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Longitudinal perspective of autonomy support on habitual physical activity of adolescents

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Longitudinal perspective of autonomy support on habitual physical activity of adolescents

Longitudinal study in physical education

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The data that support the findings of this study are openly available in Figshare.com at

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The aim of this study was to test the relationship between autonomy support, basic psychological needs and self-determined motivation with respect to enjoyment, intention towards practice and habitual physical activity. A sample of 717 students, aged between 13 and 19 years old was used.

A longitudinal design was carried out with two measurement time points. The results indicated positive relationships for all model variables between the two measurement times.

The results obtained are discussed with respect to the use of an interpersonal style to support autonomy in the academic context of physical education classes for the promotion of greater commitment and adherence to physical activity.

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Introduction

Consequences of autonomy support in physical education

From the existing legislative framework of the European Union (Council of the European Union, 2018; European Parliament, 2006) a competence approach is proposed that will allow society to face complex tasks and diverse demands. A model that can help achieve this development of competence is the Self-Determination Theory (SDT, Deci & Ryan, 2000, 2008), which describes the possibility of modifying the social climate to achieve adaptive consequences, and can therefore be applied to various areas of human life and society. The implications of the studies on this model have demonstrated a deployment of effective measures for the positive transformation of schools and other development scenarios (Ryan & Deci, 2019, 2020), as well as in the development of welfare policies (Ntoumanis et al., 2020; Vansteenkiste et al., 2020).

More specifically, the evidence collected in the area of physical education (Sun et al., 2017; Vasconcellos et al, 2019) indicates the need to continue to delve into the relationships of variables such as social climate, motivation, and their consequences, in order to promote a high rate of physical activity among students. In this sense, it is necessary to continue searching for relationships and models that satisfy the basic psychological needs of the students, and that also show new paths directed towards the search for the habitual practice of physical activity. In recent years, the convenience of conducting longitudinal studies has been pointed out as a possibility that can help us to better understand how the variables are integrated into a more complex model, to ultimately allow us to promote learning for life (Cronin et al., 2019).

Self-determined motivation in physical education

The SDT highlights the importance of internal resources for the development of behavioral self-regulation. Three basic psychological needs that guide an individual's actions have been identified as

universal and necessary for well-being: autonomy, competence and relatedness (Deci and Ryan, 2000, 2008; Ryan and Deci, 2017). Autonomy can be defined as the need to feel involved in the decisions that affect one's actions. Competence refers to the need to feel effective in one's interactions with the world, while relatedness refers to the need to feel connected to other people, the social environment and its acceptance.

The support of social agents is a direct predictor of the perceived satisfaction of students' needs and an indirect predictor of motivation and adaptive experiences, and/or learning outcomes (Vallerandet al., 1997). In the educational context, supporting autonomy means respecting the attitudes and suggestions of the students, providing foundations that allow them to grant meaning to learning, and accepting their own pace. The support to their competence refers to the organization and distribution of the activities which are facilitated thanks to the structure, providing clear expectations, and effective feedback during the lesson. Expressing enjoyment in interactions with the students, demonstrating concern and presence fosters support for the relationship (Vasconcellos et al., 2019). The selection of these teaching strategies creates a continuum in which two interpersonal motivational styles are differentiated: the autonomy support style and the control style (Amoura et al., 2015; Silk et al., 2003; Tilga et al., 2019).

Some features of teacher behavior with a controlling motivational style include pressuring students to think, feel, or act in a specific way, resorting to external sources of motivation, showing impatience, or adopting only the teacher's perspective. On the other hand, the behaviors of the autonomy support style try to adopt the students' perspective, respecting the individual pace and rhythm and cultivating their internal motivational resources (Reeve, 2009). Specifically, research has demonstrated the positive contribution of the motivational style of supporting autonomy on the satisfaction of basic needs for the optimal development of the participant (Mageau & Vallerand, 2003; Vansteenkiste & Ryan, 2013). Thus, several studies (Fin et al., 2019; Huéscar et al., 2020; Vasconcellos et al., 2019; Vasconcellos, 2019) have highlighted that the satisfaction of the three basic needs is positively related to the adaptive

outcomes of students in physical education, finding not only benefits for the student (for example: classroom engagement, skill development, future intentions to exercise, and academic achievement…) but also for the teacher including greater teaching motivation, teaching skill, and teaching well-being (Cheon et al., 2014). Conversely, some consequences of adopting a controlling interpersonal teaching style would be the frustration of psychological needs (Cronin et al., 2019), fear of failure, and reduced participation in the academic and health context (De Meyer et al., 2016; De Meyer et al., 2014; Haerens, et al., 2015).

According to Ryan & Deci, (2017) there is a continuum of the motivation in which our behavior is ranging from "non-self-determined to self-determined."On one end of the spectrum we can find amotivation, which refers to behaviors not regulated by the subjects, who experience a sense of purposelessness. The other side of the spectrum show individuals entirely motivated by intrinsic sources which are self-determined and driven by the satisfaction inherent in the behavior or activity. In between these extremes several levels of extrinsic motivation with different regulatory, these are form less to more autonomous: external regulation, introjected regulation, identified regulation, integrated regulation. Previous research has shown that there is a greater probability of achieving autonomous motivation when support for competence, autonomy, and relatedness is guaranteed (Moreno et al., 2010). Conversely, if these psychological needs are not met, the probability of experiencing controlling motivation is increased (Álvarez et al., 2009; Papaioannou et al., 2007) as the regulation of the behavior falls to the other side of the spectrum.

From enjoyment to physical activity

According to the SDT (Ryan & Deci, 2017) the intrinsically-motivated student body will be more likely to perceive their experiences as positive. Enjoyment is considered a positive emotion that can be described as a multidimensional construct related to emotion, enthusiasm, and perceptions of competence (Huhtiniemi et al., 2019). Studies on motivational regulations in physical education have

pointed out positive relationships between intrinsic motivation and enjoyment (Gråstén & Watt, 2017) as well as between the latter and autonomous motivation, being negative for controlling motivation in the context of physical education (Huhtiniemi et al., 2019; Gråstén et al., 2012 ; Yli-Piipari et al., 2012). Thus, although the satisfaction of basic psychological needs plays a key role in the intention to be physically active (Kang et al., 2020), enjoyment remains a strong predictor of physical activity (Lewis et al., 2016; Jekauc & Darko 2015). In this sense, immediate rewards (enjoyment) would be more strongly associated with actual persistence in a long-term goal (Woolley & Fishbach, 2016). Thus, it is necessary to take enjoyment into account when designing studies that try to understand adherence to physical-sports practice. Therefore, there is a solid base of evidence from previous research in regard to the value of positive perceptions related with the satisfaction of the needs of competence, autonomy, and relatedness with others in the context of physical education, to guarantee greater intrinsic motivation, as well as a first approach toward optimizing the intention to be physically active (Sánchez-Oliva et al., 2014). In addition, previous studies have shown that enjoyment in physical education has been associated with increased physical activity in the academic context during physical education classes (Dishman et al., 2005; Hashim et al., 2008), and also during leisure time (Wallhead & Buckworth, 2004; Hashim et al., 2008; Huhtiniemi et al., 2019).

The present study

Taking the motivational sequence proposed by Vallerand (1997, 2007), social factors affect mediators (autonomy, competence and affinity), and these in turn affect the levels of motivation of students, thus deriving a series of consequences (both cognitive, emotional and behavioral). Given the lack of studies that contribute to understanding the effect of these relationships over time with respect to the real rate of physical-sports activity in adolescents, the objective of the study was to verify the positive motivational relationships that exist between the perception of students of a climate of support for autonomy created

by the teacher and a greater intention and real practice of physical activity during a period of eight months.

Consequently, with the hypothesized study model (see figure 1) the following hypotheses were made:

Hypothesis 1) in the first measurement (T1) the support to the autonomy that the students perceive from the teacher (social factor) would have a positive relationship with the satisfaction of the basic psychological needs (mediators). This would also be the case with intrinsic motivation, which would have a positive relationship with enjoyment, and this with the intention of practicing physical activity that would ultimately have a positive relationship with the practice of the activity performed (consequences).

Hypothesis 2) in the second measurement (T2) each of the correlations predicted for hypothesis 1 would be repeated.

Hypothesis 3) according to the study model, a positive relationship between the variables of the first measurement (T1) and the second (T2) was foreseen after eight months.

Method

Participants

The sample was comprised by 717 Spanish students (girls = 359; boys = 358) aged between 13 and 19 years old (M = 15.76, SD = 1.21) from seven Spanish public schools. Given the design, 2 measurements separated in time for 8 months were carried out in which the entire sample participated for both (717 students). The participants were enrolled in the 3rd or 4th year of Obligatory Secondary Education or in the 1st or 2nd year of a Bachelor's degree.

Measurements

The perception of autonomy support provided by the physical education teachers was measured using the Spanish version of the Learning Climate Questionnaire (Núñez et al., 2012). The participants provided an answer to 5 items preceded by the root phrase "*My physical education teacher...*", with the answers provided using a 7-point Likert scale ranging from 1 (Completely disagree) to 7 (Completely agree). A confirmatory factor analysis (CFA) was performed, whose adjustment indexes were adequate: $\chi 2$ (5, 718) = 139.24, p <.001; CFI = .96; NFI = .97; TLI = .93; RMSEA = .019; RMSR = .02. The internal consistency was above acceptable, with Cronbach's alphas = 0.95 at time point 1 and 0.96 at time point 2 (eight months after the baseline assessment).

The 18-item Spanish version of the Psychological Need Satisfaction in Exercise Scale (Moreno-Murcia et al., 2011) was utilized to measure competence (e.g. "*I think I can complete the exercises that are a personally challenging*"), autonomy (e.g. "*I feel I can do exercises in my own way*") and relatedness (e.g. "*I think I get along with those I relate to when we exercise together*") in physical education classes. For the purpose of this study, the root phrase was adapted to the context under analysis "*In physical education classes*…" and participants responded to each item using a 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The measurement model had an appropriate fit: $\chi 2$ (127, 718) = 463.08, p <.001; CFI = .95; NFI = .93; TLI = .93; RMSEA = .06; RMSR = .05. Internal consistency coefficients ranged between 0.73 (relatedness) and 0.92 (autonomy) at time point 1, and ranged between 0.71 (relatedness) and 0.91 (autonomy) at time point 2.

The Spanish version of the Behavioral Regulation in Sport Questionnaire (Moreno-Murcia et al., 2011), adapted to the physical education context to measure general intrinsic motivation was used. The stem "*When I do some physical-sports activity I do it...*" preceded 4 items and answers were provided using a Likert-type scale ranging from 1 (Very False) to 7 (Very True). The internal consistency of intrinsic motivation at time point 1 was 0.88, and 0.87 eight months after.

Enjoyment was measured considering the Spanish version of the Intrinsic Satisfaction in Sport Questionnaire (Balaguer et al., 1997; Castillo et al., 2002). The dimension consisted of five items (e.g. "*I usually enjoy doing sports*") and answers were provided using a 5-point Likert scale ranging from 1 (Strongly disagree) to 1 (Strongly agree). The measurement model on this factor had an acceptable fit to the data: $\chi 2$ (5, 718) = 17.87, p <.001; CFI = .99; NFI = .99; TLI = .98; RMSEA = .02; RMSR = .01. The internal consistency value obtained in this study for time point 1 was 0.90, and 0.91 for time point 2.

The Measure of Intention to be Physically Active Scale, Spanish version (Moreno & Llamas, 2007) was used to measure students' intentions towards being physically active (e.g. "*After finishing high school, I would like to stay physically active*"). The 4 items were preceded by the root phrase "*Regarding your intention to practice physical activity or sports…"* and the answers were provided using a 5-point Likert scale ranging from 1 (Totally Disagree) to 5 (Totally Agree). The measurement model on this factor had an acceptable fit to the data: $\chi 2$ (5, 718) = 22.92, p <.001; CFI = .99; NFI = .98; TLI = .97; IFI = .98; RMSEA = .04; RMSR = .03. The internal consistency value obtained in this study for time point 1 was 0.82 and 0.85 for time point 2.

The Habitual Physical Activity Questionnaire, Spanish version (Sarria et al., 1987), was used to measure the level of habitual physical activity and was calculated by means of four parts. The first one referred to the *type of physical activities or sports carried out, the weekly frequency and the months of engagement.* The result of this first question was calculated with the following formula: Mode 1 (intensity × time × proportion) + Mode 2 (intensity × time × proportion). The different coefficients were used to calculate this formula, depending on the sport performed, the hours per week, and the months in which it was performed (Ainsworth et al., 2000; Florindo & Latorre, 2003). The other three parts evaluated the level of physical exercise during their free time (e.g., "*During my free time I do sports or physical exercises*") using a Likert scale ranging from 1 (Never) to 5 (Very often). To calculate the final result, the score of

the first question was reconverted into values from 1 to 5 and the average of the four questions was calculated.

Procedure

Approval of the ethics committee was obtained to validate throughout the research procedure. Authorization to conduct the research was obtained from the school management and the potential participants were informed of the purpose of the study and their rights as participants in this study, based on the Declaration of Helsinki and latter amendments (2013). Agreement and informed consent for the development of the study was obtained from the legal guardians of the minors and the teachers.

After obtaining the agreement and consent for throughout the research procedure, the questionnaires were completed during physical education class at two different time points with an interval of 8 months (September-May) between them. Time to complete the questionnaires ranged between 20 and 30 minutes. Participation was voluntary and the anonymity of the participants was preserved.

Statistical analysis

Preliminary analyses were conducted in IBM SPSS Statistics 23 to examine descriptive statistics as well as internal consistency scores, and correlations across variables under analysis. For internal consistency, composite reliability scores were calculated, accepting scores higher than .70 as proposed by Raykov et al., (2015).

The proposed model was calculated using Mplus 7.4 (Múthen & Múthen, 2010) with the Robust Maximum Likelihood Estimator (MLR), which provides standard errors and model fit statistics that are robust to the non-normality of the data. As described earlier, each variable in this study was assessed two times. Perceived autonomy support, needs satisfaction, intrinsic motivation, enjoyment, and intention were assessed and entered into the model as latent variables, while habitual physical activity at Time 1 and Time 2 were entered as observed variables.

For model fit evaluation, several goodness-of-fit indices were examined, namely: The Comparative Fit Index (CFI), the Tucker-Lewis Index (TLI), the Standardized Root Mean Residual (SRMR), and the Root Mean Square Error of Approximation (SRMEA) with its 90% Confidence Interval. According to previous literature (Byrne, 2016; Hair et al., 2019), for CFI and TLI, values higher than .90 are considered as adequate, and for SRMR and RMSEA, values smaller than .80 are indicative of an acceptable fit.

Results

The descriptive statistics mean, standard deviation, skewness, and kurtosis, as well as composite reliability coefficients and correlations, are reported in Table 1. Latent variables under analysis obtained means above the midpoint, and were higher at Time 2 as compared to Time 1 values. The mean for habitual physical activity was higher at Time 1 as compared to Time 2. The variable analyzed had a normal distribution, as skewness and kurtosis scores were found within commonly-described cutoffs. The correlations between the latent factors were all positive and significant between the same time point (Time 1 x Time 1) and across time points (Time 1 x Time 2). Habitual physical activity at Time 1 and Time 2 was positively and significantly associated with all the latent variables under analysis. Internal consistency was also achieved, as all the latent factors had composite reliability coefficient scores above .70.

To test the proposed model and to explore for additional relationships, analyses were performed in two steps: test of the measurement model, and test of the full structural model. The measurement model featured all the indicators of perceived autonomy support, composite scores for each need satisfaction, and for intrinsic motivation, all indicators for enjoyment and intention, and both time point measurements of habitual physical activity. Thus, we tested a measurement model considering all the variables analyzed. The results from the measurement model showed an adequate fit to the data: $\chi 2\,(400) = 1223.752$, $p < .001$, CFI = .933, TLI = .917; SRMR = .055; RMSEA = .054 (.050, .057). Regarding

item loading, each indicator loaded significantly (p <.001) and substantially (>.50) on the predefined factor. Thus, conditions were confirmed for performing a structural model.

The results from the structural model provided acceptable fit to the data $\chi 2$ (450) = 1523.264, p < .001, CFI = .912, TLI = .904; SRMR = .066; RMSEA = .058 (.055, .061). The results revealed statistically significant effects across variables under analysis. The effects between independent variable at Time 1 and dependent variable at Time 1 were all positive and significant. Additionally, the associations between the same latent variable at both time points was always positive and statistically significant. For more detailed information see Table 2 (or Figure 2).

After examining more calculations, statistically significant indirect effects also emerged. More specifically, intention, enjoyment, intrinsic motivation, and needs satisfaction played a mediating role between habitual physical activity and perceived autonomy support at Time 1. Similar trends emerged at Time 2. However, the indirect effects were more pronounced between mediators at Time 1 as compared to T2. In addition, enjoyment and intentions had the highest indirect effect in both time points. For detailed information see Table 3 and Figure 1.

Discussion

Advances in behavioral improvement do not carry with them the guarantee that they will stand on their own forever. In the context of physical education, several studies have corroborated the motivational process that triggers the teacher's behavior as a social agent towards the practice of physical-sports activity based on the SDT framework (Tilga et al., 2020). However, to understand the maintenance of these adaptive outcomes, work is needed that focuses on the effects of such a process after an extended period of time. As indicated by some very recent studies (Cronin et al., 2020; Reeve et al., 2020), longitudinal studies are presented as key for reinforcing the conclusions drawn from interventions in which teachers are instructed to increase autonomy support for their students during instruction. Therefore, and supported by the existing literature, the aim of the study was to test the relationship

between perceived autonomy support in physical education, basic psychological needs and self-determined motivation with respect to fun, intention towards practice, and habitual physical activity. The results supported the predicted model, and a positive correlation was found between support for perceived autonomy and the satisfaction of psychological needs. This was also the case with intrinsic motivation, which in turn correlated with enjoyment, with a positive relationship observed with the intention to be physically active, ultimately related to the habitual practice of physical activity. These relationships were confirmed in both the initial and final measurements, as foreseen in hypotheses 1 and 2.

According to the proposed model, the psychosocial factors have a correlation with the satisfaction of basic psychological needs both in the first measurement (T1) and in the second (T2). These are congruent with previous studies in the context of physical education, which pointed to the motivational teaching style of supporting autonomy as a positive predictor of the satisfaction of basic psychological needs (Almolda-Tomás et al., 2014; Cheon et al., 2012; Cheon et al., 2016; Cheon et al., 2018).

Likewise, the satisfaction of basic psychological needs positively predicted intrinsic motivation (Rutten et al., 2012; van Aart et al., 2015; Cheon et al., 2016), and did enjoyment (Jekauc & Darko, 2015; Huhtiniemi et al., 2019), while enjoyment positively predicted the intention to be physically active (Wallhead & Buckworth, 2004; Hashim et al., 2008; Huhtiniemi et al., 2019).

However, although these relationship chains occurred in both the first and second measurements, coinciding with hypotheses 1 and 2, the predictive force in the second measurement was lower. Given that this was a longitudinal study without intervention, it is possible that the behavior of support for teacher autonomy perceived by students in the second measurement was not as self-determined as in the first because there was no investment program with support for autonomy. In this sense, the recent work by Reeve et al., (2020), through an intervention program with autonomy support (ASIP) with students in physical education classes for one year and with three measurements, has shown an increase in the

perception of autonomy support by students. Furthermore, it may be helpful to analyze this and other findings though experimental research so that causal inferences can be made from them.

However, the results of this work suggest some practical implications. Given the importance of social factors in the model (Vallerand 1997, 2007), initiating a cascade of relationships that lead to such significant consequences such as the acquisition of healthy habits, teachers should maintain a climate of support for autonomy throughout the academic year, so it is important that they become aware of its value. With a view towards future longitudinal studies, it would be important to maintain the analysis of these relationships over time, and to continue observing their changes. Likewise, the addition of the measurement of aspects such as stress, or the teacher's perception of autonomy, competence and relationship to these longitudinal studies could provide a possible explanation of these changes and broaden the focus of study.

Given that the design limits the intervention, it was not possible to control confounding or extrinsic variables that could have influenced the results. There are social factors that could have affected the results obtained in the second measurement, preventing the desired results. Also, despite the validity of the instruments used, data collection through questionnaires may have certain limitations. Thus, in future studies the observation of the climate of support for autonomy or controlling behavior can be combined with trained observers.

Furthermore, the results of this study are especially relevant for those teachers who plan and conduct physical education lessons with the intention of encouraging a student to practice physical activity on a regular basis. It is confirmed that the interpersonal style of teaching to support autonomy is a very important tool for physical education teachers. If it is possible to generate a climate of support for autonomy that manages to satisfy the needs of relatedness, autonomy and competence, some benefits of the model will be derived, such as the improvement of the motivation, enjoyment, intention and practice of regular physical activity of the students.

However, in the environments analyzed in this study, it seems necessary to train the teachers in these types of strategies. Therefore, training programs for teachers on this subject (Moreno-Murcia et al., 2011) could help them modify or maintain the behaviors necessary to achieve more adaptive results. Some studies (Cheon et al., 2016; Cheon et al., 2017; Cheon et al., 2018) confirm that the level of support for autonomy can be improved through training.

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Table 1. Descriptive statistics, composite reliability, and correlations

	M	SD	S	K	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1. Autonomy Support T1	4.42	1.87	-.28	-1.05	*.94*											
2. Autonomy Support T2	4.47	2.06	-.34	-1.23	.56**	*.96*										
3. Needs Satisfaction T1	4.17	.91	-.41	-.02	.43**	.26**	*.71*									
4. Needs Satisfaction T2	4.32	.86	-.48	.39	.52**	.96**	.29**	*.85*								
5. Intrinsic Motivation T1	5.25	1.30	-.78	.16	.33**	.24**	.68**	.29**	*.85*							
6. Intrinsic Motivation T2	5.36	1.27	-.81	.24	.39**	.47**	.67**	.55**	.64**	*.71*						
7. Enjoyment T1	4.12	.09	-1.17	.92	.34**	.26**	.70**	.28**	.77**	.59**	*.85*					
8. Enjoyment T2	4.24	.84	-1.26	1.48	.26**	.34**	.52**	.36**	.61**	.76**	.72**	*.82*				
9. Intention T1	3.56	1.14	-.50	-.76	.22**	.14**	.63**	.20**	.85**	.60**	.76**	.64**	*.82*			
10. Intention T2	3.69	1.11	-.63	-.63	.22**	.22**	.43**	.31**	.69**	.73**	.61**	.78**	.77*	*.71*		
11. Habitual Physical Activity T1	3.54	.80	-.12	-.56	.18**	.07*	.48**	.12**	.59**	.44**	.58**	.64**	.74**	.53**	-	
12. Habitual Physical Activity T2	2.92	.77	-.24	-.45	.07	.03	.05	.03	.12**	.16**	.12**	.24**	.18**	.35**	.11*	-

Notes: T1 = Time 1; T2 = Time 2; M = Mean; SD = Standard Deviation; S = Skewness; K = Kurtosis; in italic = Composite Reliability coefficients; * p<0.05; ** p<0.01.

Table 2. Direct regression paths

	β	CI95%	
		LB	UB
Autonomy Support T1 → Needs Satisfaction T1	.45	.37	.52
Autonomy Support T1 → Autonomy Support T2	.55	.48	.62
Autonomy Support T2 → Needs Satisfaction T2	.95	.92	.97
Needs Satisfaction T1 → Intrinsic Motivation T1	.74	.68	.80
Needs Satisfaction T1 → Needs Satisfaction T2	.17	.13	.22
Needs Satisfaction T2 → Intrinsic Motivation T2	.37	.29	.45
Intrinsic Motivation T1 → Enjoyment T1	.87	.81	.92
Intrinsic Motivation T1 → Intrinsic Motivation T2	.56	.47	.65
Intrinsic Motivation T2 → Enjoyment T2	.49	.37	.67
Enjoyment T1 → Intention T1	.82	.77	.87
Enjoyment T1 → Enjoyment T2	.43	.31	.54
Enjoyment T2 → Intention T2	.53	.40	.66
Intention T1 → Habitual Physical Activity T1	.74	.70	.78
Intention T1 → Intention T2	.37	.28	.45
Intention T2 → Habitual Physical Activity T1	.37	.34	.62
Habitual Physical Activity T1 → Habitual Physical Activity T2	.10	.02	.18

Note: T1 = Time 1; T2 = Time 2; β = standardized regression coefficient; CI95% = 95% Confidence Interval; LB = Lower Bound; UB = Upper Bound.

Table 3. Indirect regression paths

	β	CI95%	
		LB	UB
Enjoyment T1 → Intention T1 → Habitual Physical Activity T1	.61	.57	.55
Intrinsic Motivation T1 → Enjoyment T1 → Intention T1 → Habitual Physical Activity T1	.53	.48	.58
Needs Satisfaction T1 → Intrinsic Motivation T1 → Enjoyment T1 → Intention T1 → Habitual Physical Activity T1	.39	.34	.45
Autonomy Support T1 →Needs Satisfaction → Intrinsic Motivation T1 → Enjoyment T1 → Intention T1 → Habitual Physical Activity T1	.18	.14	.21
Enjoyment T2 → Intention T2 → Habitual Physical Activity T2	.31	.22	.40
Intrinsic Motivation T2 → Enjoyment T2 → Intention T2 → Habitual Physical Activity T2	.16	.10	.22
Needs Satisfaction T2 → Intrinsic Motivation T2 → Enjoyment T2 → Intention T2 → Habitual Physical Activity T2	.06	.03	.08
Autonomy Support T2→Needs Satisfaction → Intrinsic Motivation T2 → Enjoyment T2 → Intention T2 → Habitual Physical Activity T2	.05	.03	.08

Note: T1 = Time 1; T2 = Time 2; β = standardized regression coefficient; CI95% = 95% Confidence Internal; LB = Lower Bound; UB = Upper Bound.

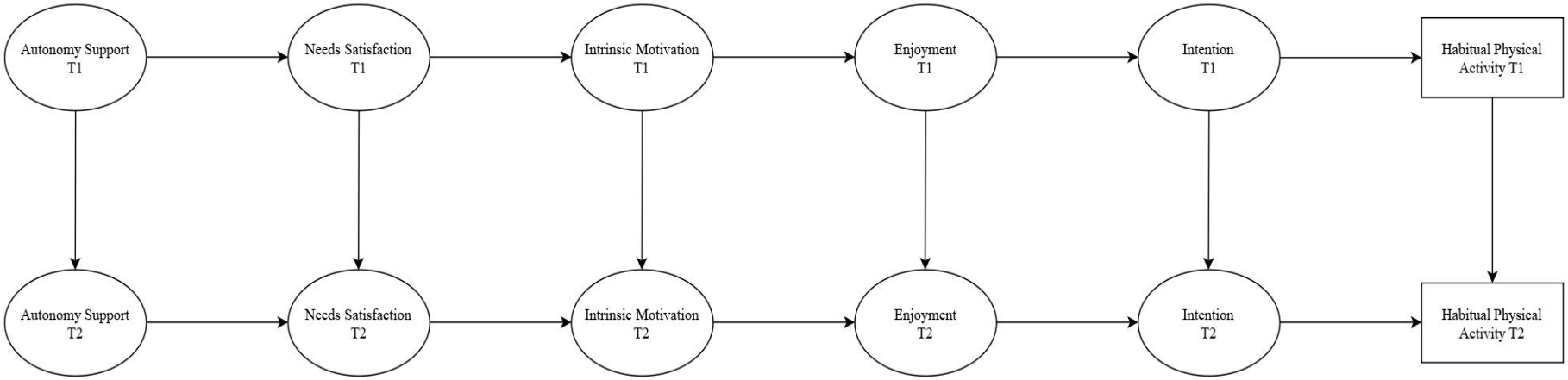

Figure 1. Hypothesized Model

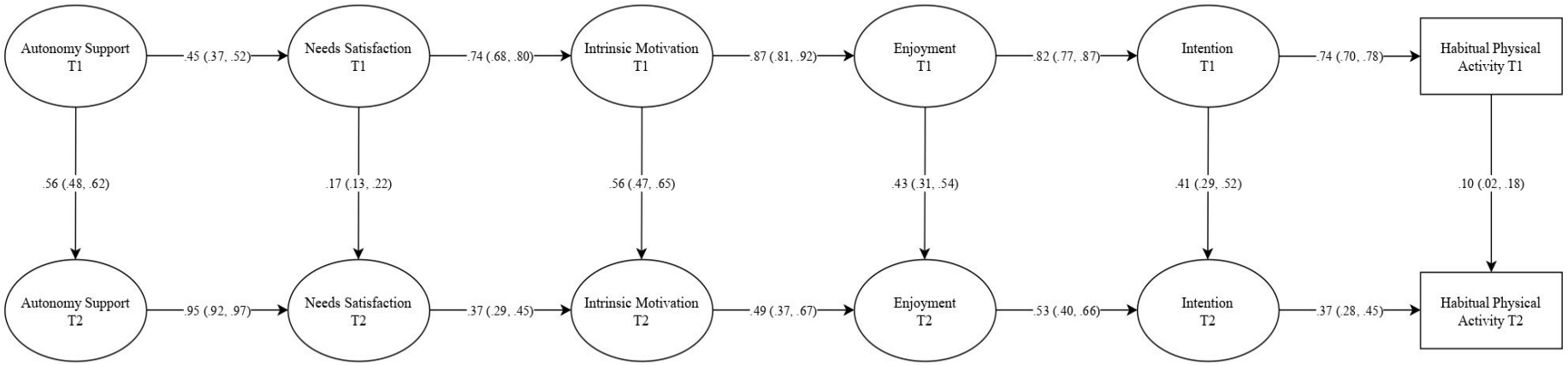

Figure 2. Model