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Adaptation and Psychometric Properties of the Behavioral Regulation in Exercise Questionnaire (BREQ-3) for Motivation Towards Incidental Physical Activity

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Abstract: This study aimed to adapt and analyze the psychometric properties of the Exercise Behavior Regulation Questionnaire (BREQ-3) for assessing motivation towards incidental physical activity. An instrumental study in a sample of 346 university students (21.1 ± 2.6 years, and 61.3% women) from various universities in Chile was undertaken. An adaptation of the BREQ-3 was applied, and a confirmatory factor analysis was performed using a robust weighted least squares estimator to assess the construct validity of the scale. Also, the convergent validity was evaluated using the average variance extracted, the discriminant validity using composite reliability, and the internal consistency using Cronbach's alpha (α) and McDonald's omega (ω) coefficients. The six-factor structure of intrinsic motivation ($\alpha = 0.96$, $\omega = 0.96$), integrated regulation ($\alpha = 0.95$, $\omega = 0.95$), identified regulation ($\alpha = 0.89$, $\omega = 0.90$), introjected regulation ($\alpha = 0.75$, $\omega = 0.77$), external regulation ($\alpha = 0.80$, $\omega = 0.83$), and amotivation ($\alpha = 0.75$, $\omega = 0.79$), with acceptable fit indices after eliminating items 8 and 11, was confirmed—χ^2/df: 2.196, CFI: 0.99, TLI: 0.99, RMSEA: 0.059 (90% CI; 0.051–0.067). Adaptation of the BREQ-3 appears to be a reliable measure for assessing motivation in the context of incidental physical activity. Its use will contribute to understanding the explanatory mechanisms underlying this behavior.

Keywords: BREQ-3; psychometric properties; factor analysis; reliability; incidental physical activity; self-determination theory

1. Introduction

Currently, approximately 31.3% of the adult population worldwide and 32.3% in Chile (Strain et al., 2024) do not meet the physical activity recommendations of the World Health Organization (Bull et al., 2020). The benefits of increasing physical activity include improved health and well-being (Dempsey et al., 2021; Díaz-Martínez et al., 2018; Kraus et al., 2019; Lacombe et al., 2019; Zhao et al., 2020). So, promoting physical activity is a public health priority (Stanaway et al., 2018; World Health Organization, 2018).

In this sense, understanding the factors that influence and predict physical activity behavior is of broad interest to the scientific community. In particular, motivational factors have been widely addressed (Owen et al., 2014; Howard et al., 2021; Manninen et al., 2022; Teixeira et al., 2012) using the self-determination theory as one of the theoretical references (Deci & Ryan, 1985).

1.1. Theory of Self-Determination

Self-determination theory has been used to explain a wide variety of human behaviors in different contexts, including work (Gagné & Deci, 2005; Henning et al., 2019), education (Manganelli et al., 2019; Reeve & Cheon, 2021; Stupnisky et al., 2019), health (Gillison et al., 2019; Ntoumanis et al., 2021), sports (Chan et al., 2020; Hagger & Chatzisarantis, 2007; Standage et al., 2019), and also for physical exercise (Hagger & Chatzisarantis, 2008; Hancox et al., 2018).

This theory points out that motivation is seen as a continuum of self-determination. At one end of this continuum is amotivation or demotivation, understood as the absence of intention towards a specific behavior. At the other extreme is intrinsic motivation, where an activity is performed because there is a natural incentive to act due to the internal satisfaction derived from that behavior. In intrinsic motivation, activity is pleasurable in itself, and its interest and enjoyment are inherent (Deci & Ryan, 1985, 2000; Ryan & Deci, 2020).

A third form of motivation, extrinsic motivation, lies between amotivation and intrinsic motivation. Extrinsic motivation involves engaging in an activity to obtain some outcome separate from the activity itself, as it presents instrumentally manipulated and goal-oriented incentives to carry out the behavior. Four forms of extrinsic motivation, called regulations, are given below in order of the least to the highest degree of self-determination: external regulation, introjected regulation, identified regulation, and integrated regulation (Deci & Ryan, 1985; Ryan & Deci, 2020).

External regulation refers to behaviors driven by external rewards. Introjected regulation is a partially internalized form of self-regulation where people engage in activities motivated by internal rewards, punishments, self-esteem, or ego. In identified regulation, people consciously identify with the value of an activity and, therefore, experience a high degree of desire, willingness, or willingness to act. In integrated regulation, people not only recognize and identify the value of the activity but also find it to be congruent with their interests and values (Ryan & Deci, 2020).

Based on the self-determination theory, instruments have been developed that allow the theoretical evaluation of the relationship between motivation and different types of physical activity, such as physical exercise or sport. These instruments have been updated in more comprehensive versions over the years and have been translated into several languages to expand their use. These include the Perceived Locus of Causation Questionnaire (Ryan & Connell, 1989), the Behavioral Regulation in Sport Questionnaire (Lonsdale et al., 2008), and the Exercise Behavioral Regulation Questionnaire (BREQ) (Mullan et al., 1997).

1.2. Behavioral Regulation in Exercise Questionnaire (BREQ)

The Behavioral Regulation in Exercise Questionnaire (BREQ) was developed by Mullan et al. (1997) to assess levels of motivation towards physical exercise based on self-determination theory (Mullan et al., 1997). In its first version, it opted for a 15-item model grouped into four factors with adequate model fit indices (χ^2 = 277.19, $p < 0.001$, root mean square error of approximation or RMSEA = 0.07) and internal consistency using Cronbach's alpha (external regulation = 0.79, introjected regulation = 0.78, identified regulation = 0.79, intrinsic motivation = 0.90). This first version did not consider the dimension of amotivation because it was statistically problematic and left out integrated regulation (Mullan et al., 1997). In this way, the model consisted of the dimensions of external regulation, introjected regulation, identified regulation, and intrinsic motivation (Mullan et al., 1997). Although some evidence of validity was observed for this first version of the BREQ, the exclusion of the dimension of amotivation remained incongruent with the taxonomy of motivation based on self-determination theory.

Subsequently, a second version of the BREQ (BREQ-2) developed by Markland and Tobin (2004) of 19 items grouped into five factors incorporated the dimension of amotivation. The BREQ-2 presented an excellent fit of the model to the data (χ^2 (125) = 136.49, p = 0.23, RMSEA = 0.02, comparative fit index or CFI = 0.95, Tucker–Lewis indices or TLI = 0.94, standardized root mean square residual or SRMR = 0.05), and also an internal consistency at acceptable levels (Markland & Tobin, 2004). The original BREQ-2 demonstrated satisfactory evidence of construct validity in English for university students (D'Abundo et al., 2014), and also for its translations in different languages in the general population (Costa et al., 2018; Liu et al., 2015; Moustaka et al., 2010).

A third version of the questionnaire (BREQ-3) was developed to resolve the conceptual discrepancy between self-determination theory and BREQ by including integrated regulation. However, this new version initially left out the dimension of amotivation (Wilson et al., 2006). It was then that González-Cutre et al. (2010) expanded on the work done by Wilson et al. (2006) and by Markland and Tobin (2004), developing the BREQ-3 in Spanish with the inclusion of the dimension of motivation. In this way, the BREQ-3 in Spanish comprised 23 items grouped into six dimensions that covered the continuum of self-determination from amotivation to intrinsic motivation (González-Cutre et al., 2010). The BREQ-3 in Spanish presented adequate fit indicators—χ^2 (215) = 689.13, $p < 0.001$; χ^2/df = 3.20; CFI = 0.91; RMSEA = 0.06; SRMR = 0.06 (González-Cutre et al., 2010). The BREQ-3 has been adapted and validated in countries such as Germany, Brazil, China, and Italy, where it has presented acceptable adjustment indices and invariance across gender and age (Cavicchiolo et al., 2022; Cid et al., 2018; Cocca et al., 2024; Luo et al., 2022). The BREQ-3 has evidence of application in the adult population in Chile (Jofré-Saldía et al., 2023; Mella-Norambuena et al., 2020; Reyes-Molina et al., 2023), having an adequate internal consistency for university students (Mella-Norambuena et al., 2020).

1.3. BREQ-3 and Incidental Physical Activity

BREQ was designed for use in physical exercise, that is, a planned, structured, repetitive physical activity that aims to improve physical fitness (Caspersen et al., 1985; Ferguson, 2014). However, there are other types of less structured physical activities, such as incidental physical activity, which have growing evidence of a positive association with indicators of physical health and well-being (Ahmadi et al., 2023; Raisi et al., 2024; Stamatakis et al., 2022, 2023; Wu et al., 2022) in addition to a higher adherence rate over time than physical exercise (Chung et al., 2018; Levine, 2007; Mak et al., 2011). Incidental physical activity is characterized as physical activity of daily living, performed at home, at work or study, or during leisure time, that does not require additional time or have recreational or physical

health purposes (e.g., climbing stairs, active transportation, standing, shopping, household chores, occupational, physical activity, among others.) (Reynolds et al., 2014; Stamatakis et al., 2019, 2021).

Adaptations of motivational instruments have been made for the study of incidental physical activity (Niven & Markland, 2016; Oliver & Kemps, 2018). In particular, Oliver and Kemps adapted the Perceived Locus of Causality Questionnaire (Ryan & Connell, 1989) and found that both more self-determined motivations and introjected and external regulations predicted levels of incidental physical activity in a group of college students. Another study adapted the BREQ-3 to analyze motivation in walking behavior, which is considered a sub-behavior of incidental physical activity. The results showed negative relationships with amotivation and external regulation, no relationship with introjection, and positive relationships with identified and intrinsic regulation (Niven & Markland, 2016). However, according to the empirical review carried out, there are no published studies that have adapted the BREQ-3 to measure motivation towards incidental physical activity. Having an instrument such as the BREQ-3 to assess incidental physical activity would allow us to understand the motivational factors underlying this type of physical activity, as well as to generate scientific evidence from various populations from different cultural backgrounds.

With the above background, this study aimed to adapt and analyze the psychometric properties of the Exercise Behavior Regulation Questionnaire (BREQ-3) for assessing motivation towards incidental physical activity.

2. Materials and Methods

2.1. Design

A quantitative approach was followed with an instrumental study design (Ato et al., 2013) developed from the cross-sectional survey method (Creswell, 2012) through collecting information at a single point in time. This study followed the recommendations for validating psychometric instruments in social and health sciences (López-Pina & Veas, 2024).

2.2. Participants

Through a non-probabilistic convenience sampling, 346 university students were recruited, aged between 18 and 34 years (mean 21.1 $\pm$ 2.6 years; 61.3% women), from 11 universities in different regions of Chile. Of these, 54% (n = 188) practiced sports or physical exercise at least once a week. The inclusion criterion was to be a regular undergraduate student in a higher education institution. No exclusion criteria related to physical exercise, level of physical activity, or other factors were applied since the study focused on motivation toward incidental physical activity. This type of activity corresponds to activities of daily living carried out by both people who practice physical exercise and those who do not.

All participants were informed about the general purpose of the study and their rights to anonymity and confidentiality. They agreed to participate in the study by signing informed consent forms before answering the questionnaire.

2.3. Instruments

The third version of the Exercise Behavior Regulation Questionnaire was adapted to Spanish (BREQ-3) (González-Cutre et al., 2010; Wilson et al., 2006). The BREQ-3, in its Spanish version, is composed of 23 items grouped in six dimensions, which evaluate amotivation, external regulation, introjected, identified, integrated, and intrinsic motivation (González-Cutre et al., 2010; Wilson et al., 2006). All items begin with the statement "I do physical exercise" and are rated on a five-point Likert-type scale, ranging from "0" (not true at all) to "4" (totally true). Items 4, 12, 18, and 22 correspond to the dimension

of intrinsic motivation (example item, "because I think exercise is fun"); items 5, 10, 15, and 20 for integrated regulation (example item, "because it is in accordance with my way of life"); items 3, 9, and 17 for identified regulation (example item, "because I value the benefits of physical exercise"); items 2, 8, 16, and 21 for introjected regulation (example item, "because I feel guilty when I do not practice it"); items 1, 7, 13, and 19 for external regulation (example item, "because others tell me I should do it"); and items 6, 11, 14, and 23 for amotivation (example item, "I do not see why I have to"). The BREQ-3 scale, initially in English, has been adapted and validated in countries such as Brazil, Italy, and Spain, with psychometric properties that indicate acceptable fit indices and that corroborate its six-dimensional factor structure and with invariance across gender and age (Cavicchiolo et al., 2022; Cid et al., 2018; González-Cutre et al., 2010). In university students in Chile, internal consistency was reported with Cronbach's alpha values of $\alpha = 0.87$ for intrinsic motivation, $\alpha = 0.87$ for integrated regulation, $\alpha = 0.66$ for identified regulation, $\alpha = 0.72$ for introjected regulation, $\alpha = 0.78$ for external regulation, and $\alpha = 0.70$ for amotivation (Mella-Norambuena et al., 2020).

2.4. Procedure

First, permission was requested from the corresponding author of the BREQ-3 in its Spanish version to adapt the instrument, and who gave his consent for its free use. Next, the adaptation process began, which included adding a statement to the instructions of the original questionnaire, with the purpose of placing the university students in the context of the incidental physical activities of daily life, which they had to keep in mind when answering the questionnaire (see Supplementary Tables S1 and S2). Then, the statement "*I do physical activity*" was prefixed to each item, unlike the original questionnaire, where this was only in the instructions. The concept of "*physical exercise*" was replaced throughout the questionnaire by "*physical activity*".

In order to evaluate the adaptations made to the original questionnaire, to verify the correct understanding of the items, and for the relevance of the questionnaire in the context of university students, cognitive interviews were carried out (Smith-Castro & Molina, 2011). The interviews used paraphrasing techniques, in which the interviewer rephrased the question to verify comprehension and clarify meaning, together with specification tests using additional questions, such as how they defined or interpreted certain terms, to explore how the participant arrived at their answer. All of the above had the purpose of detecting problems in the four moments of the question–answer process (comprehension, information retrieval, estimation, and execution) (Smith-Castro & Molina, 2011). Participants for cognitive interviews were selected through convenience sampling among students who met the same inclusion criteria as the study and who also signed the informed consent (Otzen & Manterola, 2017). Eight students from a university in the Biobío region participated, three men and five women, between 18 and 27 years old, from engineering and pedagogy careers. Each interview was audio-recorded, lasted approximately 60 min, and took place at a pre-arranged location. Each student was provided with a laptop so that they could read aloud the questionnaire available on the Google Forms platform while the interviewer (principal investigator) recorded, asked questions, and took notes. The answers submitted by the students to each of the items were analyzed, and the necessary modifications were made where comprehension difficulties were identified. Five out of the eight students expressed doubts or suggestions about one of the 23 items on the questionnaire. This led to light modifications being made in the wording of items 2, 3, 6, 8, 11, 12, 13, 14, 16, 18, and 23 (see Table 1).

Table 1. Modifications were made after the cognitive interview.

Item	Original Questionnaire	Modification
2	Because I feel guilty when I do not practice it.	I do physical activity because I feel guilty when I do not.
3	Because I value the benefits of physical exercise.	I do physical activity because I value the benefits of doing it.
6	I do not see why I have to.	I do physical activity, but I do not see why I have to do it.
8	Because I feel embarrassed if I miss the session.	I do physical activity, but I do not see why I have to do it.
11	I do not see why I have to bother exercising.	I do physical activity, but I do not see why I have to bother doing it.
12	Because I enjoy exercise sessions.	I do physical activity because I enjoy doing it.
13	Because other people will not be happy with me if I do not exercise.	I do physical activity because other people will not be happy with me if I do not do physical activity.
14	I do not see the point of exercising.	I do physical activity, but I do not see the point of doing physical activity.
16	Because I feel like I have failed when I have not exercised for a while.	I do physical activity because I feel that I have failed when I have not done physical activity for a while.
18	Because I find exercise an enjoyable activity.	I do physical activity because I find it to be an enjoyable activity.
23	I think exercising is a waste of time.	I do physical activity, but I think that doing it is a waste of time.

After these modifications, the online questionnaire was applied to university students from all over Chile through the snowball method. The link to access the questionnaire hosted on the Google Forms platform was open access, and the research team disseminated it through social networks and emails between November 2023 and June 2024.

2.5. Data Analysis

The first step was to carry out a qualitative analysis through a thematic analysis of the results obtained in the cognitive interviews. The next step, before proceeding with factor analyses, was to review the suitability of the data for analysis. A descriptive analysis of the data showed that there were no missing data. The mean and standard deviation were presented for each item. Then, a confirmatory factor analysis was carried out on the sample of 346 participants. All of this was estimated with the support of the statistical tool R (version 4.4.1), using the packages "psych" and "lavaan". Since the study variables were measured with ordinal scales, a robust weighted least squares estimator (WLSMV) was used (Brown, 2015). To evaluate the fit of the models, chi-square indices (χ^2; expected values $p > 0.05$) were used; the mean square root of approximation error (RMSEA) (which is considered a good fit if it has values less than 0.05–0.08); and the comparative fit index (CFI) and Tucker–Lewis indices (TLI) (where values > 0.95 are expected) (Brown, 2015; Hair et al., 2014) The convergent and discriminant validity of the factors was analyzed using the average variance extracted (AVE) and the composite reliability (CR). The AVE measures the level of variance captured by a construct compared to the variance attributed to measurement error. According to Fornell and Larcker (1981), discriminant validity compares the square root of the AVE with the correlations between latent constructs. A latent construct should explain more variance in itself than the variance shared with other latent constructs. Therefore, the square root of each AVE should be greater than the correlations between the other latent constructs. The recommended cut-off points are 0.50

for the AVE and 0.70 for the CR (Fornell & Larcker, 1981; Hair et al., 2014). Subsequently, Cronbach's alpha and McDonald's omega coefficients were calculated to evaluate the internal consistency of the constructs, where values > 0.70 are expected (Luján Tangarife & Cardona Arias, 2015).

3. Results

Table 2 presents the descriptive statistics for each item and the dimensions assessed in the instrument. The mean, standard deviation (SD), and minimum and maximum values observed (min–max) are reported on a scale from 0 to 4 for each dimension. The item means per dimension show a trend toward higher levels of intrinsic motivation and identified regulation, while external regulation and amotivation are the least predominant.

Table 2. Descriptive statistics by item and by dimension.

Dimension	Item	Mean (SD)	Min–Max
Intrinsic motivation	4	2.52 ± 1.50	0–4
	12	2.49 ± 1.52	0–4
	18	2.54 ± 1.49	0–4
	22	2.42 ± 1.51	0–4
Integrated regulation	5	2.25 ± 1.53	0–4
	10	1.96 ± 1.62	0–4
	15	1.91 ± 1.65	0–4
	20	1.95 ± 1.55	0–4
Identified regulation	3	2.65 ± 1.39	0–4
	9	2.41 ± 1.50	0–4
	17	2.36 ± 1.46	0–4
Introjected regulation	2	1.14 ± 1.29	0–4
	8	0.57 ± 1.03	0–4
	16	1.11 ± 1.35	0–4
	21	0.84 ± 1.22	0–4
External regulation	1	0.47 ± 0.89	0–4
	7	0.39 ± 0.84	0–4
	13	0.28 ± 0.75	0–4
	19	0.27 ± 0.69	0–4
Amotivation	6	0.38 ± 0.86	0–4
	11	0.75 ± 1.18	0–4
	14	0.25 ± 0.71	0–4
	23	0.23 ± 0.67	0–4

SD: standard deviation.

3.1. Confirmatory Factor Analysis

The original model of the BREQ-3 questionnaire, which consists of six factors, was evaluated. Then, a second model was evaluated, excluding items 8 and 11, because the residue analysis showed a high residual relationship between these two items (>0.05). Both models presented a significant chi-square (χ^2), which indicates a significant difference between the expected and observed covariance matrix, suggesting that the models proposed in both cases do not correctly represent the relationships between the observed variables. However, the CFI and TLI values are appropriate. Model 2 also presented a χ^2/df and RMSEA in adequate ranges, with values lower than three and 0.08, respectively, which indicates a better fit (see Table 3).

Table 3. Adjustment of the models of the Regulation of Behavior in Exercise Questionnaire (BREQ-3) analyzed.

Model	χ^2	χ^2/df	CFI	TLI	RMSEA
Model 1: Six factors	781.58 *	3.635	0.99	0.99	0.087 (IC 90%; 0.081–0.094)
Model 2: Six factors without items 8 and 11	382.18 *	2.196	0.99	0.99	0.059 (IC 90%; 0.051–0.067)

χ^2: chi-square; df: degree of freedom; CFI: comparative adjustment index; TLI: Tucker–Lewis index; RMSEA: mean square root of approximation error. * p-value < 0.001.

3.2. Convergent and Discriminant Validity

The convergent and discriminant validity indicators show that in both models, the average variance extracted (AVE) is adequate for the factors of intrinsic motivation and integrated and identified regulation since it exceeds the threshold of 0.50. However, amotivation has a PAVE lower than 0.50 in Model 1 (AVE = 0.35). The modification in Model 2, which excludes items 8 and 11, improves the AVE of amotivation (AVE = 0.51), reaching an adequate value. The composite reliability (CR) in both models is acceptable for all factors, except for the amotivation factor in Model 1, with a CR lower than 0.7 (CR = 0.67), which, after modification in Model 2, improves to acceptable values (CR = 0.75) (see Table 4).

Table 4. Indicators of convergent and discriminant validity and internal consistency.

	Model	AVE	CR	α	ω
Model 1	Intrinsic motivation	0.86	0.96	0.96	0.96
	Integrated regulation	0.84	0.95	0.95	0.95
	Identified regulation	0.75	0.90	0.89	0.90
	Introjected regulation	0.50	0.80	0.79	0.82
	External regulation	0.51	0.81	0.80	0.83
	Amotivation	0.35	0.67	0.68	0.73
Model 2	Intrinsic motivation	0.86	0.96	0.96	0.96
	Integrated regulation	0.84	0.95	0.95	0.95
	Identified regulation	0.75	0.90	0.89	0.90
	Introjected regulation	0.52	0.76	0.75	0.77
	External regulation	0.51	0.80	0.80	0.83
	Amotivation	0.51	0.75	0.75	0.79

AVE: average extracted variance; CR: composite reliability; α: Cronbach's alpha; ω: McDonald's omega.

3.3. Internal Consistency Analysis

The internal consistency in both models presents adequate values of Cronbach's alpha (α) and McDonald's omega (ω) for the factors of intrinsic motivation and integrated and identified regulation, with values above 0.90. In Model 2, the internal consistency indicators for the amotivation factor improve compared to Model 1, reaching an α = 0.75 and ω = 0.79, respectively (see Table 4).

The six-factor Model 2 was chosen without items 8 and 11 since it shows a robust fit, with good indices of χ^2/df, CFI, TLI, and RMSEA. In addition, the model showed adequate convergent and discriminant validity, with AVE and CR in acceptable values for all its dimensions. Internal consistency was also strong, with α and ω values ranging from good (>0.60) to excellent (>0.90). All items had factor loads greater than 0.60, and most exceeded 0.80, except for item 1 (0.75), item 2 (0.63), and item 6 (0.73). Intrinsic motivation, integrated regulation, and identified regulation showed high correlation with each other, with values equal to or greater than 0.90, as well as a low correlation with the introjected regulation factor, and a low and negative correlation with external regulation and amotivation (see Figure 1).

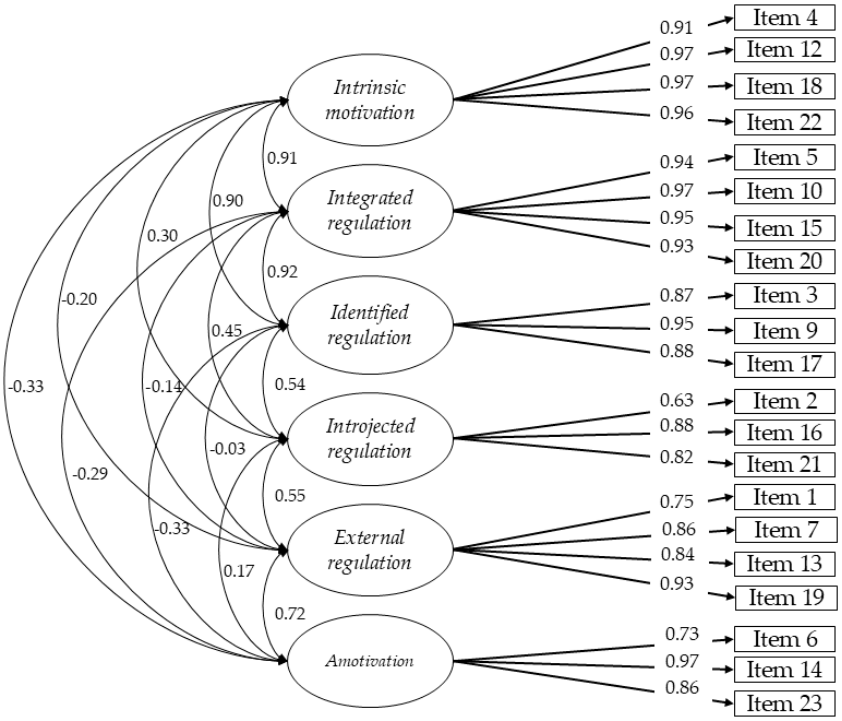


Figure 1. Diagram of the multifactorial structure of the version of the BREQ-3 for motivation towards incidental physical activity.

4. Discussion

This research aimed to adapt and analyze the BREQ-3 psychometric properties for the assessment of motivation towards incidental physical activity. Confirmatory factor analysis supported the six-factor structure corresponding to the dimensions of intrinsic motivation, integrated regulation, identified regulation, introjected regulation, external regulation, and amotivation of the original BREQ-3 model in its Spanish version (González-Cutre et al., 2010). These findings are in line with validation studies and psychometric properties of BREQ-3 in other languages and population groups, where the six-factor model has been shown to be a good fit for the data (Cavicchiolo et al., 2022; Cid et al., 2018; González-Cutre et al., 2010; Guedes & Sofiati, 2015; Luo et al., 2022).

The adjustment indices of the adaptation of the BREQ-3 that we proposed to study the motivation towards incidental physical activity, after eliminating items 8 and 11, were similar to those of the Spanish version of the BREQ-3 by González-Cutre et al. (2010) —$\chi^2 = 215$, $p < 0.001$, $\chi^2/df = 3.20$; CFI = 0.91; TFI = 0.91; RMSEA = 0.06. It is important to note that the version of the BREQ-3 by González-Cutre et al. (2010) was applied to a sample composed of practitioners from various exercise contexts, while in the present study, the sample consisted of university students, both those who practiced sports or exercised (54%) and those who did not. In this sense, the original version of the BREQ-3 was designed to assess motivation towards physical exercise (González-Cutre et al., 2010; Wilson et al., 2006), although it may share types of motivation with incidental physical activity (Lindwall et al., 2017; O'Dougherty et al., 2010), which refer to activities with a different purpose and context. This could explain some of the differences found in the initial fit of the model in the adaptation we proposed, especially with item 8 ("I do the physical activity because I feel embarrassed if I do not do it"), belonging to the dimension of amotivation, and item 11 ("I do physical activity, but I do not see why I have to bother doing it") of the introjected regulation dimension. These items would not fit the context of incidental physical activity, an activity that is part of daily life and is reflected in behaviors such as walking, climbing stairs, doing the toilet, or shopping, among others. In this sense,

the improvement in the convergent and discriminant validity indices (AVE and CR) for the dimension of amotivation, after eliminating the items, confirms this observation.

On the other hand, the correlations between the dimensions of the instrument were consistent with the theory, presenting the most self-determined dimensions, such as intrinsic motivation and integrated and identified regulation, with high correlations with each other. In addition, these more self-determined dimensions showed negative correlations with less self-determined dimensions, such as introjected and external regulation, as well as with amotivation. This pattern of correlations is consistent in the various linguistic adaptations of the BREQ-3 identified in a recent systematic review (Ursino et al., 2023), which supports the multidimensionality of motivation as a continuum of self-determination (Alivernini et al., 2018; Brooks et al., 2018; Luo et al., 2022).

Notably, although the classical six-dimensional taxonomy of motivation is widely used, an alternative classification has been proposed that groups the self-determination continuum into three categories: amotivation, controlled motivation (which includes introjected and external regulation), and autonomous motivation (which includes intrinsic motivation and integrated and identified regulation) (Vansteenkiste et al., 2010). In particular, a study of 825 university students in China showed acceptable fit indices—χ^2 (431) = 808.070, $p < 0.01$; RMSEA = 0.053 (0.047–0.059); CFI = 0.93; TLI = 0.93—and an adequate internal consistency for a three-factor model, in which the items were grouped into the dimensions of amotivation, controlled motivation, and autonomous motivation (Luo et al., 2022) This taxonomy, observed in the research that applied the BREQ-3, could explain the correlations between the dimensions observed in the present study. Other proposals have integrated behavioral regulations as second-order variables in models regrouped into two factors: autonomous and controlled motivation (Brunet et al., 2015; Cid et al., 2012; Howard et al., 2020; Luo et al., 2022). While these measures of motivation have been consistent with the central distinction underlying the self-determination continuum proposed in self-determination theory (Cid et al., 2012), combining the subscales could dismiss the differential consequences associated with each regulation (Howard et al., 2020).

Strengths and Limitations

To our knowledge, this is the first study to explore the psychometric properties of an adaptation of the BREQ-3 for the analysis of motivation towards incidental physical activity. This study reported on the construct, convergent, discriminant validity, and internal consistency of this adaptation of the BREQ-3, making it a reliable and psychometrically suitable scale for use in the context of incidental physical activity. Understanding the different forms of motivation that people experience during exercise can help predict potential outcomes (Hagger et al., 2014). This study contributes significantly to the literature by expanding the instruments available for motivational research, which may facilitate international comparisons.

However, the present study has limitations that must be considered when interpreting its results. First, although sample sizes of more than 200 cases are considered adequate to assess the quality of a test (Ferrando Piera & Anguiano Carrasco, 2010), the optimal conditions suggest having more than 400 cases, which allow exploratory and confirmatory factor analyses to be carried out (Lloret-Segura et al., 2014). Second, the study did not include a measure of incidental physical activity or a re-test in the sample of students to whom the instrument was applied. Therefore, in the present study, there are no indicators of concurrent validity or temporal stability of the adaptation of the BREQ-3. Finally, the version of the BREQ-3 validated in Spanish that was used in this study has 23 items, unlike the English versions of the BREQ-3 adapted to other languages, such as German, Portuguese, and Chinese, which include an additional item in the identified regulation

dimension, adding up to a total of 24 items, with four items per factor (Cid et al., 2018; Cocca et al., 2024; Luo et al., 2022).

Future research should evaluate the psychometric properties of this adaptation of BREQ-3 in larger samples and in populations of various ages and occupations. Its concurrent validity to objective measures of incidental physical activity and the temporal stability of the instrument should also be examined, as well as to determine if this new version of the BREQ-3 maintains the original six-factor structure or if it fits into a three-factor structure corresponding to the dimensions of autonomous motivation, controlled motivation, and amotivation. It would also be desirable to study the psychometric properties of this adaptation, including the fourth item in the identified regulation dimension that was incorporated into the English versions of BREQ-3.

This adaptation of the BREQ-3 will contribute to the research on motivation towards incidental physical activity, where evidence on the psychological mechanisms that explain these behaviors is limited (Levine, 2007; Reynolds et al., 2014; Tudor-Locke et al., 2007). To date, evidence on the psychological factors influencing incidental physical activity has focused primarily on the interaction between the continuum of motivation and implicit processes, such as attitudes, attentional biases, and approach-avoidance mechanisms (Oliver & Kemps, 2018). However, there is literature that describes, for example, how the incorporation of the self-determination continuum into the theory of planned behavior can help explain behaviors related to physical activity (Gómez-Mazorra et al., 2022; Hagger & Chatzisarantis, 2014). It has even been described how the most self-determined motivations mediate between personality traits, the constructs of the theory of planned behavior, and physical activity (Kekäläinen et al., 2022).

5. Conclusions

The present study, which adapted and analyzed the psychometric properties of BREQ-3, provides evidence that it is an adequate measure to assess motivation in the context of incidental physical activity. The confirmatory factor analysis showed a good fit to the six-factor model, supporting the structure corresponding to the dimensions of intrinsic motivation, integrated regulation, identified regulation, introjected regulation, external regulation, and amotivation. Future research should address the limitations of this research, such as sample size and lack of measures of concurrent validity and temporal stability. However, this adaptation of the BREQ-3 offers a valid and reliable tool in the study of the psychological mechanisms underlying motivation towards incidental physical activity, an area that has so far received little attention.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/bs15020114/s1, Table S1: Adaptation of the BREQ-3 Spanish version; Table S2: Adaptation of the BREQ-3 English version.

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References

Ahmadi, M. N., Hamer, M., Gill, J. M. R., Murphy, M., Sanders, J. P., Doherty, A., & Stamatakis, E. (2023). Brief bouts of device-measured intermittent lifestyle physical activity and its association with major adverse cardiovascular events and mortality in people who do not exercise: A prospective cohort study. *The Lancet Public Health*, *8*(10), e800–e810. [CrossRef]

Alivernini, F., Manganelli, S., Cavicchiolo, E., Girelli, L., Biasi, V., & Lucidi, F. (2018). Immigrant background and gender differences in primary students' motivations toward studying. *The Journal of Educational Research*, *111*(5), 603–611. [CrossRef]

Ato, M., López-García, J. J., & Benavente, A. (2013). Un sistema de clasificación de los diseños de investigación en psicología. *Anales de Psicología/Annals of Psychology*, *29*(3), 1038–1059. [CrossRef]

Brooks, J. M., Kaya, C., Chan, F., Thompson, K., Cotton, B. P., Sánchez, J., & Fortuna, K. (2018). Validation of the Behavioural Regulation in Exercise Questionnaire-2 for adults with chronic musculoskeletal pain. *International Journal of Therapy and Rehabilitation*, *25*(8), 395–404. [CrossRef] [PubMed]

Brown, T. A. (2015). *Confirmatory factor analysis for applied research* (2nd ed.). Guilford Publications.

Brunet, J., Gunnell, K. E., Gaudreau, P., & Sabiston, C. M. (2015). An integrative analytical framework for understanding the effects of autonomous and controlled motivation. *Personality and Individual Differences*, *84*, 2–15. [CrossRef]

Bull, F. C., Al-Ansari, S. S., Biddle, S., Borodulin, K., Buman, M. P., Cardon, G., Carty, C., Chaput, J.-P., Chastin, S., Chou, R., Dempsey, P. C., DiPietro, L., Ekelund, U., Firth, J., Friedenreich, C. M., Garcia, L., Gichu, M., Jago, R., Katzmarzyk, P. T., . . . Willumsen, J. F. (2020). World Health Organization 2020 guidelines on physical activity and sedentary behaviour. *British Journal of Sports Medicine*, *54*(24), 1451–1462. [CrossRef] [PubMed]

Caspersen, C. J., Powell, K. E., & Christenson, G. M. (1985). Physical activity, exercise, and physical fitness: Definitions and distinctions for health-related research. *Public Health Reports*, *100*(2), 126–131. [PubMed]

Cavicchiolo, E., Sibilio, M., Lucidi, F., Cozzolino, M., Chirico, A., Girelli, L., Manganelli, S., Giancamilli, F., Galli, F., Diotaiuti, P., Zelli, A., Mallia, L., Palombi, T., Fegatelli, D., Albarello, F., & Alivernini, F. (2022). The psychometric properties of the Behavioural Regulation in Exercise Questionnaire (BREQ-3): Factorial structure, invariance and validity in the Italian context. *International Journal of Environmental Research and Public Health*, *19*(4), 1937. [CrossRef]

Chan, D. K. C., Zhang, L., Lee, A. S. Y., & Hagger, M. S. (2020). Reciprocal relations between autonomous motivation from self-determination theory and social cognition constructs from the theory of planned behavior: A cross-lagged panel design in sport injury prevention. *Psychology of Sport and Exercise*, *48*, 101660. [CrossRef]

Chung, N., Park, M.-Y., Kim, J., Park, H.-Y., Hwang, H., Lee, C.-H., Han, J.-S., So, J., Park, J., & Lim, K. (2018). Non-exercise activity thermogenesis (NEAT): A component of total daily energy expenditure. *Journal of Exercise Nutrition & Biochemistry*, *22*(2), 23. [CrossRef]

Cid, L., Monteiro, D., Teixeira, D., Teques, P., Alves, S., Moutão, J., Silva, M., & Palmeira, A. (2018). The Behavioral Regulation in Exercise Questionnaire (BREQ-3) Portuguese-version: Evidence of reliability, validity and invariance across gender. *Frontiers in Psychology*, *9*, 1940. [CrossRef] [PubMed]

Cid, L., Moutão, J., Leitão, J., & Alves, J. (2012). Behavioral regulation assessment in exercise: Exploring an autonomous and controlled motivation index. *The Spanish Journal of Psychology*, *15*(3), 1520–1528. [CrossRef]

Cocca, A., Kopp, M., Greier, K., Labek, K., Cocca, M., & Ruedl, G. (2024). Validity, reliability, and invariance across sex of a German version of the Behavioral Regulation in Exercise Questionnaire. *Frontiers in Psychology*, *15*, 1355928. [CrossRef]

Costa, R., Probst, M., Bastos, T., Vilhena, E., Seabra, A., & Corredeira, R. (2018). Behavioural Regulation in Exercise Questionnaire in people with schizophrenia: Construct validity of the Portuguese versions. *Disability and Rehabilitation*, *40*(21), 2577–2584. [CrossRef]

Creswell, J. W. (2012). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research*. Pearson.

D'Abundo, M. L., Sidman, C. L., Milroy, J., Orsini, M., & Fiala, K. (2014). Construct validity of college students' responses to the Behavioral Regulation in Exercise Questionnaire (BREQ-2). *Recreational Sports Journal*, *38*(1), 40–49. [CrossRef]

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior* (1st ed.). Springer. [CrossRef]

Deci, E. L., & Ryan, R. M. (2000). The «What» and «Why» of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry*, *11*(4), 227–268. [CrossRef]

Dempsey, P. C., Friedenreich, C. M., Leitzmann, M. F., Buman, M. P., Lambert, E., Willumsen, J., & Bull, F. (2021). Global public health guidelines on physical activity and sedentary behavior for people living with chronic conditions: A call to action. *Journal of Physical Activity & Health*, *18*(1), 76–85. [CrossRef]

Díaz-Martínez, X., Petermann, F., Leiva, A. M., Garrido-Méndez, A., Salas-Bravo, C., Martínez, M. A., Labraña, A. M., Duran, E., Valdivia-Moral, P., Zagalaz, M. L., Poblete-Valderrama, F., Alvarez, C., Celis-Morales, C., Díaz-Martínez, X., Petermann, F., Leiva, A. M., Garrido-Méndez, A., Salas-Bravo, C., Martínez, M. A., . . . Celis-Morales, C. (2018). No cumplir con las recomendaciones de actividad física se asocia a mayores niveles de obesidad, diabetes, hipertensión y síndrome metabólico en población chilena. *Revista médica de Chile*, *146*(5), 585–595. [CrossRef] [PubMed]

Ferguson, B. (2014). ACSM's guidelines for exercise testing and prescription 9th ed. 2014. *The Journal of the Canadian Chiropractic Association*, *58*(3), 328.

Ferrando Piera, P. J., & Anguiano Carrasco, C. (2010). El análisis factorial como técnica de investigación en psicología. *Papeles del psicólogo*, *31*(1), 18–33.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, *18*(1), 39–50. [CrossRef]

Gagné, M., & Deci, E. L. (2005). Self-determination theory and work motivation. *Journal of Organizational Behavior*, *26*(4), 331–362. [CrossRef]

Gillison, F. B., Rouse, P., Standage, M., Sebire, S. J., & Ryan, R. M. (2019). A meta-analysis of techniques to promote motivation for health behaviour change from a self-determination theory perspective. *Health Psychology Review*, *13*(1), 110–130. [CrossRef]

González-Cutre, D., Sicilia, Á., & Fernández, A. (2010). Hacia una mayor comprensión de la motivación en el ejercicio físico: Medición de la regulación integrada en el contexto español. *Psicothema*, *22*(4), 841–847. [PubMed]

Gómez-Mazorra, M., Reyes-Amigo, T., Torres, H. G. T., Sánchez-Oliva, D., & Labisa-Palmeira, A. (2022). Actividad física en tiempo libre en estudiantes universitarios y transición escolar a la universidad desde las teorías de comportamiento: Una revisión sistemática. *Retos*, *43*, 699–712. [CrossRef]

Guedes, D., & Sofiati, S. (2015). Tradução e validação psicométrica do Behavioral Regulation in Exercise Questionnaire para uso em adultos brasileiros. *Revista Brasileira de Atividade Física & Saúde*, *20*(4), 397–412. [CrossRef]

Hagger, M., & Chatzisarantis, N. (2008). Self-determination theory and the psychology of exercise. *International Review of Sport and Exercise Psychology*, *1*(1), 79–103. [CrossRef]

Hagger, M. S., & Chatzisarantis, N. L. D. (Eds.). (2007). *Intrinsic motivation and self-determination in exercise and sport* (1st ed.). Human Kinetics.

Hagger, M. S., & Chatzisarantis, N. L. D. (2014). An integrated behavior change model for physical activity. *Exercise and Sport Sciences Reviews*, *42*(2), 62–69. [CrossRef] [PubMed]

Hagger, M. S., Hardcastle, S. J., Chater, A., Mallett, C., Pal, S., & Chatzisarantis, N. L. D. (2014). Autonomous and controlled motivational regulations for multiple health-related behaviors: Between- and within-participants analyses. *Health Psychology and Behavioral Medicine*, *2*(1), 565–601. [CrossRef] [PubMed]

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2014). PLS-SEM: Indeed a silver bullet. *Journal of Marketing Theory and Practice*, *19*(2), 139–152. [CrossRef]

Hancox, J. E., Quested, E., Ntoumanis, N., & Thøgersen-Ntoumani, C. (2018). Putting self-determination theory into practice: Application of adaptive motivational principles in the exercise domain. *Qualitative Research in Sport, Exercise and Health*, *10*(1), 75–91. [CrossRef]

Harriss, D. J., Jones, C., & MacSween, A. (2022). Ethical standards in sport and exercise science research: 2022 update. *International Journal of Sports Medicine*, *43*(13), 1065–1070. [CrossRef] [PubMed]

Henning, G., Stenling, A., Tafvelin, S., Hansson, I., Kivi, M., Johansson, B., & Lindwall, M. (2019). Preretirement work motivation and subsequent retirement adjustment: A self-determination theory perspective. *Work Aging and Retirement*, *5*(2), 189–203. [CrossRef]

Howard, J. L., Bureau, J., Guay, F., Chong, J. X. Y., & Ryan, R. M. (2021). Student motivation and associated outcomes: A meta-analysis from self-determination theory. *Perspectives on Psychological Science*, *16*(6), 1300–1323. [CrossRef] [PubMed]

Howard, J. L., Gagné, M., Van den Broeck, A., Guay, F., Chatzisarantis, N., Ntoumanis, N., & Pelletier, L. G. (2020). A review and empirical comparison of motivation scoring methods: An application to self-determination theory. *Motivation and Emotion*, *44*(4), 534–548. [CrossRef]

Jofré-Saldía, E., Villalobos-Gorigoitía, Á., Cofré-Bolados, C., Ferrari, G., & Gea-García, G. M. (2023). Multicomponent training in progressive phases improves functional capacity, physical capacity, quality of life, and exercise motivation in community-dwelling older adults: A randomized clinical trial. *International Journal of Environmental Research and Public Health*, *20*(3), 2755. [CrossRef] [PubMed]

Kekäläinen, T., Tammelin, T. H., Hagger, M. S., Lintunen, T., Hyvärinen, M., Kujala, U. M., Laakkonen, E. K., & Kokko, K. (2022). Personality, motivational, and social cognition predictors of leisure-time physical activity. *Psychology of Sport and Exercise*, *60*, 102135. [CrossRef]

Kraus, W. E., Powell, K. E., Haskell, W. L., Janz, K. F., Campbell, W. W., Jakicic, J. M., Troiano, R. P., Sprow, K., Torres, A., & Piercy, K. L. (2019). Physical activity, all-cause and cardiovascular mortality, and cardiovascular disease. *Medicine and Science in Sports and Exercise*, *51*(6), 1270–1281. [CrossRef]

Lacombe, J., Armstrong, M. E. G., Wright, F. L., & Foster, C. (2019). The impact of physical activity and an additional behavioural risk factor on cardiovascular disease, cancer and all-cause mortality: A systematic review. *BMC Public Health*, *19*(1), 900. [CrossRef]

Levine, J. A. (2007). Nonexercise activity thermogenesis—Liberating the life-force. *Journal of Internal Medicine*, *262*(3), 273–287. [CrossRef] [PubMed]

Lindwall, M., Ivarsson, A., Weman-Josefsson, K., Jonsson, L., Ntoumanis, N., Patrick, H., Thøgersen-Ntoumani, C., Markland, D., & Teixeira, P. (2017). Stirring the motivational soup: Within-person latent profiles of motivation in exercise. *International Journal of Behavioral Nutrition and Physical Activity*, *14*(1), 4. [CrossRef] [PubMed]

Liu, J., Chung, P.-K., Zhang, C., & Si, G. (2015). Chinese-translated Behavioral Regulation in Exercise Questionnaire-2: Evidence from university students in the Mainland and Hong Kong of China. *Journal of Sport and Health Science*, *4*(3), 228–234. [CrossRef]

Lloret-Segura, S., Ferreres-Traver, A., Hernández-Baeza, A., & Tomás-Marco, I. (2014). El Análisis Factorial Exploratorio de los Ítems: Una guía práctica, revisada y actualizada. *Anales de Psicología*, *30*(3), 1151–1169. [CrossRef]

Lonsdale, C., Hodge, K., & Rose, E. A. (2008). The behavioral regulation in sport questionnaire (BRSQ): Instrument development and initial validity evidence. *Journal of Sport & Exercise Psychology*, *30*(3), 323–355. [CrossRef]

López-Pina, J.-A., & Veas, A. (2024). Validation of psychometric instruments with classical test theory in social and health sciences: A practical guide. *Anales de Psicología*, *40*(1), 163–170. [CrossRef]

Luján Tangarife, J. A., & Cardona Arias, J. A. (2015). Construcción y validación de escalas de medición en salud: Revi revisión de propiedades psicométricassión de propiedades psicométricas. *Archivos de medicina*, *11*(3), 1.

Luo, Y., Mullin, E. M., Mellano, K. T., Sha, Y., & Wang, C. (2022). Examining the psychometric properties of the Chinese Behavioral Regulation in Exercise Questionnaire-3: A bi-factor approach. *PLoS ONE*, *17*(3), e0265004. [CrossRef] [PubMed]

Mak, K.-K., Ho, S.-Y., Lo, W.-S., McManus, A. M., & Lam, T.-H. (2011). Prevalence of exercise and non-exercise physical activity in Chinese adolescents. *The International Journal of Behavioral Nutrition and Physical Activity*, *8*, 3. [CrossRef] [PubMed]

Manganelli, S., Cavicchiolo, E., Mallia, L., Biasi, V., Lucidi, F., & Alivernini, F. (2019). The interplay between self-determined motivation, self-regulated cognitive strategies, and prior achievement in predicting academic performance. *Educational Psychology*, *39*(4), 470–488. [CrossRef]

Manninen, M., Dishman, R., Hwang, Y., Magrum, E., Deng, Y., & Yli-Piipari, S. (2022). Self-determination theory based instructional interventions and motivational regulations in organized physical activity: A systematic review and multivariate meta-analysis. *Psychology of Sport and Exercise*, *62*, 102248. [CrossRef]

Markland, D., & Tobin, V. (2004). A modification to the Behavioural Regulation in Exercise Questionnaire to include an assessment of amotivation. *Journal of Sport and Exercise Psychology*, *26*(2), 191–196. [CrossRef]

Mella-Norambuena, J. A., Nazar Carter, G., Sáez Delgado, F., Bustos Navarrete, C., López-Angulo, Y., & Cobo Rendón, R. (2020). Variables sociocognitivas y su relación con la actividad física en estudiantes universitarios chilenos (Sociocognitive variables and their relationship with physical activity in Chilean university students). *Retos*, *2041*(40), 76–85. [CrossRef]

Moustaka, F. C., Vlachopoulos, S. P., Vazou, S., Kaperoni, M., & Markland, D. A. (2010). Initial validity evidence for the Behavioral Regulation in Exercise Questionnaire-2 among Greek exercise participants. *European Journal of Psychological Assessment*, *26*(4), 269–276. [CrossRef]

Mullan, E., Markland, D., & Ingledew, D. K. (1997). A graded conceptualisation of self-determination in the regulation of exercise behaviour: Development of a measure using confirmatory factor analytic procedures. *Personality and Individual Differences*, *23*(5), 745–752. [CrossRef]

Niven, A. G., & Markland, D. (2016). Using self-determination theory to understand motivation for walking: Instrument development and model testing using Bayesian structural equation modelling. *Psychology of Sport and Exercise*, *23*, 90–100. [CrossRef]

Ntoumanis, N., Ng, J. Y. Y., Prestwich, A., Quested, E., Hancox, J. E., Thøgersen-Ntoumani, C., Deci, E. L., Ryan, R. M., Lonsdale, C., & Williams, G. C. (2021). A meta-analysis of self-determination theory-informed intervention studies in the health domain: Effects on motivation, health behavior, physical, and psychological health. *Health Psychology Review*, *15*(2), 214–244. [CrossRef] [PubMed]

O'Dougherty, M., Kurzer, M. S., & Schmitz, K. H. (2010). Shifting motivations: Young women's reflections on physical activity over time and across contexts. *Health Education & Behavior*, *37*(4), 547–567. [CrossRef]

Oliver, S., & Kemps, E. (2018). Motivational and implicit processes contribute to incidental physical activity. *British Journal of Health Psychology*, *23*(4), 820–842. [CrossRef]

Otzen, T., & Manterola, C. (2017). Sampling techniques on a population study. *International Journal of Morphology*, *35*(1), 227–232. [CrossRef]

Owen, K. B., Smith, J., Lubans, D. R., Ng, J. Y. Y., & Lonsdale, C. (2014). Self-determined motivation and physical activity in children and adolescents: A systematic review and meta-analysis. *Preventive Medicine*, *67*, 270–279. [CrossRef]

Raisi, A., Boonpor, J., Breheny, M., Vasquez, J., Matus, C., Diaz-Martinez, X., Pell, J. P., Ho, F. K., & Celis-Morales, C. (2024). Association of stair use with risk of major chronic diseases. *American Journal of Preventive Medicine*, *66*(2), 324–332. [CrossRef] [PubMed]

Reeve, J., & Cheon, S. H. (2021). Autonomy-supportive teaching: Its malleability, benefits, and potential to improve educational practice. *Educational Psychologist*, *56*(1), 54–77. [CrossRef]

Reyes-Molina, D., Nazar, G., Cigarroa, I., Marín, F. C., Regla, R. C., Pardo, K. R., Martorell, M., Ochoa, C., Ulloa, N., & Zapata-Lamana, R. (2023). Motivación, barreras y beneficios para la práctica de ejercicio físico en una intervención mobile health en adultos del Biobío, Chile (Motivation, barriers and benefits for the practice of physical exercise in a mobile health intervention in adults from Biobío, Chile). *Retos*, *49*, 623–631. [CrossRef]

Reynolds, R., McKenzie, S., Allender, S., Brown, K., & Foulkes, C. (2014). Systematic review of incidental physical activity community interventions. *Preventive Medicine*, *67*, 46–64. [CrossRef] [PubMed]

Ryan, R. M., & Connell, J. P. (1989). Perceived locus of causality and internalization: Examining reasons for acting in two domains. *Journal of Personality and Social Psychology*, *57*(5), 749–761. [CrossRef] [PubMed]

Ryan, R. M., & Deci, E. L. (2020). Intrinsic and extrinsic motivation from a self-determination theory perspective: Definitions, theory, practices, and future directions. *Contemporary Educational Psychology*, *61*, 101860. [CrossRef]

Smith-Castro, V., & Molina, M. (2011). *La entrevista cognitiva: Guía para su aplicación en la evaluación y mejoramiento de instrumentos de papel y lápiz*. Available online: https://www.iip.ucr.ac.cr/es/publicaciones/publicacion-de-investigador/la-entrevista-cognitiva-guia-para-su-aplicacion-en-la-0 (accessed on 7 November 2024).

Stamatakis, E., Ahmadi, M. N., Friedenreich, C. M., Blodgett, J. M., Koster, A., Holtermann, A., Atkin, A., Rangul, V., Sherar, L. B., Teixeira-Pinto, A., Ekelund, U., Lee, I.-M., & Hamer, M. (2023). Vigorous intermittent lifestyle physical activity and cancer incidence among nonexercising adults: The UK biobank accelerometry study. *JAMA Oncology*, *9*(9), 1255–1259. [CrossRef]

Stamatakis, E., Ahmadi, M. N., Gill, J. M. R., Thøgersen-Ntoumani, C., Gibala, M. J., Doherty, A., & Hamer, M. (2022). Association of wearable device-measured vigorous intermittent lifestyle physical activity with mortality. *Nature Medicine*, *28*(12), 2521–2529. [CrossRef]

Stamatakis, E., Huang, B.-H., Maher, C., Thøgersen-Ntoumani, C., Stathi, A., Dempsey, P. C., Johnson, N., Holtermann, A., Chau, J. Y., Sherrington, C., Daley, A. J., Hamer, M., Murphy, M. H., Tudor-Locke, C., & Gibala, M. J. (2021). Untapping the health enhancing potential of Vigorous Intermittent Lifestyle Physical Activity (VILPA): Rationale, scoping review, and a 4-pillar research framework. *Sports Medicine*, *51*(1), 1–10. [CrossRef] [PubMed]

Stamatakis, E., Johnson, N. A., Powell, L., Hamer, M., Rangul, V., & Holtermann, A. (2019). Short and sporadic bouts in the 2018 US physical activity guidelines: Is high-intensity incidental physical activity the new HIIT? *British Journal of Sports Medicine*, *53*(18), 1137–1139. [CrossRef] [PubMed]

Stanaway, J. D., Afshin, A., Gakidou, E., Lim, S. S., Abate, D., Abate, K. H., Abbafati, C., Abbasi, N., Abbastabar, H., Abd-Allah, F., Abdela, J., Abdelalim, A., Abdollahpour, I., Abdulkader, R. S., Abebe, M., Abebe, Z., Abera, S. F., Abil, O. Z., Abraha, H. N., . . . Murray, C. J. L. (2018). Global, regional, and national comparative risk assessment of 84 behavioural, environmental and occupational, and metabolic risks or clusters of risks for 195 countries and territories, 1990–2017: A systematic analysis for the Global Burden of Disease Study 2017. *The Lancet*, *392*(10159), 1923–1994. [CrossRef]

Standage, M., Curran, T., & Rouse, P. C. (2019). Self-determination-based theories of sport, exercise, and physical activity motivation. In T. S. Horn, & A. L. Smith (Eds.), *Advances in sport and exercise psychology* (4th ed., pp. 289–311). Human Kinetics.

Strain, T., Flaxman, S., Guthold, R., Semenova, E., Cowan, M., Riley, L. M., Bull, F. C., & Stevens, G. A. (2024). National, regional, and global trends in insufficient physical activity among adults from 2000 to 2022: A pooled analysis of 507 population-based surveys with 5·7 million participants. *The Lancet Global Health*, *12*(8), e1232–e1243. [CrossRef]

Stupnisky, R. H., BrckaLorenz, A., & Laird, T. F. N. (2019). How does faculty research motivation type relate to success? A test of self-determination theory. *International Journal of Educational Research*, *98*, 25–35. [CrossRef]

Teixeira, P. J., Carraça, E. V., Markland, D., Silva, M. N., & Ryan, R. M. (2012). Exercise, physical activity, and self-determination theory: A systematic review. *International Journal of Behavioral Nutrition and Physical Activity*, *9*, 78. [CrossRef] [PubMed]

Tudor-Locke, C., van der Ploeg, H. P., Bowles, H. R., Bittman, M., Fisher, K., Merom, D., Gershuny, J., Bauman, A., & Egerton, M. (2007). Walking behaviours from the 1965–2003 American Heritage Time Use Study (AHTUS). *International Journal of Behavioral Nutrition and Physical Activity*, *4*(1), 45. [CrossRef]

Ursino, D. J., Attorresi, H. F., & Abal, F. J. P. (2023). Cuestionario de Regulación Conductual en el Ejercicio Físico: Una revisión sistemática. *Revista Iberoamericana de Psicología*, *16*(1), 67–78. [CrossRef]

Vansteenkiste, M., Niemiec, C. P., & Soenens, B. (2010). The development of the five mini-theories of self-determination theory: An historical overview, emerging trends, and future directions. In T. C. Urdan, & S. A. Karabenick (Eds.), *The decade ahead: Theoretical perspectives on motivation and achievement: Vol. 16 part A* (pp. 105–165). Emerald Group Publishing Limited. [CrossRef]

Wilson, P. M., Rodgers, W. M., Loitz, C. C., & Scime, G. (2006). «It's Who I Am...Really!» The importance of integrated regulation in exercise contexts. *Journal of Applied Biobehavioral Research*, *11*(2), 79–104. [CrossRef]

World Health Organization. (2018). *Global action plan on physical activity 2018–2030: More active people for a healthier world*. World Health Organization. Available online: https://apps.who.int/iris/handle/10665/272722 (accessed on 7 November 2024).

World Medical Association. (2013). World Medical Association Declaration of Helsinki: Ethical principles for medical research involving human subjects. *JAMA*, *310*(20), 2191–2194. [CrossRef] [PubMed]

Wu, Y., Luo, M., Tan, X., & Chen, L. (2022). Stair climbing, genetic predisposition, and the risk of incident type 2 diabetes: A large population-based prospective cohort study. *Journal of Sport and Health Science*, *12*(2), 158–166. [CrossRef] [PubMed]

Zhao, R., Bu, W., Chen, Y., & Chen, X. (2020). The dose-response associations of sedentary time with chronic diseases and the risk for all-cause mortality affected by different health status: A systematic review and meta-analysis. *The Journal of Nutrition, Health & Aging*, *24*(1), 63–70. [CrossRef]

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