Journal of Sports Sciences

ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/rjsp20

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To cite this article: F. Rodrigues & D. Teixeira (2023) The relationships between passions, intentions, habit and exercise frequency, Journal of Sports Sciences, 41:8, 803-811, DOI: 10.1080/02640414.2023.2240622

To link to this article: https://doi.org/10.1080/02640414.2023.2240622

JOURNAL OF SPORTS SCIENCES
2023, VOL. 41, NO. 8, 803–811
https://doi.org/10.1080/02640414.2023.2240622

Routledge
Taylor & Francis Group

SPORT AND EXERCISE PSYCHOLOGY

The relationships between passions, intentions, habit and exercise frequency

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ABSTRACT

There were three purposes to this research. First, we sought to test the differential role of harmonious and obsessive passion in predicting intention and habit for exercise. The second goal of this research was to test the associations between intention, habit and exercise frequency. Last, the third goal was to assess the mediation role of intention and habit in the relationship between both forms of passion and exercise frequency. The sample consisted of 284 participants (140 males, 144 females) aged 18–60 years old (M age = 29.81, SD = 9.16). Regression paths of the structural model indicated significant associations: a) harmonious passion was significantly associated with intentions and habit; b) obsessive passion was significantly associated with habit; c) intentions and habit were significantly associated with exercise frequency. The mediation model variance explained was 17% ($p < .001$). The total effect via harmonious and obsessive passion was β = .57 (IC95% = .42, .73) and the total indirect effect was β = .11 (IC95% = .02, .24). Having harmonious passion for a fitness activity appears to have the potential to increase regular physical activity among exercisers. Individuals who recognize the significance of physical exercise and participate in activities they enjoy the most can affirm the positive effects on their health from being active.

ARTICLE HISTORY
Received 9 December 2022
Accepted 18 July 2023

KEYWORDS
harmonious; obsessive; intention; habit; motivation

Introduction

While motivational processes have been described in the literature as sufficient determinants of exercise adherence (Rodrigues et al., 2018), variance on the actual behaviour is low (Rhodes et al., 2022). Dual-process theories have been developed within the psychology literature to describe how individuals reach decisions, based on reflective and automatic processes. Grounded on dual-process theory assumptions applied to exercise (see Brand & Ekkekakis, 2018; Stevens et al., 2020; Strobach et al., 2020) we propose to explore how intentions and habit may help explain exercise behaviour. The incorporation of the suggested variables in dual-process models for exercise initiation and adherence has resulted in the development of various theoretical frameworks aimed at substantiating this objective, as outlined by Strobach et al. (2020). According to existing literature, intentions towards exercising are crucial in the early stages of adopting this behaviour but are less important compared to habit when the behaviour has been acted upon on the long term (Bruijn & Rhodes, 2011; Bruijn et al., 2012).

Habit–intention interaction on exercise

Dual-process theories have been described as providing evidence of how thoughts and actions can arise as a result of two processes. On one hand, there is a reflective and conscious system in which the person explicitly expresses deliberate actions, and on the other, the automatic and non-conscious system describes how implicit processing leads the person to engage in a given behaviour. Intention is a cognitive process that could belong to the reflective system as it involves conscious decision-making, planning and goal-setting. It is the explicit representation of an individual's willingness and readiness to perform a particular behaviour. Within the dual-process theory assumptions, intention would interact with the automatic system, which governs habitual responses, to influence behaviour. The automatic system is driven by and environmental cues and triggers that prompt individuals to engage in particular behaviours without conscious awareness or deliberation. Habit formation could be included as part of the automatic system, which creates automatic responses to environmental cues. While intentions are the transformation of a mental image to a behavioural process, habit is the automatic process of routine behaviour which is based on triggered exposure to the same environmental cues (Gardner et al., 2020).

Strobach et al. (2020) suggest that during the adoption phase, intentions play a more significant role in initiating a behaviour, whereas in the maintenance phase, habits become crucial for sustaining the behaviour over time. As exercise is repeated in a stable and consistent environment, the more implicit processes should guide this behaviour. Nevertheless, the degree to which behaviour becomes automatic also relies on the intricacy of the behaviour, and since exercising is considered a multifaceted activity, its automaticity may vary (Hagger, 2019). The explicit processes involved in exercise, such as planning sessions, packing gym bags and following training programs, suggest that intentions are always present. For long-time exercisers, habit can take over when intentions are low, and self-regulatory processes can activate intentions to be physically active when automatic processing is absent,

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according to Strobach et al. (2020). This suggests that experienced exercisers can exhibit individual differences, with some relying more on deliberate intention to exercise, while others are more automatically engaged in physical activity.

Motivation in the form of passion

Passion is conceptualized as a strong tendency towards an activity that people like, spend time and energy, and engage in the long term (R. J. Vallerand et al., 2003). Passion is not an emotion or affective state, but rather a motivational force that drives people to engage in a certain behaviour. This concept is the foundation of the dualistic model of passion (R. J. Vallerand et al., 2003) which distinguishes two passions: harmonious passion and obsessive passion. Many empirical studies on the nature, predictors, correlates and outcomes of the two passions have been developed in the past and meta-analytically reviewed (Curran et al., 2015). In addition, psychometric testing has provided evidence of the distinctiveness of the two forms of passion (Marsh et al., 2013). In the harmonious side of passion, the person identifies the importance of the activity and integrates it into the authentic self because it is highly valued, and the person chooses to invest time without putting into risk other activities. The behaviour is internalized and assumes an autonomous-oriented perspective in which it is harmoniously accepted by the person. In the obsessive side of passion, the person feels compelled to engage in the behaviour due to internal contingencies. The sense of controlled internalization of the activity causes conflict with other activities although the person likes the activity.

While both passions seem to be opposite, theoretically, and empirically they are not (R. J. Vallerand, 2015). There is a tendency in which harmonious passion seems to be correlated to adaptive outcomes such as positive emotions, life satisfaction and autonomous motivation, and obsessive passion tends to be associated with negative emotions, ill-being and controlled motivation (Curran et al., 2015). However, both are facets of internalization of the behaviour and a sense of liking. Hence, these passions tend also to be positively correlated with each other and with other outcomes (Curran et al., 2015). Regarding the exercise context, there are some inconsistencies. A couple of studies (Paradis et al., 2013; Parastatidou et al., 2014) showed that both passions were positively correlated with intentions towards exercising. Contrary, Rodrigues et al. (2022) found intentions only to be associated with harmonious passion. Kovacsik et al. (2019) found that both passions were positively associated with exercise intensity. Bum (2019) showed that harmonious passion was positively correlated with positive emotions and exercise adherence, while obsessive passion was not associated with positive emotions and was negatively associated with exercise adherence. Kovacsik et al. (2021) in a study conducted over a 12-week course, found that while both passions correlated with the risk of exercise addiction, obsessive passion tended to increase over time according to increased exercise addiction, but harmonious passion did not. Berg et al. (2020) describe significant associations between positive emotions and both passions.

Unlike autonomous and controlled motivation, both passions can operate in the direction of intentions and consequently, regular exercise. Highly harmoniously passionate individuals identify exercise as important and involve conscious value in such a way that exercise is accepted as personally important (Parastatidou et al., 2014). Highly obsessively passionate persons are internally controlled by their exercise behaviour and are unable to cease the activity (Kovacsik et al., 2021). Passions may regulate intentions in the adoption phase, providing an initial motivational force that guides behaviour and could eventually lead to habit formation to sustain the behaviour, as suggested by Dunton et al. (2022) and Strobach et al. (2020). These theoretical assumptions suggest that the interaction between intention and habit is yet to be explored in relation to different types of passion, such as harmonious and obsessive passion, which may be significantly associated with both intention and habit. Overall, motivational models of exercise may overemphasize intentions and neglect the role of habit formation in the exercise context.

Current research

The dualistic model of passion provides an understanding, although limited, of how an individual might be motivated for exercise. Building on past research on passion and reflective factors, Kovacsik et al. (2021, 2019) have shown that intentions play a pivotal role in the understanding of the relationship between passion and exercise frequency in individuals. These and other research efforts on these topics have focused on outcomes that can be expressed as explicit processes of decision and motivation (Strobach et al., 2020). However, research is needed on the automatic side, and for this study in particular, how harmonious, and obsessive passion can contribute to the structure of exercise habits. The findings presented above provide strong support for the tenability of the exploration of the dualistic model of passion and dual-process theory assumptions in exercise practice and contexts.

In the past, emphasis was made on trying to understand the stable disposition for exercise and promoting this behaviour in the long term (Ekkekakis & Zenko, 2016). Exercise has typically been studied within the scope of humanistic and socioecological models rooted in reflective-based perspectives which likely exaggerate the rational willingness to make decisions in order to achieve desired goals (Brand & Ekkekakis, 2018). They tend to underplay or ignore non-reflective factors, which clearly articulate the role of habits in instigating various health behaviours, such as exercise (Gardner et al., 2020; Strobach et al., 2020). Hence, the intention-habit-behaviour relationship in the exercise context is more complex than theoretically proposed.

Exploring the factors that influence individuals to engage in physical activity has practical implications in the field of exercise science, particularly when using dual-process model assumptions. Unfortunately, passion has been overlooked in the exercise context, considered irrelevant or limited in its interpretation for understanding the motivational determinant of exercise, as noted by Rodrigues et al. (2022). While most studies have focused on the negative side of passion as a contributor to addiction, not all dependence is detrimental. For example, in a longitudinal study, Berg et al. (2020) found that increased obsessive passion was associated with positive emotions. Similarly, Parastatidou et al. (2014) reported that

highly obsessive exercisers had higher intentions to continue. Considering the potential interaction between intention and habit, it is reasonable to view passion as an indicator that can enhance the predictability to explain exercise frequency.

In light of the above, there were three purposes for this research. First, we sought to test the differential role of harmonious passion and obsessive passion in predicting intention and habit for exercise. The second goal of this research was to test the associations between intention and habit and exercise frequency. Last, the third goal was to assess the mediation role of intention and habit in the relationship between passions and exercise frequency.

Since passion drives behaviour, we expected obsessive passion and harmonious passion to be positively associated with intention and habit, being harmonious passion the strongest determinant. This is because harmonious passion is associated with more flexible and integrated behaviour, whereas obsessive passion may be associated with a more rigid and inflexible behaviour (R. J. Vallerand et al., 2003). Thus, individuals who have high levels of harmonious passion for exercise may be more likely to form habits and maintain their exercise behaviour over time. In addition, both obsessive and harmonious passions have been found to be positively associated with exercise intention and habit formation (e.g., Rodrigues et al., 2022). In turn, we expected both habit and intentions to be associated with the frequency of regular exercisers. Based on the dual-process model assumptions and the transtheoretical model, we can expect both habit and intentions to be positively associated with the frequency of regular exercisers. Intention plays a crucial role in initiating and sustaining physical activity behaviour, as it represents a conscious decision to engage in exercise. Additionally, habit, which develops through repeated behaviour, can also play an important role in maintaining regular exercise behaviour. Therefore, we can expect that individuals with strong intentions and strong exercise habits are more likely to engage in physical activity frequently.

Methods

Participants

The sample consisted of 284 Portuguese exercisers (140 males, 144 females) aged 18–60 years old (M age = 29.81, SD = 9.16). Participants all reported that they were exercising per week on average 3.79 days (SD = 1.49) and the training periods lasted between 30 and 180 minutes ($M = 65.84$; SD = 22.84). Participants were more actively engaged in fitness group classes ($n = 105$) or resistance training ($n = 179$). Concerning exercise intensity, participants self-reported their training to be frequently light ($n = 25$), moderate ($n = 168$) or vigorous ($n = 91$). To be eligible for this study, we established certain criteria that participants had to meet, which included i) being 18 years of age or older, chosen criterion to ensure that all participants were legally able to consent to participating in the study; ii) giving informed consent to participate in the study, included criterion to ensure that all participants fully understood the purpose and requirements of the study and gave their explicit consent to participate; and iii) engaging in regular exercise for more than 6 months. The decision to include the third criterion was guided by the transtheoretical model (Prochaska et al., 1992), which suggests that individuals who have been exercising for over 6 months are less likely to discontinue the behaviour (Buckworth et al., 2013). All the participants who did not fulfil these criteria were excluded from participation in this study.

Procedures

Data collection procedures were conducted in accordance with the Helsinki Declaration and its later amendments. The study design was presented to the Ethics Committee Board (reference number omitted for review purposes), and the committee found it to be absent of potentially problematic issues and therefore expected from a detailed review. The study was conducted as a cross-sectional online survey between September 2021 and April 2022. In order to recruit participants for the study, the researchers contacted several fitness centres that had contacts from several potential participants. These centres included mailing lists and social groups that were relevant to the research. The researchers then asked these fitness centres to share the link to the questionnaire with their members or followers. This approach allowed for a larger pool of potential participants to be reached and for a diverse range of individuals to be included in the study. The survey provider used in this study was Google Forms. Participation in the survey was voluntary and anonymous, and potential participants were required to provide informed consent by checking a box before completing the online questionnaire.

Instruments

We used the Passion Scale Portuguese version (Rodrigues et al., 2022) to measure harmonious passion and obsessive passion. Participants were asked to think about a fitness activity (e.g., fitness group classes) they liked the most when exercising. Then, a 7-point scale anchored between 1 (do not agree at all) to 7 (completely agree) was used to respond to 12 items (e.g., "This activity allows me to live a variety of experiences" for harmonious passion; e.g., "I cannot live without it" for obsessive passion). Previous studies have demonstrated satisfactory levels of validity and reliability for this instrument (Cid et al., 2019; Rodrigues et al., 2022).

We used the Self-Report Behavioral Automaticity Index Portuguese version (Rodrigues et al., 2021) to measure the degree of exercise habit. A 7-point scale ranging from 1 (strongly disagree) to 7 (strongly agree) was used to respond to four items (e.g., "Exercising is something I do automatically"). The scale utilized in this study has exhibited favourable levels of validity and reliability in previous research (Faria et al., 2022; Marques et al., 2022).

Intention was assessed using a Portuguese validated scale (Rodrigues et al., 2020) grounded on the theory of planned behaviour to measure intention towards exercise in the future. Three items to evaluate intention to continue exercising (e.g., "I will continue to exercise in the next 6 months as I currently do") were responded using a 7-point scale anchored from 1 (absolutely not) to 7 (absolutely yes). The instrument employed in

previous studies has consistently exhibited acceptable scores of validity and reliability (Rodrigues et al., 2019; Teixeira et al., 2022)

We created a simple questionnaire based on the FITT principles (ACSM, 2021) to measure Frequency, Intensity, Time and Type. Responses for frequency per week and time are provided on a continuous measure, while intensity on a categorical (i.e., light, moderate and vigorous-intensity training). We provided examples for each exercise intensity so that participants could provide answers accordingly to their perceptions. For measuring the type of physical activity, we considered the response provided in the passion scale. The questionnaire was created based on the works of several researchers showing the validity of single-items on measuring exercise-related indicators (Craig et al., 2003; Milton et al., 2011).

Statistical analysis

The researchers calculated the a priori sample size for structural equation modelling using the Soper calculator (2022), taking into account the following input parameters: an anticipated effect size of 0.3 (medium effect), a desired statistical power level of 0.95, four latent variables, 20 observed variables and a probability level of 0.05. The calculations yielded a minimum sample size of 207 to detect the anticipated effect and a minimum sample size of 100 for the model structure.

We used the expectation-maximization approach to handle possible missing completely at random data. Means and standard deviations are reported for total sample, as well as for male and female exercisers, and according to exercise guidelines groups. In order to determine the statistical significance of deviation from a normal distribution, the skewness and kurtosis estimates were divided by their corresponding standard error to get the z score. Z-score below |1.96| suggests normal distribution. The independent t-test to examine sex differences was performed. The significance level was set at $p \leq .05$ to reject the null hypothesis. Effect size based on Cohen's *d* was calculated between sex and thresholds were set at 0.2, 0.5 and 0.8 for small, medium or large effects (Cohen, 1988).

Alphas for internal consistency were calculated considering as acceptable coefficients ≥.70 (Cronbach, 1951). Bivariate correlations were conducted considering variables of interest. Partial correlations were also performed controlling for sex. Significance was set at $p < .05$. These analyses were conducted in IBM SPSS Statistics Version 25.0 (IBM Corp., Armonk, NY).

Before performing structural equation modelling analysis, tolerance test and Variance Inflation Factor (VIF) scores were analysed to test for possible multicollinearity issues (Cohen, 1988). The tolerance of independent variables should be greater than 0.1 for there to be no multicollinearity. The Durbin–Watson statistic test for autocorrelation was also calculated, assuming an acceptable range of 1.50–2.50 (Durbin & Watson, 1951). Structural equation modelling analysis was performed to test proposed associations considering the maximum likelihood robust estimator, since it is robust against non-normal data (Muthén & Muthén, 2017). Analysis of model fit was verified through the conventional goodness-of-fit indexes, namely, comparative fit index (CFI); Tucker-Lewis index (TLI); standardized root mean square residual and root mean square error of approximation (RMSEA) and its respective confidence interval (CI) at 90%. The following cut-off values were considered (Hair et al., 2019), namely, CFI and TLI ≥ .90 and SRMR and RMSEA ≤ .08. Qui-square test and respective degrees of freedom will be reported for transparency but not analysed as it is significantly influenced by model complexity and sample size (Hair et al., 2019). Direct and indirect coefficients between variables were assessed considering standardized beta coefficients. Significance was set at CI 95% (Williams & MacKinnon, 2008). These analyses were conducted in MPLUS version 8.0 (Muthén & Muthén, Los Angeles, CA).

Mediation analysis was performed to estimate the effects within the hypothesized model. Predictors, mediators and outcome variables were standardized before testing double-parallel mediation analysis (Hayes, 2018; Preacher & Hayes, 2008). A sequential mediation model was tested (model 4; double-parallel mediation with two independent variables) in which, harmonious and obsessive passion as predictor variables, exercise frequency as an outcome variable, and intention and habit were imputed in the mediation model for analysis. Bootstrap with 5000 samples was employed, and the confidence interval at 95% was considered for significance (Williams & MacKinnon, 2008). Bootstrapping procedures (5000 samples) allow for resampling that is recommended for mediation analysis purposes, particularly the ones based on ordinary least squares calculations (Hayes, 2018). These analyses were conducted in IBM SPSS PROCESS version 3.3 (Hayes, 2018).

Results

Looking at samples, harmonious passion displayed a greater mean compared to obsessive passion. Similarly, intention displayed a greater mean compared to habit (Table 1). Data displayed normal distribution since skewness and kurtosis scores were within the cut-off. Significant differences between sex were found in all variables under analysis. Effect sizes were classified as medium ranging from .21 to .49.

Internal consistency and correlation coefficients are described in Table 3. All latent variables displayed good

Table 1. Descriptive statistics and mean comparisons according to sex.

	Total sample				Male		Female				
Variables	Mean	SD	S	K	Mean	SD	Mean	SD	t	p	d
Harmonious Passion	5.44	1.09	−.78	.93	5.61	.96	5.26	1.18	−2.70	<.05	.32
Obsessive Passion	3.21	1.29	.29	−.77	3.43	1.28	2.99	1.27	−2.90	<.05	.35
Intention	4.28	.84	−1.35	1.78	4.37	.85	4.19	.83	−1.85	<.05	.21
Habit	4.60	1.34	.04	−.75	4.92	1.31	4.28	1.30	−4.09	<.001	.49
Exercise Frequency	3.80	1.49	.16	−.77	4.11	1.51	3.48	1.42	−3.64	<.001	.43

Notes: *M* = mean; SD = standard deviation; S = skewness; K = kurtosis; *t* = independent sample t-test; *p* = significance level; d = effect size.

Table 2. Internal consistency coefficients, bivariate and partial correlations.

Variables	α	1	2	3	4	5
1. Harmonious Passion	.81	1	.23**	.37**	.46**	.39**
2. Obsessive Passion	.86	.26**	1	.02	.20**	.05
3. Intention	.95	.38**	.03	1	.39**	.31**
4. Habit	.89	.48**	.23**	.40**	1	.21**
5. Exercise Frequency	-	.41**	.09	.32**	25**	1

Notes: Internal consistency coefficient; below diagonal line = bivariate correlations; above diagonal line = partial correlations controlling for sex; *$p < .01$.

Table 3. Goodness-of-fit indexes.

Models	χ^2	df	CFI	TLI	SRMR	RMSEA	CI90%
Passion Scale	225.112	53	.947	.909	.074	.077	.073–.082
Self-Report Behavioral Automaticity Index	69.842	2	.932	.915	.045	.066	.059–.077
Intention Scale	23.109	0	1.000	.000	.000	.000	.000–.000
Measurement Model	535.574	161	.927	.917	.056	.051	.041–.060
Structural Model	554.276	164	.920	.908	.061	.059	.045–.067

Notes: χ^2 = Chi-square; df = degrees of freedom; CFI = Comparative Fit Index; TLI= Tucker Lewis Index; SRMR= standardized root mean square residual; RMSEA= root mean square error of approximation; CI90% = confidence interval at 90% for RMSEA.

reliability scores ranging from .81 to .95. Bivariate correlations displayed significant associations, except obsessive passion with intentions and exercise frequency (see Table 2). Consistent findings were observed in the partial correlations, even after controlling for sex. The subsamples exhibited comparable patterns of associations among the variables under investigation when compared to the entire sample. Based on these results, we proceeded with the structural equation model analysis, considering the entire sample, to examine the relationships among the variables.

The tolerance values ranged from 0.75 to 0.91. In addition, the VIF values ranged from 1.21 to 1.33. Therefore, there were no multicollinearity issues in this analysis. The Durbin–Watson test indicated a score of 2.09, indicating score close to zero autocorrelation. For validity, a confirmatory factor analysis model was tested for each scale. The passion scale, the self-report behavioural automaticity index, and the intention scale provided each acceptable model fit to the data (see Table 3). Next, we tested a measurement model of the hypothesized associations. The model showed adequate fit as well as the following structural model. Regression paths indicated significant associations: a) harmonious passion was positively and significantly associated with intentions and habit; b) obsessive passion was positively and significantly associated with habit; c) intentions and habit were positively and significantly associated with exercise frequency. Indirect regression paths indicated also positive and significant correlations between harmonious passion and exercise, via intention and habit. Looking at explained variance, intentions to continue exercising and habit explained 18% on exercise (see Table 4).

To examine construct interactions in more detail, mediation analysis was conducted. The model variance explained was 17% ($p < .001$). The total effect via harmonious passion and via obsessive passion was β = .57 (IC95% = .42, .73). According to the results, there was a total indirect effect of β = .11 (IC95% = .02, .24), suggesting that intention and habit play a role in associating passions with exercise behaviour (refer to Figure 1).

Discussion

The present investigation aimed to examine the distinct contributions of harmonious passion and obsessive passion in predicting exercise intentions and habit, as well as exercise frequency. A secondary objective was to evaluate the associations among exercise intentions, habit and frequency. Finally, an additional aim was to explore the mediating role of exercise intentions and habit in the link between passions and exercise frequency.

First, as hypothesized, the results demonstrated that both forms of passion were positively associated with habit and intentions towards exercise. Specifically, we found that harmonious passion was positively associated with intention towards exercise, conceptualized for this study as assumptions of reflective processes. We suggest that this occurs because exercisers with integrative self-processes fully partake in the passionate activity with an openness that is conducive to internalization of the activity (R. Vallerand & Verner-Filion, 2020). This passionate attachment tends to lead to a highly valued activity, which may explain the reflective effort to be physically active. Thus,

Table 4. Structural equation model analysis.

	Direct			Indirect	
Regression paths	β	CI95%	Regression paths	β	CI95%
Harmonious Passion → Intention	.46*	.31, .60	Mediator: Intention		
Harmonious Passion → Habit	.61*	.51, .71	Harmonious Passion → Exercise	.12*	.04, .21
Obsessive Passion → Intention	.09	−.02, .30	Obsessive Passion → Exercise	−.03	−.07, .01
Obsessive Passion → Habit	.17*	.12, .31	Mediator: Habit		
Intention → Exercise	.27*	.14, .40	Harmonious Passion → Exercise	.09*	.04, .17
Habit → Exercise	.15*	.01, .28	Obsessive Passion → Exercise	.01	−.02, .02

Notes: β = standardized coefficients; CI95% = confidence interval at 95%; * p = level of significance at < .05.

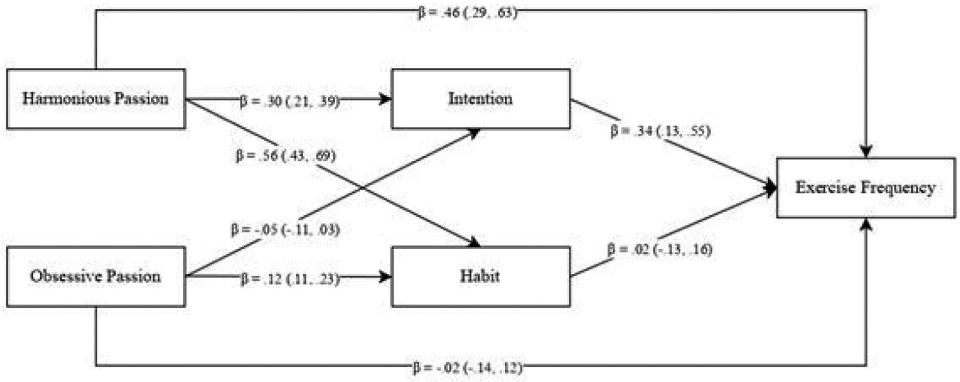

Figure 1. Mediation analysis.
Notes: β = standardized coefficients; between brackets = confidence interval at 95%; total effect = .57 (IC95% = .42, .73); total indirect effect = .11 (IC95% = .02, .24).

individuals who have developed harmonious passion towards exercise may be more likely to identify with exercise as a part of their identity and perceive exercise as more congruent with their goals and plans, leading to stronger intentions towards exercise. In addition, harmonious passion was positively associated with habit, conceptualized for this study as assumptions of automatic processes. Looking at exercise experience, the frequency and consistency of the behaviour are associated with the formation of habits (Gardner, 2015) that may explain how harmoniously passionate activities such as exercise in the long term provide significant predictability on automatic processes. Obsessive passion was significantly associated with intentions but not habit. These results support previous studies (Paradis et al., 2013; Parastatidou et al., 2014) suggesting that obsessively passionate exercisers are – to a certain degree – overwhelmingly focused on their pursuit of the beloved behaviour. Accordingly, they may spend a lot of reflective energy thinking relentlessly about exercising. This directs to high mental effort leading to no space for automatic processing to occur as the behaviour controls reflective processing (Brand & Ekkekakis, 2018). We hypothesize the idea that models explaining exercise dependence on automaticity will be impaired by obsessive passion. Hence, individuals with high obsessive passion are not as persistent as those high in harmonious passion as described by Curran et al. (2015). Current results could suggest that dropouts in the initial stages may depend on the initial motives of practice and the overwhelming cognitive and affective efforts they make in the first few weeks (e.g., taking three classes per day and training 7 days a week) towards a controlled reason towards exercise (e.g., aesthetics). On the long run, the obsessive passion can translate into a predictor of dropout or, at the other end, an unhealthy addiction towards exercise (Kovacsik et al., 2019, 2021). We speculate the former outcome to be more pronounce since evidence shows that individuals are less autonomously motivated in the initial stages of exercise adoption, and thus to maintain exercise behaviour because of obsessive passion (i.e., controlled motivation) may risk dropout (Rodrigues et al., 2022).

Second, looking at the intention-habit-behaviour interaction, both processes were associated with exercise. While intention displayed a more significant association with frequency compared to habit, the variance explained by these factors was low. This supports previous assumptions on the gap between reflective and non-reflective processes and healthy behaviours (Bruijn & Rhodes, 2011). The vigorous and challenging nature of exercise behaviour may require strong motivational and automatic components simultaneously, rather than only one of these processes (Bruijn et al., 2012). Thus, for exercise to occur, habit may reflect the importance of action control, to exercisers who have habituated this behaviour demonstrating more success in translating their positive exercise intentions into actual exercise behaviour (Strobach et al., 2020).

According to the current results, the passion model receives support on explaining exercise behaviour and is believed to be associated with assumptions of dual-process theory, including the role of intentions and habits in facilitating exercise frequency. This sheds light on the reflective and automatic processes involved in exercise behaviour. A notable implication of our findings is the crucial role of intention and habit as mediators in the relationship between passion and exercise behaviour. Our results show that harmonious passion has a positive indirect effect on exercise behaviour, suggesting that intention and habit play a partial mediation role. It is worth noting that intention has a stronger association with exercise behaviour compared to habit. Nevertheless, the direct effect of harmonious passion remains significant (β = .57; IC95% = .42, .73). Harmonious passion surpasses the association of intention and habit and exercise behaviour. We hypothesize two reasons for the current results. One, the significant association between harmonious passion and exercise could be partially explained by the also reflective process of passion on behaviour. Passion stands out as a possible motivator and thus requires thinking of the behaviour individuals like (for more see Curran et al., 2015). We asked participants to report the fitness activity they liked the most and thus participants thought of the activity and then reflected on their responses to the questionnaire. Second, we consider that consistent positive affective states provide support for liking the activity in which these individuals are engaged. Rhodes and Kates (2015) have systematically demonstrated that positive affect is positively associated with intentions and future exercise sessions. Grounded in dual-process theories, previous positive affective response to exercise provides foundations for future engagement. While passion could be

described as a motivational force by nature, it also could have an emotional representation for exercisers. Hence, harmonious passion (item example: "This activity allows me to live memorable experiences") could be explored in future studies as associated with affect or emotions.

Habit and intentions towards exercise did not mediate the relationship between obsessive passion and exercise. A *post-hoc* analysis showed that removing the obsessive passion in this model increased the predictive power of harmonious passion on mediators and outcome variable. Obsessive passion, while ensuring exercise habit, does not produce significant gains on intentions and may even facilitate some deleterious effects. Contrary to the results described by Rodrigues et al. (2022), the current finding that obsessive passion increases intentions but not habit, and the absence of a significant association with exercise, explains the non-significant mediation role of habit. Habits are formed through consistent repetition of a behaviour in a specific context. Despite the importance of habit in predicting exercise behaviour (Gardner, 2015), literature has shown that harmonious passion may not be as strongly related to exercise habits as it is to exercise intentions. For example, a study by Kovacsik et al. (2021) found that harmonious passion for exercise was positively associated with exercise intentions but was not significantly associated with exercise habit in young adults. The authors argued that because individuals with harmonious passion for exercise are likely to engage in exercise more intrinsically, they may not need to rely on habit as much to maintain their exercise behaviour. Even though obsessive passion has been described as a predictor of exercise addiction (Kovacsik et al., 2019), it seems that current exercisers are more harmoniously engaged in this behaviour.

Limitations, strength and research agenda

This study was conducted under some limitations which should be considered when understanding the current results. First, this was a correlational design, and, consequently, no causal inferences can be warranted. Nonetheless, we followed the same methodological process of previous studies (e.g., Berg et al., 2020; Bum, 2019; Rodrigues et al., 2020) who also relied on structural and mediation analyses to interpret their research findings based on cross-sectional data. The novel empirical results and practical implications provide initial evidence for testing future experimental studies. Second, all scales in this study were self-reported by the exercisers. Consequently, future research is needed to replicate the present results either with more objective assessments of reflective and affective processing (Bastos et al., 2022) and exercise behaviour (e.g., pedometer) or qualitative data such as individual interviews. Third, the participants in this study were relatively homogeneous. It would thus appear important to replicate the present findings with other populations (e.g., leisure-time exercisers, athletes) to test possible differences. Last, passion varies according to the preferred activity (R. J. Vallerand, 2015). While some individuals engage in the fitness activity they like, others do it for controlled motivation (e.g., medical prescription) or in accordance with goal-oriented perspectives (e.g., social recognition). It would be interesting to explore the implications of non-passionate exercise activities in the long term using prospective methods.

Practical implications

The present results have practical implications for exercise physiologists regarding suggestions as to how to increase regular exercise. The first one is to create an exercise environment that enables the development of harmonious passion. This may be done by supporting self-determinate behaviour and affective judgements of exercise such as enjoyment (Rodrigues et al., 2021) by focusing on affective responses that promote future exercise participation (Evmenenko & Teixeira, 2022; Rhodes & Kates, 2015; Teixeira et al., 2022). A second avenue to increase exercise is to plan exercise sessions that lead to positive affective responses that accumulate into affective motivation for future active behaviour (Bastos et al., 2022). While being reflective by nature, harmonious passion can present itself as an emotional force that drives hedonic motivation. Exercise physiologists tend to promote a tunnel vision of exercise-oriented goals, hinder efficacy feedback and encourage comparisons between fitness centre attendees (ref). While the present research used a dual-process variable categorization approach to the study of exercise, it should be noted that this is the first study to explore its association with the dualistic model of passion. Therefore, researchers are encouraged to provide more theoretical evidence that offers complementary viewpoints and a broader understanding of passion as a reflective or emotional motivator towards exercise. As researchers continue to study the constructs of obsessive and harmonious passion, it may also be worthwhile for them to also investigate the potential influence of age and behavioural experience on these phenomena.

Conclusion

Research indicates that cultivating a harmonious passion for a fitness activity has the potential to increase the likelihood of maintaining regular exercise. Specifically, individuals who demonstrate greater harmonious passion for exercise exhibit higher intentions and habitual exercise behaviours. This passion type is posited to be associated with both reflective and automatic assumptions of exercise frequency. In contrast, although obsessive passion was also associated with intentions and predicted physical activity initiation and maintenance, its predictive power was found to be weaker when compared to harmonious passion. Therefore, it is hypothesized that without harmonious passion, the association between obsessive passion and exercise adherence on a long-term basis may not be significant. Ultimately, individuals who recognize the importance of physical exercise and engage in activities they enjoy are likely to experience positive health effects from their active lifestyles.

Acknowledgments

The authors thank all participants for volunteering for this study and continuing to participate in the exercise intervention.

Disclosure statement

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Funding

Filipe Rodrigues was supported by the national funds through the Portuguese Foundation for Science and Technology, I.P., under the project UIDB/04748/2020.

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Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy and ethical restrictions.

Approval

Approval from the Ethical Committee of IP Leiria (CE/IPLEIRIA/35/2021) was obtained.

References

ACSM. (2021) . American College of Sports Medicine's guidelines for exercise testing and prescription. (11th Ed). Wolters Kluwer.

Berg, S., Forest, J., & Stenseng, F. (2020). When passion does not change, but emotions do: Testing a social media intervention related to exercise activity engagement. *Frontiers in Psychology*, *11*, 71. https://doi.org/10.3389/fpsyg.2020.00071

Brand, R., & Ekkekakis, P. (2018). Die Affective-Reflective Theory zur Erklärung von körperlicher Inaktivität und Sporttreiben. *German Journal of Exercise and Sport Research*, *48*(1), 48–58. https://doi.org/10.1007/s12662-017-0477-9

Bruijn, G. J., & Rhodes, R. E. (2011). Exploring exercise behavior, intention, and habit strength relationships. *Scandinavian Journal of Medicine & Science in Sports*, *21*(3), 482–491. https://doi.org/10.1111/j.1600-0838.2009.01064.x

Bruijn, G. J., Rhodes, R. E., & van Osch, L. (2012). Does action planning moderate the intention-habit interaction in the exercise domain? A three-way interaction analysis investigation. *Journal of Behavioral Medicine*, *35*(5), 509–519. https://doi.org/10.1007/s10865-011-9380-2

Buckworth, J., Dishman, R., O'Connor, P., & Tomporowski, P. (2013). Exercise psychology. (2nd ed). Human Kinetics.

Bum, C.-H. (2019). Structural relationships among exercise passion, emotion, and adherence behaviors of sports participants. *Social Behavior & Personality: An International Journal*, *47*(2), e7645. https://doi.org/10.2224/sbp.7645

Cid, L., Vitorino, A., Bento, T., Teixeira, D. S., Rodrigues, F., & Monteiro, D. (2019). The passion scale-Portuguese version: reliability, validity, and invariance of gender and sport. *Perceptual and Motor Skills*, *126*(4), 694–712. https://doi.org/10.1177/0031512519849744

Cohen, J. (1988). Statistical power analysis for the behavioral sciences. (2nd ed). Routledge Academic.

Craig, C. L., Marshall, A. L., Sjöström, M., Bauman, A. E., Booth, M. L., Ainsworth, B. E., Pratt, M., Ekelund, U., Yngve, A., Sallis, J. F., & Oja, P. (2003). International physical activity questionnaire: 12-country reliability and validity. *Medicine and Science in Sports and Exercise*, *35*(8), 1381–1395. https://doi.org/10.1249/01.MSS.0000078924.61453.FB

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, *16*(3), 297–334. https://doi.org/10.1007/bf02310555

Curran, T., Hill, A. P., Appleton, P. R., Vallerand, R. J., & Standage, M. (2015). The psychology of passion: A meta-analytical review of a decade of research on intrapersonal outcomes. *Motivation and Emotion*, *39*(5), 631–655. https://doi.org/10.1007/s11031-015-9503-0

Dunton, G., Leventhal, A., Rebar, A., Gardner, B., Intille, S., & Rothman, A. (2022). Towards consensus in conceptualizing and operationalizing physical activity maintenance. *Psychology of Sport and Exercise*, *61*, 102214. https://doi.org/10.1016/j.psychsport.2022.102214

Durbin, J., & Watson, G. S. (1951). Testing for Serial Correlation in Least Squares Regression. II. *Biometrika*, *38*(1/2), 159–177. https://www.jstor.org/stable/2332325

Ekkekakis, P., & Zenko, Z. (2016). Escape from cognitivism: Exercise as hedonic experience. In M. Raab, P. Wylleman, R. Seiler, A. M. Elbe, & A. Hatzigeorgiadis (Eds.), *Sport and exercise psychology research: From theory to practice* (pp. 389–414). Elsevier Academic Press. https://doi.org/10.1016/B978-0-12-803634-1.00018-2

Evmenenko, A., & Teixeira, D. (2022). The circumplex model of affect in physical activity contexts: A systematic review. *International Journal of Sport and Exercise Psychology*, *20*(1), 168–201. https://doi.org/10.1080/1612197X.2020.1854818

Faria, J., Andrade, A., Evmenenko, A., Rodrigues, F., Marques, P., Cid, L., & Teixeira, D. (2022). Preference for and tolerance of exercise intensity: The mediating role of vitality in exercise habit. *International Journal of Sport Psychology*, *52*(6), 555–568. https://doi.org/10.7352/IJSP.2021.52.555

Gardner B. (2015). A review and analysis of the use of 'habit' in understanding, predicting and influencing health-related behaviour. *Health psychology review*, *9*(3), 277–295. https://doi.org/10.1080/17437199.2013.876238

Gardner, B., Lally, P., & Rebar, A. (2020). Does habit weaken the relationship between intention and behaviour? Revisiting the habit-intention interaction hypothesis. *Social and Personality Psychology Compass*, *14*(8), e12553. https://doi.org/10.1111/spc3.12553

Hagger, M. (2019). Habit and physical activity: Theoretical advances, practical implications, and agenda for future research. *Psychology of Sport and Exercise*, *42*, 118–129. https://doi.org/10.1016/j.psychsport.2018.12.007

Hair, J. F., Babin, B. J., Anderson, R. E., & Black, W. C. (2019). Multivariate Data Analysis. (8th ed). Cengage Learning.

Hayes, A. (2018). Introduction to mediation, moderation, and conditional process analysis. (2nd ed). Guilford Press.

Kovacsik, R., Griffiths, M. D., Pontes, H. M., Soós, I., de la Veja, R., Ruíz-Barquín, R., Demetrovics, Z., & Szabo, A. (2019). The role of passion in exercise addiction, exercise and exercise intensity in long-term exercisers. *International Journal of Mental Health and Addiction*, *17*(6), 1389–1400. https://doi.org/10.1007/s11469-018-9880-1

Kovacsik, R., Tóth-Király, I., Egorov, A., & Szabo, A. (2021). A longitudinal study of exercise addiction and passion in new sport activities: The impact of motivational factors. *International Journal of Mental Health and Addiction*, *19*(5), 1511–1526. https://doi.org/10.1007/s11469-020-00241-z

Marques, P., Andrade, A., Evmenenko, A., Monteiro, D., Faria, J., Rodrigues, F., Cid, L., & Teixeira, D. (2022). The preference for and tolerance of exercise intensity: Na exploratory analysis of intensity discrepancy in health club settings. *Current Psychology*. https://doi.org/10.1007/s12144-022-03149-0

Marsh, H. W., Vallerand, R. J., Lafrenière, M.-A. K., Parker, P., Morin, A. J. S., Carbonneau, N., Jowett, S., Bureau, J. S., Fernet, C., Guay, F., Salah Abduljabbar, A., & 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. https://doi.org/10.1037/a0032573

Milton, K., Bull, F. C., & Bauman, A. (2011). Reliability and validity testing of a single-item physical activity measure. *British Journal of Sports Medicine*, *45*(3), 203–208. https://doi.org/10.1136/bjsm.2009.068395

Muthén, L. K., & Muthén, B. O. (2017). Mplus User's Guide. (8th ed.). Los Angeles, CA: *Muthén & Muthén*.ISBN: 9780982998328.

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. https://doi.org/10.1016/j.psychsport.2013.02.003

Parastatidou, I. S., Doganis, G., Theodorakis, Y., & Vlachopoulos, S. P. (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. https://doi.org/10.1007/s11469-013-9466-x

Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods*, *40*(3), 879–891. https://doi.org/10.3758/BRM.40.3.879

Prochaska, J., DiClemente, C., & Norcross, J. (1992). In search of how people change. Applications to addictive behaviors. *The American Psychologist*, *47*(9), 1102–1114. https://doi.org/10.1037/0003-066X.47.9.1102

Rhodes, R. E., Cox, A., & Sayar, R. (2022). What predicts the physical activity intention-behavior gap? A systematic review. *Annals of Behavioral Medicine*, *56*(1), 1–20. https://doi.org/10.1093/abm/kaab044

Rhodes, R. E., & Kates, A. (2015). Can the affective response to exercise predict future motives and physical activity behavior? A systematic review of published evidence. *Annals of Behavioral Medicine*, *49*(5), 715–731. https://doi.org/10.1007/s12160-015-9704-5

Rodrigues, F., Bento, T., Cid, L., Pereira Neiva, H., Teixeira, D., Moutão, J., Almeida Marinho, D., & Monteiro, D. (2018). Can interpersonal behavior influence the persistence and adherence to physical exercise practice in adults? A systematic review. *Frontiers in Psychology*, *9*, 2141. https://doi.org/10.3389/fpsyg.2018.02141

Rodrigues, F., Cid, L., Forte, P., Teixeira, D., Travassos, B., & Monteiro, D. (2021). Evaluating habit in exercisers: Testing the self-report behavioral automaticity index. *Motricidade*, *17*(2), 185–192. https://doi.org/10.6063/motricidade.21495

Rodrigues, F., Soares, R., Bernardes, R., Monteiro, D., & Teixeira, D. (2022). Validation of the passion scale for the Portuguese population practicing exercise. *Cuadernos de Psicología del Deporte*, *22*(3), 151–162. https://doi.org/10.6018/cpd.514241

Rodrigues, F., Teixeira, D. S., Cid, L., Machado, S., & Monteiro, D. (2019). The role of dark-side of motivation and intention to continue in exercise: A self-determination theory approach. *Scandinavian Journal of Psychology*, *60*(6), 585–595. https://doi.org/10.1111/sjop.12582

Rodrigues, F., Teixeira, D. S., Neiva, H. P., Cid, L., & Monteiro, D. (2020). The bright and dark sides of motivation as predictors of enjoyment, intention, and exercise persistence. *Scandinavian Journal of Medicine & Science in Sports*, *30*(4), 787–800. https://doi.org/10.1111/sms.13617

Stevens, C. J., Baldwin, A. S., Bryan, A. D., Conner, M., Rhodes, R. E., & Williams, D. M. (2020). Affective determinants of physical activity: A conceptual framework and narrative review. *Frontiers in Psychology*, *11*, 568331. https://doi.org/10.3389/fpsyg.2020.568331

Strobach, T., Englert, C., Jekauc, D., & Pfeffer, I. (2020). Predicting adoption and maintenance of physical activity in the context of dual-process theories. *Performance Enhancement & Health*, *8*(1), 101162. https://doi.org/10.1016/j.peh.2020.100162

Teixeira, D. S., Rodrigues, F., Cid, L., & Monteiro, D. (2022). Enjoyment as a predictor of exercise habit, intention to continue exercising, and exercise frequency: The intensity traits discrepancy moderation role. *Frontiers in Psychology*, *13*, 780059. https://doi.org/10.3389/fpsyg.2022.780059

Vallerand, R. J. (2015). *The psychology of passion: A dualistic model*. Oxford University Press. https://doi.org/10.1093/acprof:oso/9780199777600.001.0001

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. https://doi.org/10.1037/0022-3514.85.4.756

Vallerand, R., & Verner-Filion, J. (2020). Theory and research in passion for sport and exercise. In G. Tenenbaum & R. Eklund Eds., *Handbook of Sport Psychology* (*4th*, pp. 206–230). chapter 11 https://doi.org/10.1002/9781119568124.ch11.

Williams, J., & MacKinnon, D. P. (2008). Resampling and distribution of the product methods for testing indirect effects in complex models. *Structural Equation Modeling: A Multidisciplinary Journal*, *15*(1), 23–51. https://doi.org/10.1080/10705510701758166