



Dimensions of passion and their relationship to the risk of exercise addiction: Cultural and gender differences

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ABSTRACT

This study was performed to investigate further the two-dimensional aspect of passion and its relationship to the risk of exercise addiction (REA) in nine nations and to clarify the unresolved gender differences. The here reported results stem from the reanalysis of data gathered in three previous empirical studies. The analyses demonstrated that harmonious (HP) and obsessive (OP) passion are two independent, non-interacting predictors of the REA, the prevalence of which was 12.1 % in the current sample that included 1448 people (age = 30.49 ± SD = 11.17 years; 55 % men), who exercised *at least three hours per week*. Furthermore, the results show that HP and OP could co-exist as a single ‘total’ or ‘true’ passion within the individual or in high-low HP and OP proportions, supporting the proposal for one, two-dimensional passion. Indeed, most people at REA demonstrated both high HP and high OP. The weekly amount of exercise was weakly associated with the two dimensions of passion. Relatively specific cultural differences in the REA and OP, but not HP, have emerged. The results also demonstrate that when a minimal weekly volume of training (i.e., 3 h) is a criterion for participant recruitment, no gender differences occur in the REA.

1. Introduction

1.1. Passion and the dual model

Passion for sports and exercise mirrors affinity for and engagement in a beloved activity that one finds appealing and meaningful and dedicates attention, time, and energy to it (Vallerand et al., 2003). However, a popular *dual model* of passion includes two opposite forms of passion, harmonious and obsessive. According to Vallerand (2008), passion emerges when one likes or loves the activity, freely selects to participate, and identifies with it. Its harmonious dimension dominates when an adopted exercise is internalized into the self automatically while engaging in the activity with flexibility, which is positively related to positive affect but has an inverse association with negative affect (Stenseng et al., 2011; Vallerand et al., 2003; 2006; Vallerand &

Miquelon, 2007). In contrast, the obsessive dimension of passion surfaces when one internalizes the activity in a controlled way, without flexibility, the outcome of which is an obligatory behavior that is generally positively associated with negative affect (Stenseng et al., 2011; Vallerand et al., 2003; Vallerand & Miquelon, 2007). Moreover, an obsessively passionate individual attaches great importance to the adopted activity’s contingencies, such as self-esteem, self-efficacy, and escape from problems, making it difficult for one to stop the passionate activity (Vallerand, 2010).

Their inverse relationship with affect, and automatic and controlled internalization, suggest that harmonious passion (HP) and obsessive passion (OP) are opposites on a unidimensional spectrum. This conceptualization is supported by research evidence showing that HP and OP have different relationships with different factors (Vallerand, 2015). At the same time, they *jointly facilitate* deliberate practice and

Abbreviations: EAI, Exercise Addiction Inventory; HP, Harmonious Passion; OP, Obsessive Passion; PS, Passion Scale; REA, Risk of Exercise Addiction.

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performance, which are two critical factors in sports and exercise (Vallerand, 2015). Indeed, Szabo (2018) reported that an enthusiastic female bodybuilder exhibited high HP and OP and proposed a two-dimensional model for passion as based on his finding. This approach to passion is in concert with the two-dimensional model of affect, i.e., the independence of positive and negative affect (Watson et al., 1988). Accordingly, in accord with Lawrie’s (1980) view of passion, which simultaneously includes both joy and suffering, both HP and OP can be high (true passion), low, or imbalanced (high HP low OP or vice versa) within the person in the context of an activity, ideology, or hobby. Furthermore, the four ratios might be distinct, as described in the next paragraph. Therefore, the two forms of passion within the dual model are dynamic and interact continuously to yield a proportion of form and intensity in various situations.

1.2. Two-dimensional view of passion

According to Vallerand (2015), “although one’s passion can be predominantly harmonious or obsessive, just about anyone’s passion can be made harmonious or obsessive at a given point in time by pushing on the right (situational) button. In other words, social factors can temporarily induce one type of passion or the other” (page 116). This view is in accord with the dynamic nature of passion but suggests that OP and HP are mutually exclusive and driven by an antagonistic mechanism. When OP is high, HP is low. This perception contrasts the two-dimensional view (Szabo, 2018), in which the co-occurrence of high OP and high HP reflects intense passion, while low OP and low HP reflect no passion. Furthermore, the high OP paired with low HP reveals obligatory/pressured behavior. Last, high HP paired with low OP mirrors affinity, devotion/commitment to a beloved activity, ideology, or hobby (Fig. 1).

1.3. Passion and the risk of exercise addiction

Obsessive passion might lead to addiction, while HP usually does not (Wang & Chu, 2007). In the context of exercise behavior, several relatively recent studies investigated the relationship between the risk of exercise addiction (REA) and passion. Exercise addiction can be defined as individuals’ inability to control their exercise despite obstacles and adverse situations (Adams, 2009), which results in physical, psychological, and social harm (Juwono & Szabo, 2020). Some scholars suggest that OP is positively associated with the REA in endurance sports and recreational exercise (Schipfer & Stoll, 2015; Stenseng et al., 2011). Furthermore, athletes and exercisers experiencing high HP could augment the time spent on training without decreasing the time spent on essential life activities. In contrast, obsessively passionate exercisers tend to devote excessive time to their exercise while reducing the time spent on other important life activities (Paradis et al., 2013). Moreover, it appears that OP bears a stronger relationship with the REA than HP (Parastatidou et al., 2014). Later inquiries with athletes and recreational exercisers have further supported such relationships between OP, HP,

and the REA.

1.4. Is competition status associated with obsessive passion?

A study reported that highly competitive athletes who showed high OP had higher levels of well-being than athletes exhibiting high HP (Amiot et al., 2006). In contrast, low-competitive athletes with high OP showed lower well-being than athletes with high HP. Later, an inquiry testing professional dancers (Akehurst & Oliver, 2013) also showed that the REA had a stronger relationship with OP than HP. Another investigation by de la Vega et al. (2016) tested regional- and national-level competitive athletes in contrast to recreational exercisers and found that, in general, OP and commitment to sports emerged as predictors of the REA. Competitive athletes scored higher than recreational exercisers on all measures. Team sports athletes reported more HP, OP, and a commitment to their sports, but not different levels of REA, than athletes involved in individual sports.

1.5. Exercise frequency and form of exercise

A study of marathon runners (Lucidi et al., 2016) exposed a weak positive correlation between training frequency and OP and HP. Further, a survey of athletes involved in six different sports (Kovacsik et al., 2018b) showed that both OP and HP were predictors of the REA. However, when conducting separate tests for the team and individual sports athletes, the authors found that OP accounted for 25 % of the variance in the REA in the former group. However, it accounted for twice as much in individual sports athletes (50 %), while HP had a weak contribution in both cases. Furthermore, matching the result of de la Vega et al. (2016), athletes in team sports scored higher on HP than athletes involved in individual sports. Overall, the few investigations examining the relationship between the REA and passion in athletes provide consistent results, showing that OP is a predictor of the REA. In contrast, HP appears to be mostly unrelated to REA, as expected based on the two-dimensional model of passion (Szabo, 2018). However, this form of relationship also exists in recreational exercisers.

1.6. Passion and risk of addiction in recreational exercisers

Back (2015) tested recreational exercisers and found a positive correlation between the REA and OP. Another survey of 360 leisure exercisers (Kovacsik et al., 2018a) showed that OP was a predictor of the REA while HP had a negligible effect. Comparatively, an extensive study of 1255 fitness attendees (Lichtenstein et al., 2020) reported that OP predicted a significant proportion of variance (48 %) in the REA. Furthermore, a study of 485 university students showed a stronger correlation between the REA and OP than HP on two measures of the REA (Sicilia et al., 2018). In this work, both dimensions of passion, primarily OP, mediated the relationship between motivational regulations and the REA. In an earlier study performed by the same research team (Sicilia et al., 2017), a statistically significant correlation emerged between the REA and OP, while HP was unrelated to the REA. Still, both dimensions of passion mediated the relationship between goal contents that are inseparable from deliberate practice (Vallerand, 2015) and the REA. Based on the little research in the area, most studies with athletes and recreational exercisers support the relationship between the REA and OP. At the same time, HP appears weakly related to the REA.

1.7. Gender and passion

Independent of the REA, differences in passion between men and women exercisers are not apparent. For example, a study of Greek exercisers could not show a difference in passion between men and women (Parastatidou et al., 2012). Similarly, another cross-sectional investigation with Canadian university students participating in various individual exercises found no difference in passion between men and women

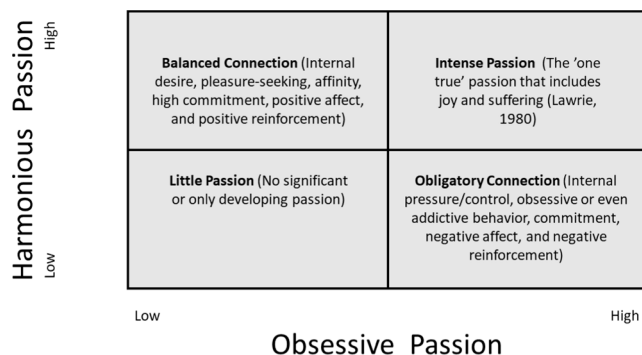


Fig. 1. The two-dimensional model of passion (based on Szabo, 2018).

(Paradis et al., 2013). Further, there was no gender difference in passion among Spanish exercisers (de La Vega et al., 2016). In contrast, a more recent study found that women exercising at lower intensities reported greater obsessive and harmonious passion than men exercising at similar exercise intensities (Kovacsik et al., 2018a).

1.8. Culture and passion

Cultural differences in passion were reported in a study comparing Hungarian and Spanish exercisers (Szabo et al., 2018). Hungarian women scored significantly higher on HP and OP than their Spanish counterparts, but Hungarian men only scored higher on OP when compared to Spanish men. These findings suggest that gender differences are likely to exist at a cultural level. Gender differences also emerged in a study of Danish fitness exercisers in OP but not HP, with men scoring higher than women (Lichtenstein et al., 2020). Overall, research on gender, physical activity, and passion is still meager, and their interaction and connection to REA have not been studied. Therefore, further research is needed to explore the gender-culture relationship to the passion for exercise.

1.9. Rationale

Based on the reanalyses of data from three previously published studies, the current work aimed to re-examine OP and HP in individuals exercising regularly for at least three hours per week because past studies in the area often did not set a minimum exercise volume. Further, based on study results with competitive athletes and in accord with a two-dimensional model for one (true) passion (Szabo, 2018), we presumed that more intense involvement in exercise is positively related to both OP and HP. Furthermore, based on past research, we also conjectured the REA would be positively associated with OP and HP in this combined cross-national sample. Additionally, in contrast to earlier works, we not only examined the predictive power of OP and HP on the REA but also tested *whether their interaction could be a predictor of the REA*. Finally, based on Szabo et al. (2018), we posited that gender and cultural differences might exist in the context of the REA-passion relationship.

1.10. Objectives of the study

The study's main purpose was to test the two-dimensional nature of passion in exercise behavior based on limited evidence and a recent proposal (Szabo, 2018; Szabo & Demetrovics, 2022). Further, the investigation aimed to determine the relationship between REA, OP, and HP in a large international sample exercising at least 180 min per week (Bull et al., 2020). This criterion is necessary because most previous works in this area have ignored the exercise volume. However, studying REA in only occasional exercisers cannot be rationalized (Huang et al., 2019; Pálfi et al., 2021). Furthermore, the 180-minute criterion slightly exceeds the lower limit of the 150–300 min moderate-intensity and the upper limit of the 75–150 min vigorous exercise recommended for adults by the World Health Organization (Bull et al., 2020). Additionally, another aim was to test whether the *interaction* of OP and HP could be a predictor of REA. Finally, we aimed to explore the cultural and gender associates of the REA-passion relationship and their interaction.

2. Methods

2.1. Dataset and participants

The current study is based on data gathered from three previously published studies (de la Vega et al., 2022; Kovacsik et al., 2018a,b). The raw data are posted at the Mendeley data repository (<https://doi.org/10.17632/6kd538g8nz.1>). Apart from one study (n = 190, Hungarian sample; Kovacsik et al., 2018b) that relied on volunteers

attending a university sports club, all data were collected online through study adverts on social media (Facebook, LinkedIn, or Twitter). The data analyzed in this work contain responses from participants who exercised at least three hours per week. Therefore, cases that did not meet this criterion were deleted from the three original datasets. The combined dataset comprised anonymous responses from 1448 (see also Table 4A) adults from nine nations, including Argentina, Chile, Costa Rica, Ecuador, Honduras, Hungary, Mexico, Spain, and Uruguay. The age of the respondents in the combined dataset was $M = 30.49$ years ($\pm SD = 11.17$), ranging from 18 to 78 years. Although the form and level of exercise are not available because they were not consistently recorded in the three previous studies, all participants exercised regularly, averaging 8.78 h ($\pm SD = 2.26$) of weekly exercise, ranging from 3 to 35 h. The self-identified gender distribution comprised 797 (55 %) men and 649 (45 %) women.

2.2. Instruments

The instruments used in the combined dataset were the Spanish (Sicilia et al., 2013) and Hungarian (Demetrovics & Kurimay, 2008) versions of the Exercise Addiction Inventory (EAI; Terry et al., 2004) and the Spanish (Chamarro et al., 2015) and Hungarian (Orosz et al., 2016) versions of the Passion Scale (PS; Marsh et al., 2013).

2.2.1. Exercise addiction inventory

The EAI is used for assessing the risk of exercise addiction (REA). This tool is based on the Components Model of Addictions (Griffiths, 2005). Sample items include: "If I have to miss an exercise session, I feel moody and irritable." or "Exercise is the most important thing in my life." This 6-item questionnaire is rated on a 5-point Likert scale ranging from "strongly disagree" to "strongly agree." A score of 24 or higher reflect high REA (Terry et al., 2004). The EAI comes with good psychometric properties. Its internal reliability (Cronbach α) ranges from 0.58 to 0.80; that of the Hungarian version is between 0.61 and 0.73 (Griffiths et al., 2015), while the value for the Spanish version is 0.70 (Sicilia et al., 2013).

2.2.2. Passion scale

The Passion Scale (PS) consists of 17 statements, six measuring HP, six assessing OP, and five gauging criterion passion. In the current data reexamination, only the two subscales assessing HP and OP were used. Both subscales are rated on a 7-point Likert scale, ranging from "not agree at all" to "very strongly agree." Sample items include: "This activity is in harmony with the other activities in my life." (HP) or "If I could, I would only do my activity." (OP). The word "activity" refers to the form(s) of exercise practiced by the participant. The internal reliability (Cronbach α) of the Spanish PS is 0.81 based on Chamarro et al.'s study (2015), while that of the Hungarian version ranges from 0.77 to 0.88 (Kovacsik et al., 2018a; Tóth-Király et al., 2017).

2.3. Statistical analysis

Statistical analyses were conducted with the 'Jeffreys's Amazing Statistics Program' (JASP), Version 0.16, software. In addition to calculating the descriptive statistics, pairwise associations were estimated with Pearson correlations (r). To test the interplay between OP and HP, variables were centered (i.e., the mean value was subtracted from the individual values), and an interaction term (OP X HP) was calculated by multiplying the centered values. A multiple linear regression analysis was performed to test variables' individual contributions to REA scores. In Step 1, control variables (age, gender, and exercise volume) were entered into the equation; OP, HP, and their interaction term were entered in Step 2. For group-level analysis, the REA scores were recoded into a binary variable (REA group = 1 if EAI < 24, REA group = 2 if EAI \geq 24). Group-level differences were estimated with the Mann-Whitney test, using rank-biserial correlation as an

estimator of effect size. Furthermore, a binary logistic regression analysis was used with the REA groups as the criterion variable. Finally, cultural and gender differences were examined with Chi-Square (χ^2) tests and Multivariate Analysis of Co-Variance (MANCOVA) using the Statistical Package for Social Sciences (SPSS, V. 28).

3. Results

The descriptive statistics are shown in Table 1. In the current sample, 12.1 % of respondents ($n = 175$) met Terry et al.'s (2004) criterion for high REA. Using the *below-* and *above-*median scores (HP = 34 and OP = 20), most exercisers could be placed in the high-OP/high-HP and low-OP/low-HP quadrants (Fig. 2A, B). Prevalence of high REA differed significantly between the four quadrants of the two-dimensional space ($\chi^2(3) = 136.55, p < .001$), and it was the highest in the high-OP/high-HP quadrant (Fig. 2A). The intersection of OP and HP (Fig. 2B) also illustrates that most respondents in the high-REA group were clustered within the high-OP/high-HP quadrant in the two-dimensional model.

The weekly hours of exercise were weakly associated with REA and both HP and OP ($r = 0.25, 0.22$ and 0.18 , respectively $p < .001$). The REA was moderately positively associated with both OP ($r = 0.48, p < .001$) and HP ($r = 0.40, p < .001$; see Fig. 3). When examining the correlations separately in the low- and high-REA groups, the respective values were (r) 0.36 ($p < .001$) and 0.21 ($p = .005$) for OP, and 0.35 ($p < .001$) and 0.16 ($p = .04$) for HP, respectively. There was also a moderate association between OP and HP in the full sample 0.42 ($p < .001$), which was lower when tested separately for low- and high-REA groups (0.35 and $0.32, p < .001$, respectively). We then used Fisher's r -to- z transformation to calculate a z value that can be applied to test the statistical significance of the difference between correlation coefficients. The results revealed that the r coefficients differed significantly. Both OP and HP were more strongly related to the REA scores in the low- than high-REA group ($z = 2.01, p = .02$ and $z = 2.51, p = .006$, respectively).

Step 1 of the multiple linear regression analysis explained 6.1 % of the total variance of REA score ($F(3,1442) = 31.30, p < .001$), but only the 'weekly hours of exercise' was a significant predictor. In Step 2, the explained variance was 29.8 % ($F(6,1439) = 101.76, p < .001$). Significant predictors of the REA scores, after controlling for age, gender, and weekly hours of exercise, were OP ($\beta = 0.370, p < .001$) and HP ($\beta = 0.225, p < .001$). The interaction between OP and HP did not predict REA (Table 2).

The Mann-Whitney test resulted in a statistically significant difference between the two REA groups with respect to both OP ($W = 45056.5, p < .001; r = -0.595$) and HP ($W = 63695.0, p < .001; r = -0.428$) (Fig. 4). Obsessive passion (OR = 1.159, $p < .001$) and HP (OR = 1.101, $p < .001$) were significant predictors of REA in binary logistic regression analysis after controlling for age, gender, and hours spent with exercise (Cox & Snell $R^2 = 0.149$) (Table 3). Again, the interaction between OP and HP was not a significant predictor of REA.

The test of gender difference in the prevalence of high REA showed no overall statistically significant difference ($\chi^2(1) = 0.78, p > .05$) between men and women. When these tests were repeated separately for nine nations, no statistically significant gender differences were observed again. Furthermore, the MANCOVA testing the cultural and gender differences, while controlling for age and hours of exercise per week (because they were weakly correlated with the dependent measures), showed no interaction between the latter and no gender main effect. However, a statistically significant multivariate 'culture' effect (Pillai's

Trace = 0.203, $F[24,4278] = 12.95, p < .001$, effect size, partial ETA squared [η_p^2] = 0.068) has emerged, which was statistically significant for all the three measures: REA ($F[8,1426] = 16.07, p < .001, \eta_p^2 = 0.083$); OP ($F[8,1426] = 6.68, p < .001, \eta_p^2 = 0.036$); HP ($F[8,1426] = 2.06, p = .04, \eta_p^2 = 0.011$). The Bonferroni-corrected post-hoc test showed that Hungarians scored lower on the REA than all other nations ($p < .001$) except Honduras ($p > .05$), which scored lower than Mexico ($p = .03$). In contrast, Hungarians scored higher on OP than Chile and Spain ($p = .002$ and $p < .001$, respectively), while the other nations did not differ. No statistically significant differences emerged in HP. These results are illustrated in Table 4.

4. Discussion

The current study's primary purpose was to examine the proposed two-dimensional model of passion in exercise behavior (Szabo, 2018; Szabo & Demetrovics, 2022) and to test the association between REA, OP, and HP in a large international sample exercising at least 3 h per week (Bull et al., 2020). A secondary aim was to test whether the interaction of OP and HP could predict the REA. Finally, the tertiary aim was to explore the cultural and gender associates of the REA-passion relationship and their interaction. The main findings lend support for the one passion and a two-dimensional model. The two dimensions of passion, OP and HP, predict the REA independently. Cultural differences appeared in the REA and OP but did not emerge in HP. Finally, no gender differences emerged in the current work.

4.1. Passion: dual or two-dimensional?

The dualistic model of passion (Vallerand et al., 2003) distinguishes between HP and OP with valid support. The two dimensions of passion are different in many aspects (Fig. 1). Our results suggest that HP and OP are not mutually exclusive despite their suggested opposite polarity, but rather they co-occur consistently in various proportions (Fig. 2A). Habitual exercisers can best be described with a two-dimensional model of passion (refer to Fig. 2A, B). The 'truly' passionate exercisers are likely to exhibit both high HP and high OP, supporting the one passion view (Lawrie, 1980). Still, in accord with Vallerand (2015), they freely chose their internalized activity, which they love and derive joy and pleasure from. However, they also exhibit high OP (see Fig. 2B), serving as internal mental pressure (self-control/self-discipline) to engage in the beloved activity. In the presence of high HP, this form of control is not exactly slavery, as Vallerand (2015) sees it, but the reflection of a holistic and symbiotic connection with the object of passion, in the spirit of "no-pain, no-gain". In this view, passion is one incorporating both pain and gain, as Lawrie (1980) conceptualized it earlier, reflecting an intense love for an ideology, event, hobby, or activity for which (in some extreme cases) is worth dying (Dean, 2004).

4.2. Passion and the risk of exercise addiction

The current results partially support Vallerand's analogy between obsessive passion and slavery because the REA was higher in the high-OP/low-HP group (12.4 %) than in the low-OP/high-HP group (4.9 %; Fig. 2A). Addiction can be conceptualized as slavery (Seidinger-Leibovitz et al., 2015), but our findings show that the prevalence of high REA was the highest in the high-OP/high-HP group (Fig. 2A, B). The REA group-based findings also showed that people in the high REA group exhibited higher OP and HP than those in the low REA group (Fig. 4A, B). Further, our findings that OP and HP independently predict REA without interacting with each other account for the greater prevalence of REA in high-OP/low-HP than in the high-HP/low-OP group. Therefore, while high OP, in accord with earlier research (Kovacsik et al., 2018a,b; Lichtenstein et al., 2020), is a strong predictor of the REA, it is still only a partial predictor. Based on the current findings, most high REA cases involve both high OP and high HP, supporting the two-dimensional view of

Table 1

The table presents the descriptive statistics of the assessed variables.

$n = 1448$	M	SD	minimum	maximum
Risk of exercise addiction (REA)	18.55	4.24	6	30
Obsessive passion (OP)	20.59	7.62	6	42
Harmonious passion (HP)	33.63	5.59	6	42

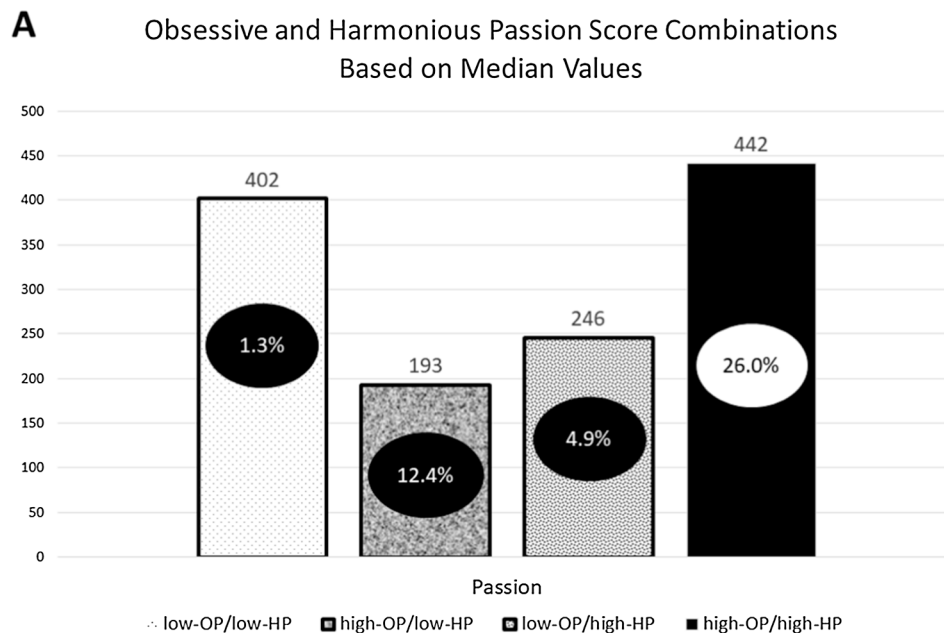


Fig. 2A. Prevalence of REA in the four quadrants of the two-dimensional model of passion.

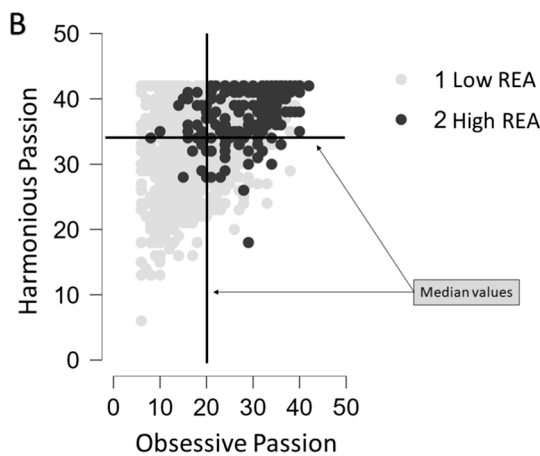


Fig. 2B. The intersection of OP and HP in low (grey) and high (black) REA groups on a median-split two-dimensional space (n = 1448). Note: The figure illustrates obsessive and harmonious passion proportions based on median values. The numbers represent frequencies. Cases with scores matching the median value in either measure were excluded (n = 163).

passion.

Although past research demonstrated that OP is a stronger predictor of the REA than HP (Kovacsik et al., 2018a,b; Lichtenstein et al., 2020; Sicilia et al., 2018), in the current study, when examining the relationship in the whole sample both dimensions of passion correlated moderately with and predicted the REA significantly (Fig. 3 and Table 2). Notably, these results emerged after controlling for age, gender, and the weekly hours (set to a minimum of three hours) of exercise in the regression analysis. It is also important to note that while these results are relevant to the whole sample, in the high-REA group, the relationship of the REA scores with OP and HP scores was significantly weaker than in the low-REA group. These findings suggest that other factors mediate the association between passion and the REA. Indeed, studies have shown that motivational factors play vital roles in this relationship. For example, in a recent longitudinal study (Kovacsik et al., 2020), most motivational factors predicted passion, while the REA was predicted by female gender, team sport participation, exercise

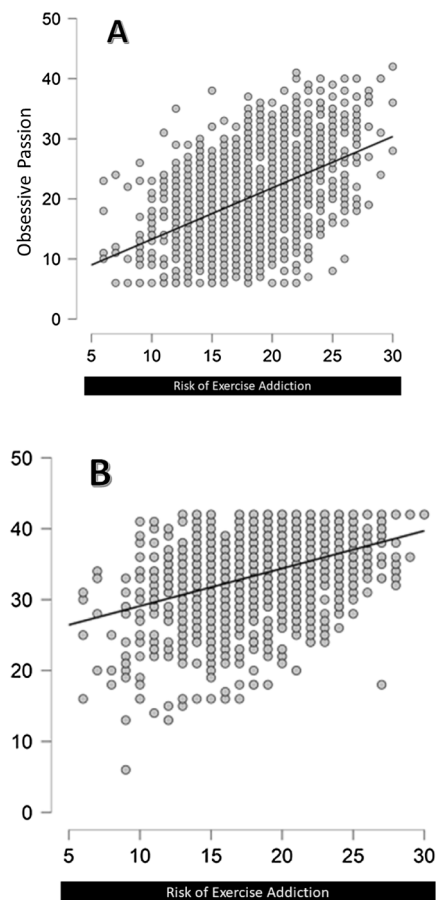


Fig. 3. Associations between the REA and OP (A) and the REA and HP (B).

intensity, and identified motivation. Earlier, Sicilia et al. (2018) also reported that both OP and HP mediated the relationship between motivational factors and the REA.

Table 2

The table presents the output of the multiple linear regression analyses with the risk of exercise addiction (REA) score as the criterion variable (n = 1448).

Measure	B ± SE	95 % CI lower	95 % CI upper	Standardized β	p
Step 1					
(Intercept)	16.737 ± 0.483	15.790	17.684		< 0.001
Age	-0.005 ± 0.010	-0.024	0.014	-0.014	0.594
Gender	0.156 ± 0.218	-0.272	0.583	0.018	0.475
Weekly hours of exercise	0.199 ± 0.021	0.159	0.240	0.247	< 0.001
Step 2					
(Intercept)	6.525 ± 0.731	5.091	7.960		< 0.001
Age	0.028 ± 0.009	0.011	0.045	0.073	0.001
Gender	0.213 ± 0.189	-0.158	0.584	0.025	0.260
Weekly hours of exercise	0.100 ± 0.019	0.063	0.136	0.124	< 0.001
Obsessive passion	0.206 ± 0.014	0.178	0.234	0.370	< 0.001
Harmonious passion	0.171 ± 0.020	0.131	0.211	0.225	< 0.001
Interaction between obsessive passion and harmonious passion	7.837e-4 ± 0.002	-0.003	0.005	0.009	0.717

Note: B = unstandardized coefficient; β = standardized beta; CI = Confidence Interval; n = number of observations; SE = Standard Error; p = probability.

4.3. Gender differences

In contrast to studies that reported gender differences in the REA and/or passion (Dumitru, Dumitru, & Maher, 2018; Kovacsik, Tóth-Király, Egorov, & Szabo, 2020; Lichtenstein, Jensen, & Szabo, 2020; Szabo et al., 2018; Szabo, de La Vega, Ruiz-Barquín, & Rivera, 2013), in the current analysis, gender was not a statistically significant predictor of the REA-passion relationship. Further, the prevalence of high REA was not different between women and men, and no gender differences emerged in REA, OP, and HP between men and women in nine nations (Table 4). One factor accounting for the difference from past research is that we only included data from participants who exercise regularly for at least three (3) hours per week.

Exercise volume is acknowledged as a possible mediator of gender effects in the REA because, in general, female exercisers workout in lesser volumes than men (Dumitru et al., 2018). In support of the role of exercise volume, our results are in line with a recent report, also limiting participation to those who exercised at least three times per week (Pálfi et al., 2021) and suggesting that men and women do not differ in the REA. Therefore, both theoretical and empirical rationale exists for studying gender differences in REA by considering exercise volume. However, it was also shown that while there is support for metric invariance of the assessment tool (EAI) across genders in several nations, the scalar invariance of the EAI could not be established (Griffiths et al., 2015). The authors suggested that men and women use starting points of the EAI items (intercepts) differently; therefore, the REA comparison should be performed as covariates. In contrast, the direct comparison of the means should be carried out cautiously.

4.4. Cultural differences

In the REA scores, Hungarians scored lower than all other nations except Honduras. In contrast, they scored higher on OP than Chile and Spain. Cultural differences in OP between Spaniards and Hungarians

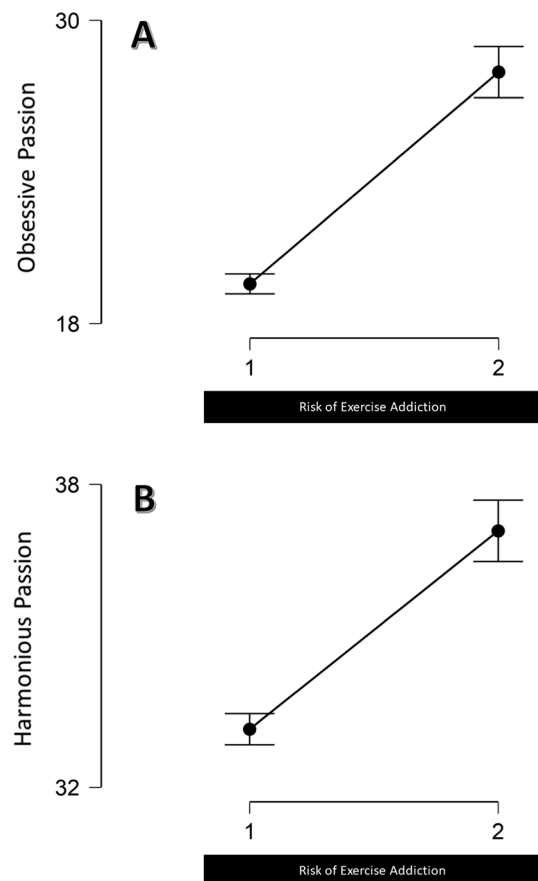


Fig. 4. Differences in OP (A) and HP (B) between low REA (1) and high REA (2) groups. Note: The error bars indicate the 95% confidence intervals).

Table 3

The table presents the output of the binary logistic regression analysis with the risk of exercise addiction (REA) scores as criterion variable (n = 1448).

Measure	Estimate ± SE	OR	95 % CI lower	95 % CI upper	p
(Intercept)	-4.071 ± 0.439	0.017	0.007	0.040	< 0.001
Age	0.019 ± 0.008	1.020	1.004	1.036	0.016
Gender	0.244 ± 0.181	1.277	0.895	1.820	0.177
Weekly hours of exercise	0.054 ± 0.015	1.056	1.025	1.088	< 0.001
Obsessive passion (centered)	0.147 ± 0.018	1.159	1.119	1.199	< 0.001
Harmonious passion (centered)	0.096 ± 0.027	1.101	1.045	1.160	< 0.001
Interaction between obsessive passion and harmonious passion	-0.003 ± 0.003	0.997	0.991	1.004	0.423

Note: CI = Confidence Interval; OR = Odds Ratio; n = number of observations; SE = Standard Error; p = probability.

were already reported (Szabo et al., 2018). In that study, similar to the current one, Hungarians reported higher OP than the Spanish participants. These findings might be associated with individualism and masculinity scores which are highest in Hungary compared to the Spanish nations studied here (Hofstede et al., 2010). Although all nations were Spanish speaking in contrast to Hungarians, they still represented different cultures from three continents. Similar findings were noted in a study using another tool of exercise addiction assessment, the Exercise Dependence Scale (Hausenblas & Downs, 2002), where participants

Table 4
Cultural (Table 4A) and gender (Table 4B) comparisons in REA, OP, and HP.

Measure	Country	Data origin	n	Mean	SD
Risk of Exercise Addiction (REA)	Argentina	Online	101	19.337	4.107
	Chile	Online	94	19.340	3.729
	Costa Rica	Online	86	19.326	3.727
	Ecuador	Online	87	19.793	3.939
	Honduras	Online	80	18.167	4.239 *b
	Hungary	Offline and online	430	16.560	4.167 *a
	Mexico	Online	92	20.641	3.415
	Spain	Online	406	19.079	4.048
	Uruguay	Online	92	20.130	4.196
	Obsessive Passion (OP)	Argentina	Online	101	20.168
Chile		Online	94	19.053	7.682
Costa Rica		Online	86	20.616	8.677
Ecuador		Online	87	22.080	8.420
Honduras		Online	80	20.150	8.602
Hungary		Offline and online	430	22.323	6.448 *c
Mexico		Online	92	21.022	7.921
Spain		Online	406	18.616	7.576
Uruguay		Online	92	21.576	8.333
Harmonious Passion (HP)		Argentina	Online	101	33.871
	Chile	Online	94	34.266	4.622
	Costa Rica	Online	86	34.953	5.921
	Ecuador	Online	87	34.621	5.783
	Honduras	Online	80	32.000	7.585
	Hungary	Offline and online	430	33.367	5.115
	Mexico	Online	92	34.587	4.999
	Spain	Online	406	33.079	5.800
	Uruguay	Online	92	34.261	5.959

Measures	Men (n = 797)		Women (n = 649)		p
	Mean	SD	Mean	SD	
Risk of exercise addiction (REA)	18.48	4.20	18.65	4.30	NS
Obsessive passion (OP)	20.78	7.44	20.36	7.83	NS
Harmonious passion (HP)	33.41	5.65	33.89	5.51	NS
The prevalence of high risk of exercise addiction (REA)			Count	Percent	
All nations: Frequencies of high REA ¹	91/797	11.42%	84/649	12.9%	NS

Note: n = number of observations; NS = Not Significant; p = probability; SD = Standard Deviation; ¹The Chi-Square tests performed separately for all nations were not significant either. Note: *a = lower than all nations except Honduras; *b = lower than Mexico; *c = higher than Chile and Spain.

from Norway scored lower than those from Belgium, Germany, Netherlands, and Turkey on most measures of the REA. There are several potential reasons for cross-cultural differences in EAI and passion, including mass attitude to exercise, collectivist versus individualist society (Curran et al., 2015; Hofstede et al., 2010), motivational features, and regulators across nations (Soos et al., 2019), and possibly other factors related to the means of assessment (Griffiths et al., 2015). Since this aspect of the current work was exploratory, further research is needed to identify the source of the cultural differences in this area.

4.5. Relevance of the risk of exercise addiction

Finally, the prevalence of the high REA was 12.1 % in the current sample, much higher than that reported in a Hungarian population-wide study (Mónok et al., 2012). Still, studies report prevalence rates ranging from 2.7 % (Zeulner et al., 2016) to as high as > 40 % (Smith et al., 2010). In addition, the minimum volume of exercise, set as at least three hours per week, could be associated with the prevalence rate found here because there was a weak correlation between the weekly hours of exercise and the REA. Finally, the high REA scores do not imply dysfunction (Szabo, 2018), or else > 25 % of the high-OP/high-HP group

(refer to Fig. 2A) in the current analysis could be considered dysfunctional. Indeed, while supporting the two-dimensional one-passion model, the present study also shows that about a quarter of ‘truly’ passionate individuals (high-OP/high-HP) exhibit symptoms of addiction that may reflect a ‘risk’ level. Accordingly, the prevalence of the REA is different in the four quadrants of the two-dimensional model of passion, being the lowest in the low-OP/low-HP quadrant and the highest in the high-OP/high-HP quadrant. Studies on motivational features of those in the latter quadrant may shed light on the difference between ‘truly’ passionate exercisers being at REA in contrast to the majority who are not at risk.

4.6. Limitations

The current study’s limitations include its cross-sectional design and the convenience sample of eight Spanish and two Hungarian samples, one being recruited from a university sports club in contrast to the rest recruited and tested online. Another possible limitation is that possibly those at REA exercise significantly more than three hours per week, which was the lower limit for inclusion in the current study. Indeed future research should examine the case studies with clinical consequences and estimate the minimum exercise volume for studying REA from those cases. Still, we should highlight that athletes train in massive volumes without any psychiatric maladjustment. Furthermore, the current study did not account for the type of sport, which is another limitation that should be addressed in future works. Finally, from a cross-cultural perspective, future research should look at the differences between individualist and collectivist societies in the studied measures and identify the reason behind them.

5. Conclusion

The present results support a two-dimensional model of passion in which one ‘true’ passion is characterized by both high OP and high HP. The prevalence of the REA is the highest (26 %) among these ‘truly’ passionate individuals. This segment of intensely passionate exercisers exhibits a passion that involves both pleasure and pain, mirroring the motto of “no pain, no gain” endorsed by many coaches and fitness institutions. This study suggests that OP and HP are neither opposites nor antagonistic to each other but co-exist in various proportions depending on the person’s relationship with the object of passion. The findings also show that OP and HP have a weaker connection to the high than low-REA scores, but they both predict REA independently in the whole sample. While no gender differences emerged, cultural differences surfaced in the REA and OP, but not HP. The practical implications are that the interpretation of passion and REA across nations should be cautious. Further, the REA is most prevalent among exercisers showing high OP and HP. Still, a remaining question is how many of those at REA in this group might have a clinical dysfunction? The answer to this question will emerge from qualitative studies or clinical investigations using in-depth interviews because the questionnaire data are unsuitable for diagnosis.

Declaration of Competing Interest

Given their role as an Editorial Board Member, Demetrovics Z. had no involvement in the peer-review of this article and had no access to information regarding its peer-review. All other authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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