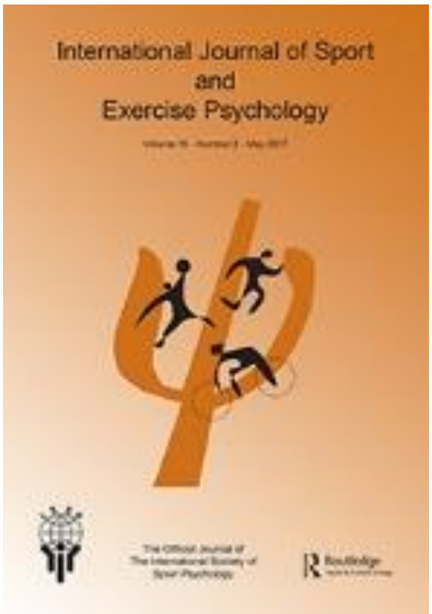

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Title page

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Running head: Intention-Behavior Gap and Exercise

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The Intention-Behavior Gap: An Empirical Examination of an Integrative Perspective to Explain Exercise Behavior

Abstract

This study tested the Theory of Planned Behavior (TPB) in conjunction with two sets of variables from the Health Action Process Approach (HAPA) and the Subjective Exercise Experience Scale (SEE) to predict exercise behavior. This study included 454 participants who exercised in a fitness center. We collected measures of the TPB (attitudes, subjective norms, perceived behavioral control, and intention), HAPA (planning), and SEE (positive well-being, psychological distress, and fatigue) and assessed exercise behavior at a three-month follow-up. Structural equation modeling found partial support for the TPB model (explaining 10% of the variance in exercise behavior) and adequate fit indices for an adjusted model of the TPB that includes a positive well-being dimension (explaining 11% of the variance in exercise behavior). In sum, the original TPB partially predicts exercise behavior; when considered together with other predictors, limited evidence was found for its utility in explaining exercise behavior.

Keywords: Theory of Planned Behavior; Planning; Subjective Experiences; Exercise.

The Intention-Behavior Gap: An Empirical Examination of an Integrative Perspective to Explain Exercise Behavior

Regular exercise contributes to physical and mental health (Maddux & Dawson, 2014); it is associated with the prevention of several medical conditions (Erikssen, 2001; Weinstein, Lydick, & Biswabharati, 2014), with the promotion of subjective well-being, and with reduced depression, anxiety, and stress (Warburton, Nicol, & Bredin, 2006). Across developed countries, most people exercise at rates below the recommended levels (Buckworth, Dishman, O'Conner, & Tomporowski, 2013; Martinez-Gonzalez et al., 2001); therefore, it is important to understand the psychological factors involved in exercise practice (Baker, Little, & Brownell, 2003; Courneya, 1995). Research has shown that it is difficult to motivate people to initiate regular exercise programs and to continue them once initiated (Marcus et al., 2000). Therefore, it is important to understand the factors that prompt the initiation of exercise practice and that are involved in its maintenance. Researchers, however, have dedicated much more attention to understanding the initiation of exercise behavior than to its maintenance (Armitage, 2005).

The integration of different conceptual approaches can help to overcome some of the problems related to understanding exercise behavior (Hagger, 2009). In fact, there is evidence that social-cognitive models (as in the case of the Theory of Planned Behavior - TPB) are not sufficient to address the relation between intentions to perform a certain behavior and actual performance, usually referred to as the "intention-behavior gap" (Hagger, & Chatzisarantis, 2014; Sheeran, 2002). To address this issue, this study analyzed the psychological factors involved in exercise practice by taking an integrative perspective, combining the TPB (Ajzen, 1991), the Health Action Process Approach (HAPA; Schwarzer, 1992), and the Subjective Exercise Experiences Scale (SEE;

McAuley & Courneya, 1994). These three perspectives consider the social-cognitive factors (TPB), motivational factors (HAPA), and experiential factors (SEE) implicated in changing human behavior in a variety of settings.

The TPB was established as the starting point to analyze the relation between the intention to exercise and the frequency of exercise. Our decision derives from the fact that the TPB represents one of the best-researched theories used to explain exercise behavior (Armitage, 2005; Hagger, Chatzisarantis, & Biddle, 2002; McEachan, Conner, Taylor, & Lawton, 2011). For example, some studies have linked the dimensions proposed by the TPB with the intention to exercise in order to explain readiness for exercise (Courneya, 1995), and others have identified intention as a predictor of subsequent exercise behavior (Rosen, 2000). More specifically, the TPB assumes that the proximal determinant of behavior is the person's *intention* to perform the target behavior, which reflects that person's plan of action and motivation to engage in a particular behavior. Intentions are determined by a person's *attitude toward the behavior* (a positive or negative evaluation of the behavior); *subjective norms* (a person's perceptions of social pressure to perform or not perform the target behavior); and *perceived behavioral control* (a person's confidence in his/her ability to perform the target behavior). The TPB proposes that the likelihood of performing a certain behavior increases if the person has a positive attitude toward the behavior (attitudes), feels social pressure to perform the behavior (subjective norms), and believes that he or she will be successful in performing the behavior (perceived behavioral control). Perceived behavioral control can also have a direct effect on behavior when people are accurate in their evaluation of actual control regarding the target.

Despite the relevance of the TPB in explaining many health behaviors, there is evidence that the model is a better predictor of intentions to exercise than of actual exercise behavior (Norman & Conner, 2005; Rhodes & de Bruijn, 2013). As confirmed by meta-analysis studies, the TPB constructs predict 44% of the variance in intention for physical activity, but only 24% of the variance in actual exercise behavior (McEachan et al., 2011). Ajzen (1991) has acknowledged that "the TPB is, in principle, open to the inclusion of additional predictors if it can be shown that they capture a significant proportion of the variance in intentions or behavior after the theory's current variables have been taken into account" (p. 199). The inclusion of other predictors in the study of exercise behavior may help to resolve the gap between the prediction of intentions and the prediction of actual behavior (i.e., the "intention-behavior gap"; Sheeran, 2002). As noted by Rhodes and Dickau (2013), intentions to exercise do not always translate into behavior, intentions to exercise do not always translate into behavior, which suggests that intentions are sometimes useful in predicting exercise behavior but usually insufficient.

Considering all these aspects, the first hypothesis of this study is that the TPB would be a better predictor of exercise intentions than of exercise behavior (see Figure 1). Considering the evidence that TPB is insufficient to explain the behavior of exercise, we introduced in this study motivational and experiential factors, leading to hypothesis 2. In this case, it is proposed that the variables selected from the HAPA and SEE would serve as mediators (Baron & Kenny, 1986) in the intention–exercise behavior relation (see Figure 2) and that their inclusion in the tested models would increase the explained variance in exercise behavior relative to the variance explained when solely using the TPB. After integrating these variables, we tested the integrated model to see if it could reduce the intention-behavior gap.

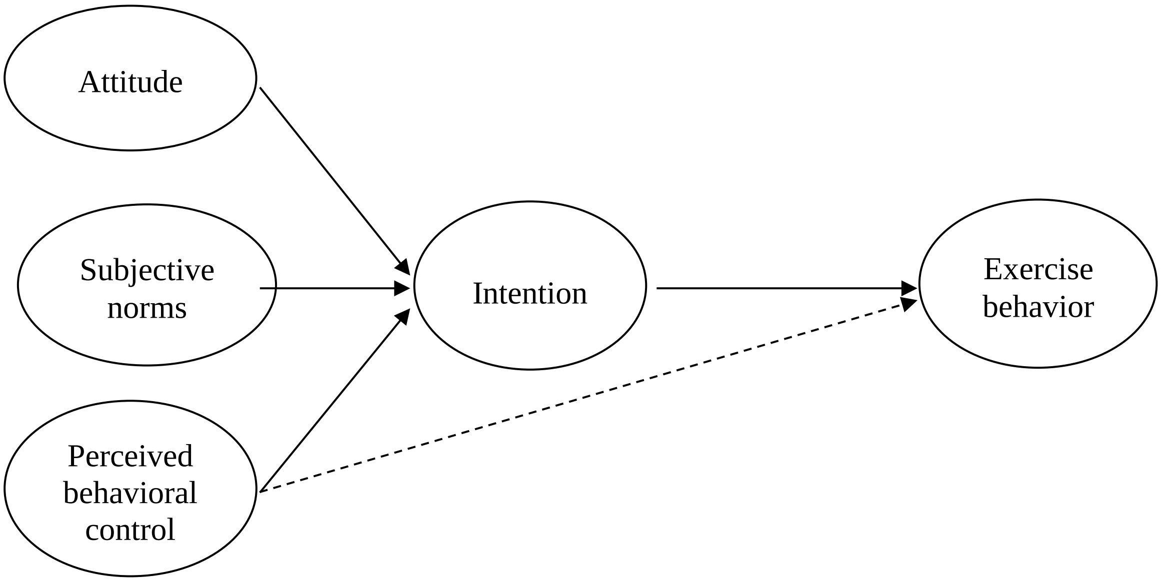

Figure 1. Theory of Planned Behavior (hypothesis one)

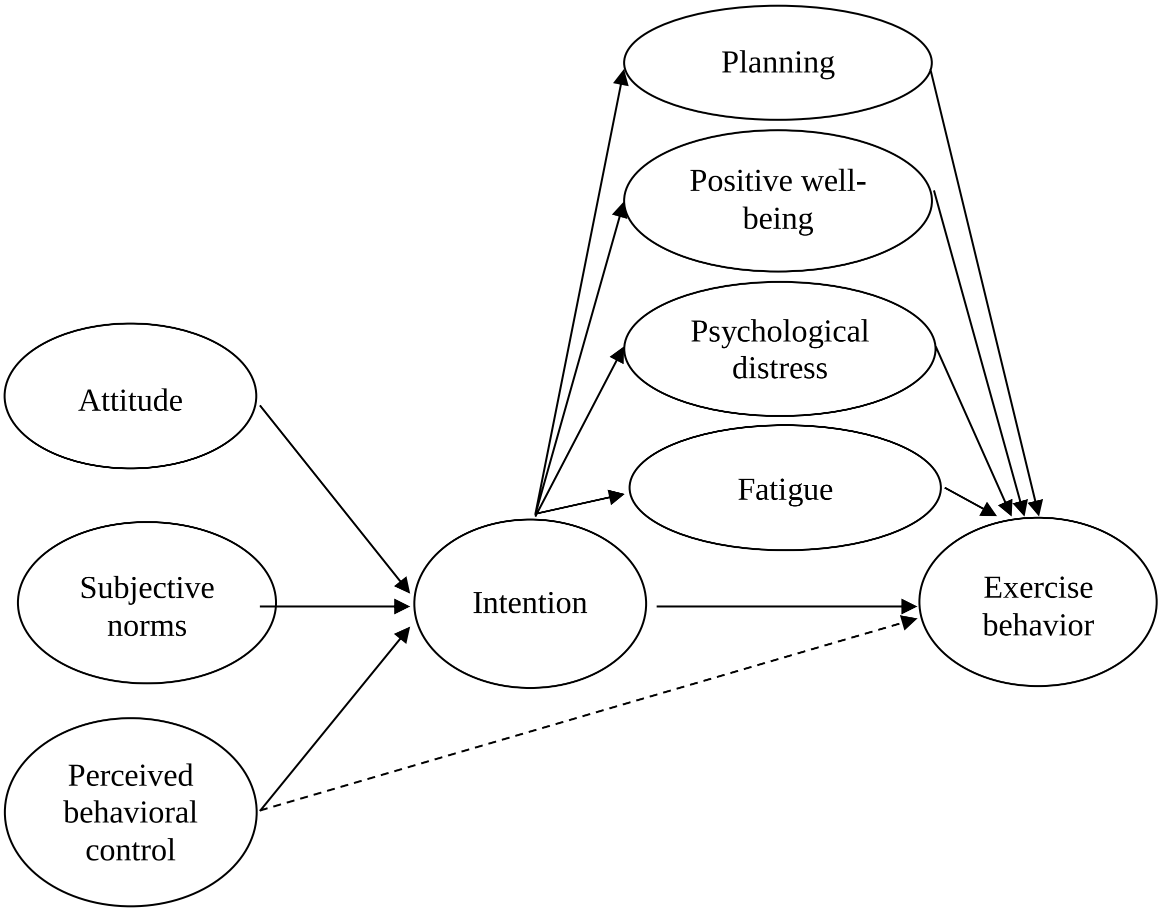

Figure 2. The mediation model (hypothesis two)

From the HAPA, we selected the variable *action plans* because it explains how people transform their intentions into a behavior (Schwarzer, 1992), helping to reinforce the link between intentions and behavior across the phases of change (Heckhausen & Kuhl, 1985; Schwarzer, 1999). Action plans are mental representations of a desirable future situation ("where" and "when") and a behavioral action ("how"), which is expected to be effective for the goal pursuit (Sniehotta, Scholz, & Schwarzer, 2005). This concept has existed for years in the social psychological literature (see Leventhal, Singer, & Jones, 1965) and is now integrated in several models of behavioral change, including HAPA (Schwarzer & Luszczynska, 2008) and the Integrated Behavior Change Model (Hagger & Chatzisarantis, 2014), to name a few. Action plans were measured in this study by using the concept of *planning* (Norman & Conner, 2005) being assumed that *planning* can mediate the relation between intention to exercise and exercise behavior. Some findings indicate that action plans can be involved in changing different behaviors, as in the case of exercise (Arbour & Martin Ginis, 2009; Barg et al., 2012; Gellert, Ziegelmann, Lippke, &Schwarzer, 2012; Prestwich et al., 2012). There is also evidence that action plans are developed after the formation of intentions, acting in a separate "volitional" phase (Gollwitzer, 1999; Hagger & Chatzisarantis, 2014; Schwarzer & Fuchs, 1996) by facilitating the efficient recall of the intention (Hagger & Luszczynska, 2014) and the initiation of the behavior (Sheeran, Webb, & Gollwitzer, 2005; Webb & Sheeran, 2004). Thus, action plans (i.e., *planning*) influence the relation between intention and behavior, helping to reduce the "intention-behavior gap". In this study we hypothesize that planning will mediate the relation between intention to exercise and exercise behavior.

Most research on exercise behavior has focused on cognitive, behavioral, and even environmental variables (e.g., Ajzen, 1991, Humpel, Owen, & Leslie, 2002; Prochaska & Marcus, 1994); much less research has examined how affective variables influence exercise behavior, despite the availability of theories that provide a framework for understanding how subjective experiences and affect is related to exercise (see, for example, the Hedonic theory; Kahneman, 1999). Nevertheless, some research has been sustaining the predictive value of affect and emotions on exercise (e.g., Mohiyeddini, Pauli, and Bauer (2009). For this reason, this study included positive and negative poles of psychological health, related to positive well-being and psychological distress and an indicator of fatigue related to exercise (McAuley & Courneya, 1994). We selected the Subjective Exercise Experiences Scale for this study to evaluate the direct psychological responses to exercise practice. The main advantage of this measure is that it focuses on the positive emotional/affective states related to exercise (e.g., great, positive, strong, terrific) and on the negative effects of exercise (e.g., awful, crummy, discouraged, miserable) (McAuley, 1994). In addition, the scale evaluates somatic states of fatigue, which provide a clearer perspective of the psychophysiological responses to exercise (Clore, Ortony, & Foss, 1987). We hypothesized that subjective experiences related to exercise will mediate the relation between exercise intentions and exercise behavior.

In summary, this study examined the ability of these conceptual models and dimensions to predict intention to exercise and exercise behavior itself. We used the objective frequency of exercise behavior as the criterion of analysis of exercise behavior. In fact, in regard to the study of exercise maintenance, research has most often used short-term designs based on the subjective perception of exercise practice or the intention to exercise (Armitage, 2005). The alternative assumed in this study was to analyze the psychological factors that explain the maintenance of an exercise program, using the frequency of exercise as the criterion of analysis.

Method

Participants

The total sample consisted of 454 participants, 248 females (54.6%) and 205 males (45.2%) (one participant did not provide information regarding gender). The participants' ages ranged from 15 to 61 years old (*M* = 25.14 years; *SD* = 7.13 years). All participants were exercising in the same fitness center, engaging in bodybuilding (*n* = 240; 52.9%), cardio fitness (*n* = 32; 7%), and classes involving rhythmic activities (*n* = 182; 40.1%).

Measures

The evaluation protocol included measures derived from the TPB, HAPA, and SEE. We measured the TPB dimensions according to the guidelines provided by Ajzen (2002) and translated and adapted them for Portuguese participants (see Gomes & Capelão, 2013). Specifically, this study defines the TPB dimensions of attitudes, subjective norms, perceived behavioral control, and intention in terms of target, action, context, and time elements (Fishbein & Ajzen, 2010). We also translated and adapted the measures derived from HAPA and SEE for Portuguese participants (see Carneiro & Gomes, 2015, 2016).

Attitudes (TPB-A; Ajzen, 2002). We measured this dimension using six items, with response options formatted on a 7-point bipolar adjective scale (e.g., *useful/useless, wise/foolish, beneficial/harmful*). We calculated a mean global score (α = .78) in which higher values represent a more positive attitude toward exercise. The statement that preceded the adjectives was "For me, practicing regular exercise is…". The Exploratory Factor Analysis confirmed the one-factor structure of the instrument (KMO = .793; Bartlett's Test = 825.929, *df* = 15, *p* = .000; Explained variance = 50.7%).

Subjective Norms (TPB-SN; Ajzen, 2002). We measured this dimension by evaluating the normative beliefs of exercisers regarding the opinion of important persons about their exercise practice given the specific exercise context (e.g., this fitness center), frequency (e.g., at least three times per week), and time frame (e.g., next three months). Respondents answered the four items on a 7-point Likert scale (1 = *Disagree*; 7 = *Agree*) and then we calculated a mean global score. Higher values represent a stronger perception of normative beliefs regarding exercise practice (α = .88). The Exploratory Factor Analysis confirmed the one-factor structure of the instrument (KMO = .797; Bartlett's Test = 1120.764, *df* = 6, *p* = .000; Explained variance = 73.9%).

Perceived Behavioral Control (TPC-PBC; Ajzen, 2002). We measured this dimension by evaluating four components of exercise behavior (e.g., likelihood of adopting an exercise practice, perception of control around exercise, personal confidence about the exercise practice, and personal ability to engage in exercise behavior). Respondents answered the four items on a 7-point Likert scale (example: 1 = *Very difficult*; 7 = *Not at all difficult*) and then we calculated a mean global score. Higher values represent a stronger perception of behavioral control over exercise practice (α = .90). The statement that preceded each item was “For me, practicing regular exercise in this fitness center, at least three times a week for three months is…”. The Exploratory Factor Analysis confirmed the one-factor structure of the instrument (KMO = .830; Bartlett's Test = 1182.242, *df* = 6, *p* = .000; Explained variance = 77.6%).

Intention (TPB-I; Ajzen, 2002). We measured this dimension using three items to evaluate the intention of engaging in exercise in a specific exercise context (e.g., this fitness center), frequency (e.g., at least three times per week), and time frame (e.g., next three months). Respondents answered the three items on a 7-point Likert scale (example: 1 = *Unlikely*, 7 = *Likely*) and then we calculated a mean global score. Higher values represent a stronger intention to engage in exercise practice (α = .93). The statement that preceded each item was “For me, practicing regular exercise in this fitness center, at least three times a week for three months…”. The Exploratory Factor Analysis confirmed the one-factor structure of the instrument (KMO = .726; Bartlett's Test = 1137.387, $df = 3$, $p = .000$; Explained variance = 87.3%).

Planning (HAPA-P). Based on Norman and Conner (2005) and Luszczynska and Schwarzer (2003), we assessed action planning by four items concerned with *when* (e.g., days of exercise practice), *where* (e.g., place of exercise practice), *what* (e.g., type of exercise), and *how* often (e.g., frequency of exercise) participants planned to exercise. The responses were scored on a 7-point Likert scale ranging from 1 (*Disagree*) to 7 (*Agree*). We obtained the score by calculating a mean score, which means that higher values represent a stronger role of planning in exercise practice ($\alpha = .81$). The instructions to complete the instrument asked participants to consider their exercise practice in that specific fitness center, at least three times a week for three months. Then, the statement that preceded each item was “I have well-defined…”. The Exploratory Factor Analysis confirmed the one-factor structure of the instrument (KMO = .726; Bartlett's Test = 668.967, $df = 6$, $p = .000$; Explained variance = 64.3%).

Subjective Exercise Experiences Scale (SEES; McAuley & Courneya, 1994). This instrument evaluates global psychological responses to the stimulus properties of exercise in the following three dimensions: positive well-being (four items), psychological distress (four items), and fatigue (four items). The first two dimensions correspond to positive and negative poles associated with psychological well-being related to exercise, whereas the third dimension represents an indicator of tiredness associated with exercise. Respondents answered on a 7-point Likert scale ranging from 1 (*Not at all*) to 7 (*Very much so*). We obtained the scores by calculating a mean score for each subscale. Higher values represent stronger perceptions of well-being ($\alpha = .83$), psychological distress ($\alpha = .82$), and fatigue from exercise practice ($\alpha = .87$). The

Exploratory Factor Analysis confirmed the three-factor structure of the instrument (KMO = .808; Bartlett's Test = 2374.212, *df* = 66, *p* = .000; Explained variance = 68.3%).

Exercise Behavior (EB). We obtained the global score of exercise behavior by consulting the computer records of exercise behavior practice per month for the three months following the application of the evaluation protocol with the above-described measures. We obtained the final value for exercise behavior by averaging the exercise sessions performed by each participant over the three-month period, which means that higher values correspond to higher frequencies of exercise behavior for the participants over the three months. This time frame of three months is well beyond those reported by Randall and Wolff (1994), who concluded that more than one-third of studies addressing the intention-behavior relation used time intervals of less than one week between initial assessment and the subsequent measure of behavior.

Procedure

This study was conducted in accordance with the ethical procedures outlined in the Declaration of Helsinki and in conformance with both national and European regulations on conducting research with human participants; it was also in accordance with the internal guidelines of the research center of the first author of this paper. The data collection involved four steps. First, we met with the manager of the fitness center to explain the research goals and the data collection procedures. Second, after approval was received from the fitness center manager, we invited exercisers at the fitness center to participate in the study and assured them that their data would remain anonymous and confidential. We specifically asked participants to authorize the researchers to access their exercise frequency records for the subsequent three months. Only participants who agreed to these conditions were included in the study, and all provided written informed consent before participating. Third, after the authorization of participants, we began data collection, including the evaluation protocol with the described psychological measures. The data collection included 651 evaluation protocols delivered to participants; 454 were returned, yielding a response rate of 69.7%. This return value reflects the fact that some participants completed the evaluation protocol in the fitness center (before an exercise session), whereas other participants completed the evaluation protocol outside the fitness center at their convenience (in this situation, some participants never returned their protocol). Fourth, three months after collecting the evaluation protocol, we consulted the computer records capturing the exercise practice of all participants in this study to determine the exercise behavior variable.

Data Screening

We conducted the data screening analysis to detect the univariate and multivariate outliers (Tabachnick & Fidell, 2007). After this procedure, we identified ten multivariate outliers (2.2% of total sample, two women and eight men) and subsequently eliminated them from the analysis. Thus, we ultimately included a total of 444 participants included in the analysis.

Data Analysis

We used structural equation modeling (SEM) to test the hypotheses. All analyses were conducted in AMOS 21.

To assess the model fit, we used the χ^2 goodness-of-fit statistic, the root mean square error of approximation (RMSEA, Steiger, 1990), the Tucker-Lewis index (TLI, Tucker & Lewis, 1973), and the comparative fit index (CFI, Bentler, 1990). The cut-off criteria used in this study were in accordance with generally accepted indices suggested in the literature: RMSEA values < .05 indicate excellent fit, and ≤.08 indicate acceptable fit; TLI values greater than .90 are considered to indicate acceptable fit; and CFI values close to .95 indicate excellent fit, and those ≥ .90 are interpreted as reflecting good fit (Bentler, 2007). Finally, we also used the bootstrap procedure of AMOS to obtain 95% confidence intervals around the parameter estimates (MacKinnon, Fairchild, & Fritz, 2007). Bootstrapping is a powerful resampling method used to obtain parameter estimates and confidence intervals; also by using bootstrapping it is not assumed that the variables are normally distributed.

Results

Table 1 presents means, standard deviations, and correlations between the variables under study. Considering the outcome variable of exercise behavior, positive and significant correlations with attitudes, perceived behavioral control, intention, planning, and positive well-being were observed. We found no significant correlations between exercise behavior and subjective norms, psychological distress, and fatigue.

Table 1

Means, Standard Deviations, and Correlations between Variables under Study (N = 454)

Variables	**M (SD)**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
1. EB: Exercise behavior	4.75 (4.65)	--								
2. TPB-A: Attitudes	6.44 (0.72)	.122*	--							
3. TPB-SN: Subjective norms	5.39 (1.27)	-.077	.158**	--						
4. TPB-PBC: Perceived behavioral control	5.05 (1.38)	.286***	.250***	.081	--					
5. TPB-I: Intention	4.94 (1.70)	.277***	.146**	.059	.822***	--				
6. HAPA-P: Planning	5.55 (1.17)	.171***	.163**	.125**	.491***	.466***	--			
7. SEES-PWB: Positive well-being	5.36 (0.92)	.169***	.367***	.131**	.298***	.196***	.222***	--		
8. SEES-PD: Psychological distress	1.40 (0.63)	-.010	-.292***	-.140**	-.149**	-.130**	-.203***	-.269***	--	
9. SEES-F: Fatigue	3.92 (1.39	-.043	-.215***	.015	-.067	-.071	.050	-.077	.181***	--

*$p < .05$; **$p < .01$; ***$p < .001$

Testing the Hypothesized Models

The first hypothesis stated that the TPB is a better predictor of intention of engaging in exercise than of objective exercise behavior. Model 1 confirmed the hypothesis and had acceptable fit indices (refer to Table 2), explaining 83% of the variance of intention and 12% of the variance of exercise behavior. However, certain paths in this model were not significant; thus, we removed the non-significant connections from subjective norms to intention and from perceived behavioral control to exercise behavior. This adjusted model (Model 2) had acceptable fit indices (refer to Table 2), explaining 82% of the variance of intention and 10% of the variance of exercise behavior and thus confirming the hypothesis (Table 3). However, this conclusion was not based on the use of the TPB in its original form (see Figure 1). Considering this adjusted model, positive attitudes and, particularly, stronger perceived behavioral control predicted the intention to engage in exercise. Additionally, stronger intentions predicted a higher frequency of exercise behavior (Table 3).

Based on this adjusted model of the TPB, we examined the second hypothesis by testing the variables selected from HAPA and SEE; these variables were assumed to be mediators of the intention–exercise behavior relation. Model 3 tested this hypothesis and assumed acceptable fit levels (refer to Table 2); however, none of these variables served as mediators in the relation between intention and exercise behavior. Due to these results, we removed the non-significant paths from Model 3, one by one, using higher p values of the variables as the criteria for removal. Thus, we removed the variables of planning (β = .015, p = .920), fatigue (β = -.031, p = .675), and psychological distress (β = .048, p = .458).

This process resulted in Model 4, in which all paths were significant. In this case, positive well-being assumed significant values for the relation between intention and exercise behavior. Thus, hypothesis two was partially confirmed because positive well-being was assumed to be the sole mediator of the relation between intention and exercise behavior (see Figure 2). Table 2 presents the fit indices of the mediation model, which indicate that the mediation model is acceptable. Table 4 presents the standardized effects for the partially mediated version of Model 4, namely the parameter estimates of the structural paths' coefficients and the squared multiple correlation coefficients. The estimates of the direct and indirect effects were based on 1000 bootstrap samples. The partially mediated model explained 79% of the variance associated with intention and 11% of the variance in exercise behavior, which means that positive intention and, particularly, stronger perceived behavioral control predicted the intention to exercise. Additionally, a stronger intention predicted a higher frequency of exercise behavior (refer to Table 3). The relation between intention and exercise behavior was mediated by positive well-being, which emerged as a significant predictor of exercise behavior. Specifically, intention was positively related to positive well-being, explaining 4% of the variance, which means that a stronger intention predicted a more positive experience of well-being. Thus, intention was positively related to exercise behavior both directly and indirectly, as confirmed by the partially mediated effect of positive well-being on the relation between intention and exercise behavior (Table 4).

Table 2

Fit Indices for the Structural Tested Models

Models	χ^2/p	RMSEA	RMSEA 95% CI	*P*-close	CFI	TLI
M1. TPB: Conceptual model	1.862	.045	[.037; .053]	.829	.98	.97
M2. TPB: Adjusted model	2.228	.053	[.044; .063]	.279	.97	.97
M3. TPB. + HAPA + SEES: Conceptual model	1.803	.043	[.038; .047]	.999	.95	.94
M4. TPB+ SEES: Adjusted model	2.234	.053	[.046; .060]	.249	.96	.96

Notes: TPB: Theory of planned behavior; HAPA: Health Action Process Approach; SEES: Subjective Exercise Experiences Scale.

Table 3

Standardized Effects (95% Confidence Intervals) and R^2 for the Structural Adjusted Models

Models	Standardized Effects	*p* value	95% CI
Model 2 - TPB: Adjusted model			
Path: Attitudes → Intentions	.098	.003	[.043; .158]
Path: Perceived behav. control → Intentions	.933	< .001	[.890; .974]
Path: Intentions → Exercise behavior	.310	< .001	[.227; .390]
TPB-I: Intentions R^2	.82	< .001	[.743; .882]
EB: Exercise behavior R^2	.10	< .001	[.051; .152]
Model 4 - TPB + SEES: Adjusted model			
Path: Attitudes → Intentions	.084	.006	[.033; .134]
Path: Perceived behav. control → Intentions	.908	< .001	[.869; .945]
Path: Intentions → Exercise behavior	.294	< .001	[.200; .372]
TPB-I: Intentions R^2	.79	< .001	[.724; .846]
EB: Exercise behavior R^2	.11	< .001	[.068; .163]

Table 4

Standardized Effects (95% Confidence Intervals) for Partial Mediation Model 4

Model 4: TPB+SEES: Adjusted model			
	Dependent variables		
	SEES-PWB: Positive well-being	EB: Exercise behavior	
		Indirect effect	Direct effect
TPB-I: Intentions	.198** [.109; .309]	.019** [.002; .039]	.294** [.200; .372]
SEES-PWB: Positive well-being			.098* [.011; .186]
R^2	.04** [.012;.096]		.11** [.068; .163]

* $p < .05$; ** $p < .01$

Note: the confidence intervals are presented in straight brackets.

Discussion

Research has demonstrated that it is easier to explain people's intention to exercise than their actual exercise behavior (Armitage, 2005; Hagger et al., 2002; Wang, & Zhang, 2015), a finding often referred to as the "intention-behavior gap" (Sheeran, 2002). This study attempted to address this problem by analyzing the frequency of exercise behavior over a three-month period and by including a broad set of variables from the Theory of Planned Behavior, the Health Action Process Approach, and the Subjective Exercise Experiences Scale in the prediction of exercise behavior.

Hypothesis 1 proposed that the TPB would predict exercise intentions better than it would predict exercise behavior (Figure 1). The results partially confirmed this hypothesis. The model predicted exercise intentions better than it predicted exercise behavior, but not all paths were statistically significant when using the original TPB model in predicting exercise behavior, as demonstrated by the tested Model 1 for the original TPB. More specifically, the direct paths from subjective norms to intention and from perceived behavioral control to exercise behavior were removed, leading to adjusted Model 2 of the TPB. This adjusted model of the TPB indicated that attitudes and perceived behavioral control explained 82% of the variance in exercise intentions and 10% of the variance related to exercise behavior, supporting hypothesis 1.

The results of hypothesis 1 also supported that positive evaluations regarding exercise (i.e., favorable attitude) are good predictors of exercise intentions, as demonstrated by other studies (Courneya, 1995; Courneya, Nigg, & Estabrooks, 1998; Godin, 1993, 1994). In our original Model 1 of the TPB, perceived behavioral control was a significant and strong predictor of exercise intentions but not of exercise behavior, contrary to the results from other studies (Hagger et al., 2002; Hausenblas, Carron, & Mack, 1997). Little evidence exists regarding the predictive value of perceived behavioral control in explaining physical activity. In one of the first studies on this subject, Armitage (2005) tested whether the TPB model predicted actual participation in physical activity for a period of 12 weeks. In addition to the finding that the TPB model explained much more of the variance in behavioral intention (49%) than of that in actual behavior (22%), the main conclusion of Armitage' study was that, for the first time, the TPB demonstrated the ability to predict not only intention to exercise but also actual behavior. This result was particularly relevant to perceived behavioral control, which was the only significant independent predictor of actual behavior. In our case, major differences were also found in the explained variance of intention and exercise behavior, but perceived behavioral control was a stronger predictor of intention to engage in exercise than of exercise behavior. The subjective norms measure was removed from Model 1 of the TPB because it did not predict exercise intentions. Some research has addressed the low potential impact of subjective norms on predicting exercise behavior, which shows that attitudes and perceived behavioral control are better predictors of intention (Armitage & Conner, 2001; Hagger et al., 2002; McEachan et al., 2011) and exercise behavior than subjective norms. The weak influence of subjective norms on intention supports Ajzen's notion that behavioral intentions are influenced more by the person's attitudes and perceptions of control than by the perceptions of pressure or encouragement from others (1991, 2011). Because all of the participants included in our study were already exercising regularly, their attitudes toward exercise and perceived control over exercise were likely to be more important than the influence and support of other people. Finally, the adjusted TPB (Model 2) predicted 10% of the variance of exercise behavior. These results suggest that the adjusted TPB explained exercise intentions better (values above 80%) than it explained exercise behavior, which suggests that positive attitudes and intentions toward exercise are not necessarily converted into exercise behavior (Chatzisarantis & Hagger, 2005; Kor & Mullan, 2011). This discrepancy in the explained variance of intention and exercise behavior in our study is consistent with previous research (Armitage & Conner, 2001; McEachan et al., 2011; Mohiyeddini et al., 2009) and confirms the weaker ability of the TPB to predict exercise behavior compared to predicting intention to exercise ("the intention-behavior gap"). For example, Hagger et al.'s (2002) meta-analysis of 72 studies indicated that the TPB predicted 45% of the variance in intentions but only 27% of the variance in exercise behavior. In our study, these values were more extreme (higher for intention, with values of approximately 80% of explained variance, and lower for exercise behavior, with values of approximately 10% of explained variance). Therefore, exploring additional variables that can explain this intention-behavior gap remains a central concern for future research.

The second hypothesis of this study was that variables from the HAPA and SEE would mediate the intention–exercise behavior relation (Figure 2). This hypothesis was not supported by a test of the overall model (Model 3), leading us to remove all non-significant variables, thereby developing Model 4. This model achieved acceptable fit and suggests that positive well-being mediated the relation between intention and exercise behavior.

In Model 3, planning failed to mediate the relation between intention and behavior; therefore, it was removed from Model 4. This finding is inconsistent with some previous research that suggests that planning can indeed mediate intentions and behavior (Conner, Sandberg, & Norman, 2010; Mistry, Sweet, Latimer-Cheung, & Rhodes, 2015; Sniehotta et al., 2005; Wiedemann, Schüz, Sniehotta, Scholz, & Schwarzer, 2009) and that planning can be involved in the behavior of exercise practice (Barg et al., 2012; Gellert et al., 2012; Prestwich et al., 2012). However, these promising results are not evident in regard to explaining the implementation of intentions regarding the target behavior, and substantial heterogeneity exists in the effect sizes across studies and in studies that involved longer-term follow-up measures of behavioral outcomes (Hagger & Luszczynska, 2014). In our case, perhaps the adoption of three months as the time frame for exercise behavior can also help explain the lower potential value of planning in explaining the practice of exercise.

Among the emotional and subjective experience variables, only positive well-being mediated the relation between exercise intentions and exercise behavior, representing 11% of the variance in exercise behavior (see Model 4). The introduction of this variable into the relation between intention and exercise behavior did not substantially increase the explained variance of exercise behavior because Model 2 of the adjusted TPB already explained 10% of the variance of exercise behavior (which means that positive well-being led to an increase of 1% in explained variance). This finding is not consistent with other research that has found that affective experiences and emotions can influence the relation between intention and exercise behavior (Marttila & Nupponen, 2000; Zhu & Thagard, 2002). For example, in a longitudinal study with a community sample, Mohiyeddini et al. (2009) found that the emotions associated with the intention to exercise explained 17% of the variance of exercise frequency and 20% of the exercise duration above the variance initially explained by the TPB.

Considering all of the results, the modified TPB, incorporating variables from the HAPA and SEE, was not a powerful predictor of exercise behavior. One possible explanation for this result may be related to the three-month difference between the time we administered the psychological measures (which included all the theoretical constructs) and the time we assessed the frequency of exercise. This period of time is considerably longer than the several week periods employed in most studies (e.g., Conner, Sheeran, Norman, & Armitage, 2000; McEachan et al., 2011; Mistry et al., 2015). Better matches and higher relations between measures may be more likely to occur over a period of weeks than over a period of several months. However, an extended time of evaluation is critical if we want to understand how exercise behavior can become part of people's daily routines.

In summary, our findings are consistent with the results of most other studies in suggesting that the TPB is a good predictor of exercise intentions (particularly of the perceived behavioral control dimension) but not a good predictor of actual exercise behavior. The results for the explained variance of exercise behavior were not substantial even when we included the HAPA and SEE dimensions to mediate the intention–exercise behavior relation, with the exception of the positive well-being dimension, which assumed to be a mediating variable between intention and exercise behavior. The implications of these results for future research are that we should not only attempt to understand exercise behavior by using the TPB as a theoretical framework and by accommodating new variables to explain the relation between intention and exercise behavior but that we should also use broader theoretical approaches that test new hypotheses to explain human behavior in specific contexts of human action (Sniehotta, Presseau, & Araújo-Soares, 2014). This is the case of Integrated Behavior Change Model (Hagger & Chatzisarantis, 2014) that integrates hypotheses from social-cognitive, motivational, dual-phase, and dual-systems theories, putting together perspectives from intentional, motivational, volitional, and dual-systems theories into a unified model.

This option can introduce new explanations of exercise behavior that help people to change their behavior and that help health professionals to design effective strategies to promote active lifestyles.

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