenseng, F., Rise, J., & Kraft, P. (2011). The dark side of leisure: Obsessive passion and its covariates and outcomes. *Leisure Studies*, 30(1), 49–62. doi: [10.1080/02614361003716982](https://doi.org/10.1080/02614361003716982)
- Stevens, R. E., Loudon, D. L., Yow, D. A., Bowden, W. W., & Humphrey, J. H. (2013). *Stress in college athletics: Causes, consequences, coping*. London, UK: Routledge.
- Symons Downs, D., Hausenblas, H. A., & Nigg, C. R. (2004). Factorial validity and psychometric examination of the Exercise Dependence Scale-Revised. *Measurement in Physical Education and Exercise Science*, 8(4), 183–201. doi: [10.1207/s15327841mpee0804_1](https://doi.org/10.1207/s15327841mpee0804_1)
- Szabo, A. (2010). *Addiction to exercise: A symptom or a disorder?* New York, NY: Nova Science.
- Szabo, A., de la Vega, R., Ruiz-Barquín, R., & Rivera, O. (2013). Exercise addiction in Spanish athletes: Investigation of the roles of gender, social context and level of involvement. *Journal of Behavioral Addictions*, 2(4), 249–252. doi: [10.1556/JBA.2.2013.4.9](https://doi.org/10.1556/JBA.2.2013.4.9)
- Szabo, A., & Griffiths, M. D. (2007). Exercise addiction in British sport science students. *International Journal of Mental Health Addiction*, 5(1), 25–28. doi: [10.1007/s11469-006-9050-8](https://doi.org/10.1007/s11469-006-9050-8)
- Szabo, A., Griffiths, M. D., de la Vega, R., Mervó, B., & Demetrovics, Z. (2015). Methodological and conceptual limitations in exercise addiction research. *Yale Journal of Biology and Medicine*, 88, 303–308.
- Terry, A., Szabo, A., & Griffiths, M. (2004). The exercise addiction inventory: A new brief screening tool. *Addiction Research and Theory*, 12, 489–499. doi: [10.1080/16066350310001637363](https://doi.org/10.1080/16066350310001637363)
- Vallerand, R. J. (2008). On the psychology of passion: In search of what makes people's lives most worth living. *Canadian Psychology*, 49(1), 1–13. doi: [10.1037/0708-5591.49.1.1](https://doi.org/10.1037/0708-5591.49.1.1)
- Vallerand, R. J. (2010). On passion for life activities: The dualistic model of passion. In M. P. Zanna & J. M. Olson (Eds.), *Advances in experimental social psychology* (pp. 97–133). San Diego, CA: Academic Press.
- Vallerand, R. J., Blanchard, C., Mageau, G. A., Koestner, R., Ratelle, C., Leonard, M., Gagne, M., & Marsolais, J. (2003). Les passions de l'ame: On obsessive and harmonious passion. *Journal of Personality and Social Psychology*, 85(4), 756–767. doi: [10.1037/0022-3514.85.4.756](https://doi.org/10.1037/0022-3514.85.4.756)
- Vallerand, R. J., & Miquelon, P. (2007). Passion for sport in athletes. In D. Lavallee & S. Jowett (Eds.), *Social psychology in sport* (pp. 249–262). Champaign, IL: Human Kinetics.
- Vallerand, R. J., Rousseau, F. L., Grouzet, F. M. E., Dumais, A., Grenier, S., & Blanchard, C. M. (2006). Passion in sport: A look at determinants and affective experiences. *Journal of Sport and Exercise Psychology*, 28(4), 454–478.
- Vallerand, R. J., Salvy, S. J., Mageau, G. A., Elliot, A. J., Denis, P., Grouzet, F. M. E., & Blanchard, C. (2007). On the role of passion in performance. *Journal of Personality*, 75(3), 505–534. doi: [10.1111/jopy.2007.75.issue-3](https://doi.org/10.1111/jopy.2007.75.issue-3)
- Veale, D. M. W. (1987). Exercise dependence. *British Journal of Addiction*, 82(7), 735–740. doi: [10.1111/add.1987.82.issue-7](https://doi.org/10.1111/add.1987.82.issue-7)
- Weinstein, A., Maayan, G., & Weinstein, Y. (2015). A study on the relationship between compulsive exercise, depression and anxiety. *Journal of Behavioral Addictions*, 4(4), 315–318. doi: [10.1556/2006.4.2015.034](https://doi.org/10.1556/2006.4.2015.034)
- World Medical Association. (2008). *World Medical Association Declaration of Helsinki: Ethical principles for medical research involving human subjects*. Retrieved from <http://www.wma.net/en/30publications/10policies/b3/17c.pdf>
- Youngman, J. D. (2007). *Risk for exercise addiction: A comparison of triathletes training for sprint-, Olympic-, half-ironman-, and ironman-distance Triathlons* (Open access dissertations), Paper 12. Retrieved from http://scholarlyrepository.miami.edu/cgi/viewcontent.cgi?article=1011&context=oa_dissertations
- Youngman, J., & Simpson, D. (2014). Risk for exercise addiction: A comparison of triathletes training for sprint-, Olympic-, half-ironman-, and ironman-distance triathlons. *Journal of Clinical Sport Psychology*, 8(1), 19–37. doi: [10.1123/jcsp.2014-0010](https://doi.org/10.1123/jcsp.2014-0010)