

Causal Relationship between Autonomous Motivation and Leisure Time Physical Activity in Primary School Students: Applying the Theory of Planned Behavior

MehdiGholi Gholidahaneh¹, PhD Candidate;  Saeed Ghorbani^{1*}, PhD;  Akram Esfahaninia¹, PhD

¹Department of Physical Education and Sport Sciences, Aliabad Katoul Branch, Islamic Azad University, Aliabad Katoul, Iran

*Corresponding author: Saeed Ghorbani, PhD; Department of Physical Education and Sport Sciences, Aliabad Katoul Branch, Islamic Azad University, Aliabad Katoul, Iran. Tel: +98 9129723875; Email: s.ghorbani@aliabadiu.ac.ir

Received April 5, 2021; Revised April 30, 2021; Accepted May 25, 2021

Abstract

Background: One of the most important issues in students' health is examining ways to motivate them to participate in physical activity and sports. Therefore, the purpose of the current study was to examine a hybrid model of motivational and social beliefs' processes based on the self-determination theory and the theory of planned behavior on the participation of children students in physical activity.

Methods: In the present study, a descriptive-correlation approach was used. The participants were 516 primary school students from Gonbad Kavoods, Iran, 2019. Data were collected via Sport Motivation Scale, Components of the Theory of Planned Behavior, and Leisure-Time Physical Activity Behavior Scale. Structural equation method was employed to analyze the data.

Results: Findings revealed that autonomous motivation significantly affected attitude, subjective norms, and perceived behavioral control (all $T > 1.96$). In addition, these components had significant impacts on intention to physical activity (all $T > 1.96$). Moreover, the intention to physical activity significantly affected leisure-time physical activity ($T > 1.96$). Additionally, autonomous motivation significantly affected the intention to physical activity through mediation with attitude, subjective norms, and perceived behavioral control (all $P < 0.001$). Finally, these components had significant effects on the actual physical activity behavior through mediation with intention to physical activity (all $P < 0.001$).

Conclusions: Based on our findings, it could be stated that the motivational factors proposed in the theory of self-determination affect the willingness of primary school students to participate in physical activity through mediation by attitude, subjective norms, and perceived behavioral control.

Keywords: Motivation, Attitude, Subjective norms, Perceived behavioral control, Physical activity

How to Cite: Gholidahaneh M, Ghorbani S, Esfahaninia A. Causal Relationship between Autonomous Motivation and Leisure Time Physical Activity in Primary School Students: Applying the Theory of Planned Behavior. Int. J. School. Health. 2021;8(3):184-191.

1. Introduction

Sedentary lifestyle has been suggested as one of the major risk factors for health. Research has shown that regular physical activity is beneficial for maintaining and improving health along with preventing a variety of chronic diseases and premature deaths. Several other benefits of regular physical activity include improved mental health, reduced symptoms of depression and anxiety, life satisfaction, and improved quality of life (1-4). However, numerous studies have shown that physical activity decreases significantly with age, thus increasing the prevalence of obesity and overweight in people,

particularly children who enter high school from primary school age. Numerous studies have revealed that only 20% to 25% of girls and 35% to 40% of boys follow the World Health Organization's guidelines for performing at least 60 minutes of moderate-to-severe physical activity per day (5-6). In Iran, several studies demonstrated that male and female students do not follow the international guidelines on the amount of physical activity per day (7-10).

Given these facts, examining the factors influencing the participation of children and adolescents in physical activity has become a key topic in the research on physical education, sports, and health over the past decades.

Motivation can be one of the important variables in predicting the continuity of students' participation in physical activities during leisure time. Although many theorists have described motivation as a one-dimensional structure, Deci and Ryan (11-15) proposed the Self-Determination Theory and introduced various types of motivation that are seen along a chain. The self-determination theory (11-15) distinguishes motivation from autonomous motivation (intrinsic and identified) to controlled motivation (external regulation and introjection). Autonomous motivation is considered as the highest level of motivation and refers to situations in which people are free to engage in activities and in which individuals participate voluntarily and freely in an interesting and enjoyable activity. Controlled motivation comes from an external source. Research has revealed that autonomous motivation resulted in better performance in various activities (11-15). In contrast, controlled motivation had a negative correlation with the performance of different behaviors (11-15).

Another theory receiving huge attention in the field of physical activity and sport participation is the Theory of Planned Behavior. The theory of planned behavior has been postulated by Ajzen (16-17) and is based on the propositions of the theory of logical action (18). This theory predicts the occurrence of a special behavior in human being. According to this theory, the willingness to engage in an activity is predicted by three factors, including "attitude towards behavior", "subjective norms", and "perceived behavioral control". "Attitude" refers to a person's degree of favorableness with respect to the engaged activity, which is directly influenced by the person's judgment about the outcomes of activity. "Subjective norms" refers to a personal belief regarding important persons or groups endorsing and supporting a particular activity. "Perceived behavioral control" refers to the perception of the difficulty of performing an activity (16-17).

Numerous studies have investigated the propositions of the theory of planned behavior in the field of physical activity and sport participation. For example, Tsorbatzoudis (19) tested the impact of an intervention based on the theory of planned behavior on the participations of high school students in sport and exercise. This study found that intervention enhanced attitudes, perceived behavioral control, willingness, and physical activity. Jackson and colleagues (20) examined

the propositions of the theory of planned behavior along with other factors, such as descriptive norm, moral norm, self-identity, and past behavior, for the participation in physical activity. The results revealed that moral norm, self-identity, and past behavior also affect intentions. Intentions, self-identity, and past behavior significantly predict the participation in physical activity. Bae and colleagues (21) analyzed the participation of adolescents in physical activity with the extended theory of planned behavior, including prior knowledge. The results found that attitude, subjective norm, perceived behavioral control, and prior knowledge positively influenced intention and participation in physical activity. Chatzisarantis and Hagger (22) investigated the application of intervention based on the theory of planned behavior in attitudes, intention, and physical activity. The results demonstrated that the participants exposed to a theory-based intervention reported more positive attitudes and stronger intentions than those in control cognition.

Although the theories of self-determination and planned behavior have been separately investigated in the field of physical activity and sport participation, it seems necessary to provide a conceptual model for integrating the motivational aspects of the self-determination theory with the components of planned behavior theory to better realize the underlying mechanisms in the participation of school-students in physical activity and sport during leisure time. In this regard, it has been showed that intrinsic motivation predicted attitudes and perceived control over the underlying behavioral and control beliefs. Moreover, intrinsic motivation indirectly affected intentions through attitudes and perceptions of control (23).

However, what is remarkable is that there is a lack of studies on the effect of motivation on students' physical activity through the components of planned behavior theory in the leisure time. Realizing the motivational processes along with the components of the planned behavior theory in the field of participation in the leisure-time physical activity is important from theoretical and practical points of view. The lack of motivation to engage in physical activity could bear important consequences for public health. Therefore, it is appropriate to examine children's perspectives, which can reflect their experiences and provide valuable information. According to what has been said, the purpose of current study was to examine

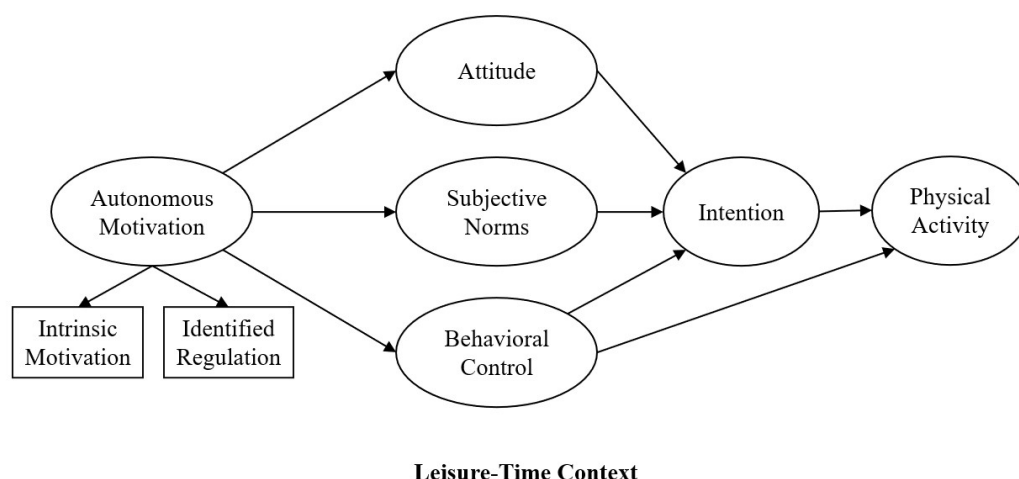


Figure 1: The figure shows the conceptual model of the current study.

the motivation of boy and girl students' participation in the leisure time through the theory of planned behavior. The conceptual model of the current study is presented in Figure 1.

2. Methods

Herein, a descriptive-correlation approach was applied. The Ethics Committee of Islamic Azad University of Aliabad Katoul approved the research method (Code: IR.IAU.AK.REC.1398.001). The parents provided written informed consent.

2.1. Participants: The participants of this study included 516 students, comprising 265 boys and 251 girls in grades four, five, and six in the primary schools of Gonbad Kavoods city, Golestan province, Iran (2019). We selected the students based on a cluster random sampling. Means and standard deviations of students' ages were 11.01 ± 0.83 and 11.02 ± 0.85 years, respectively.

2.2. Research instruments: We utilized four questionnaires concerning autonomous motivation, the components planned behavior theory, intention, and physical activity. We used the Sport Motivation Scale (24) to measure the autonomous motivation. This questionnaire consisted of eight questions scored based on a seven-point Likert scale from completely disagree (1) to completely agree (7). The designers of the scale corroborated its reliability with a Cronbach's alpha coefficient of 0.90 (24). In the current study, nine experts confirmed the validity of this questionnaire (CVI=1.00, CVR=0.78) and we measured its reliability with $\alpha = 0.91$.

The components of the theory of planned behaviors, including attitude, subjective norms, and perceived

behavioral control, were assessed with a questionnaire designed by Hagger and co-workers (25). This questionnaire consisted of sixteen questions (seven items for attitude, six items for subjective norms, and three items for perceived behavioral control) scored based on a seven-point Likert scale from completely disagree (1) to completely agree (7). The designers of the scale corroborated its reliability with a Cronbach's alpha coefficient of 0.90 (25). In the current work, nine experts confirmed the validity of this questionnaire (CVI=1.00, CVR=0.78) and we measured its reliability with $\alpha = 0.93$.

The intention to physical activity was assessed via two items (25) based on a Likert scale from strongly disagree (1) to strongly agree (7). The designers (25) reported a Cronbach's alpha coefficient of 0.87. In the current research, nine experts confirmed the validity of the Persian version of this questionnaire (CVI=1.00, CVR=1.00). Furthermore, the reliability of this questionnaire was assessed in this study with $\alpha = 0.89$.

We measured leisure-time physical activity with the Physical Activity Behavior in Leisure-Time Scale (25), including three questions scored based on an eight-point Likert scale from zero days (0) to seven days (7). The designers (25) reported high reliability with Cronbach's alpha coefficient of 0.93. In the present study, nine experts corroborated the validity of this questionnaire (CVI=0.88, CVR=0.78) and Cronbach's alpha coefficient was 0.92.

2.3. Data analysis: We employed descriptive statistics, such as mean and standard deviation, to describe the research variables. The Kolmogorov-Smirnov test examined the normal distribution of data and Spearman test measured the correlation among the research

Table 1: Descriptive data of research variables across genders

Students	Age (Years old)	Motivation in LT	Attitude	Subjective Norms	Behavioral Control	Intention	Physical Activity
Boys	11.01±0.83	4.67±1.14	4.72±0.86	3.67±1.65	5.48±0.97	4.09±1.28	1.83±2.19
Girls	11.04±0.85	4.48±0.93	4.23±0.59	3.29±1.45	5.01±1.29	3.83±0.98	1.03±1.90
Comparison	P=0.860	P=0.109	P=0.023	P=0.082	P=0.041	P=0.149	P=0.002

LT: Leisure-time

variables. Finally, we applied the structural equation method to investigate the relationships between the research variables. SPSS version 23 and Smart PLS were used to analyze the data. The level of significance was considered at the alpha level of 0.05.

3. Results

3.1. Descriptive data: The participants of this work included 516 students, comprising 265 boys and 251 girls in grades four, five, and six in the primary schools. The mean ages of boys and girls were 11.01 and 11.04 years, respectively. The ethnicity of adolescents was a mix of Fars and Turkmen. The inclusion criteria were being healthy and without any physical problems. Any students not fulfilling the questionnaires was excluded from the study.

As can be seen in Table 1, the boys ranged from moderate to high scores in leisure-time autonomous motivation, attitude, perceived behavioral control, and intention to physical activity. However, their physical activity behavior was lower than average, implying low physical activity. Moreover, girls had moderate to high scores in the autonomous motivation in leisure time, attitude, perceived behavioral control, and intention to physical activity.

However, their physical activity score was lower than average, indicating low physical activity.

3.2. Relationship between variables: Firstly, we employed Kolmogorov-Smirnov test to measure the data normality. The results revealed that the data did not have a normal distribution (all $P < 0.05$). Thus, we utilized Spearman correlation test to measure the associations between the research variables. The results implied that there were significant associations between: 1) autonomous motivation in leisure time with attitude ($r=0.331$, $P < 0.001$), 2) autonomous motivation in leisure-time with subjective norms ($r=0.728$, $P < 0.001$), 3) autonomous motivation in leisure-time with perceived behavioral control ($r=0.251$, $P < 0.001$), 4) attitude with intention to physical activity ($r=0.275$, $P < 0.001$), 5) subjective norms

with intention to physical activity ($r=0.152$, $P < 0.001$), 6) perceived behavioral control with intention to physical activity ($r=0.516$, $P < 0.001$), and 7) intention to physical activity with actual physical activity behavior ($r=0.124$, $P=0.012$).

3.3. Structural equation method: Table 2 and Figure 2 represent the results of structural equation method. The results of path analysis indicated that autonomous motivation in leisure time significantly influenced all the components of planned behavior theory, including attitude, subjective norms, and perceived behavioral control (all $T > 1.96$), which had significant impacts on the intention to physical activity (all $T > 1.96$). Moreover, the intention to physical activity significantly affected the actual physical activity behavior ($T > 1.96$). Additionally, autonomous motivation had a significant effect on the intention to physical activity through a mediation with the components of planned behavior theory (all $P < 0.001$). Finally, all the components of planned behavior theory had significant effects on the actual physical activity behavior through mediation via the intention to physical activity (all $P < 0.001$). Based on the initial results, Communality was 0.734, R^2 was 0.204 and Goodness of Fit Index (GOF) was 0.387. Since R^2 and GOF of initial model fit were low, we applied modifications to improve the model fit. To this end, we removed some questions that lowered the values of R^2 , including two questions from the variable "attitude" and one question from the variable "subjective norms". By removing these questions, the value of R^2 changed to 0.292 which is close to the acceptable level. Lastly, final GOF was obtained as 0.462, which is considered to be an acceptable model fit (26-27).

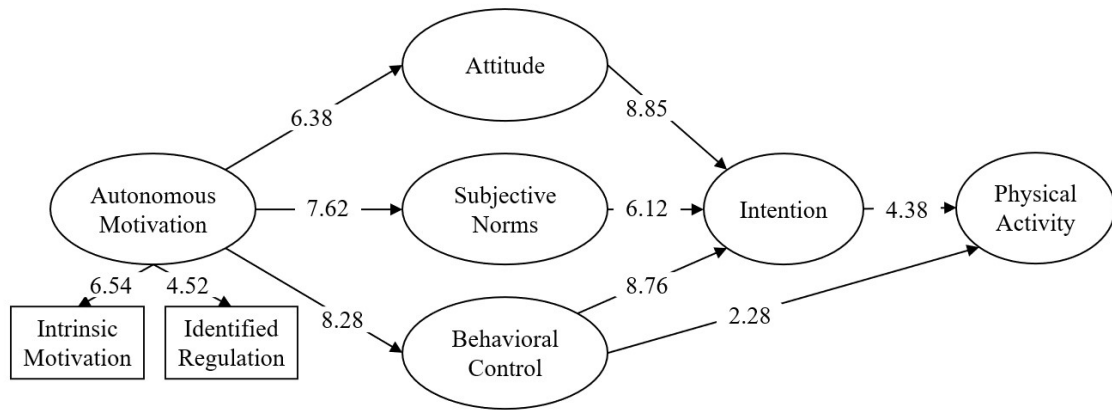
4. Discussion

Physical activity is critically involved in the long-term well-being of students; hence, the objective of the current study was to examine the causal association between autonomous motivation and physical activity of primary school students with applying the concepts of planned

Table 2: Results of path analysis between exogenous and endogenous variables**

Path	β	T-value
motivation in LT => attitude	0.275	6.38*
motivation in LT => subjective norms	0.315	7.62*
motivation in LT => perceived behavioral control	0.321	8.28*
attitude => intention	0.338	8.85*
subjective norms => intention	0.268	6.12*
perceived behavioral control => intention	0.325	8.76*
intention => physical activity	0.216	4.38*
perceived behavioral control => physical activity	0.140	2.28*
Path	Z	P-value
motivation in LT => attitude => intention	4.010	P<0.001**
motivation in LT => subjective norms => intention	3.845	P<0.001**
motivation in LT => perceived behavioral control => intention	3.964	P<0.001**
attitude => intention => physical activity	3.983	P<0.001**
subjective norms => intention => physical activity	3.501	P<0.001**
perceived behavioral control => intention => physical activity	3.517	P<0.001**

LT: Leisure-time; *T>1.96, **P<0.001 **These values are obtained after model fit modifications



Leisure-Time Context

Figure 2: The figure shows the results of path analysis based on T-Values. *T-Values are obtained after model fit modifications.

behavior theory. The conceptual model of the current study was based on the theoretical foundations of SDT (11-15) and the theory of planned behavior. The results of the present study indicated that autonomous motivation for performing physical activity is directly related to all the components of planned behavior theory, including attitudes, subjective norms, and perceived behavioral control. Moreover, all these components are directly related to the intention to physical activity. Furthermore, our results demonstrated that all the components of planned behavior theory, including attitudes, mental norms, and perceived behavioral control, mediate the relationship between autonomous motivation and intention. These results indicated the importance of the components of planned behavior

theory in this model and the direct effect on the intention to physical activity in children. These results are in line with the results of previous studies (22, 28-29). The theory of planned behavior is a self-based cognitive-social theory attempting to demonstrate the role of a person's beliefs in the behaviors he or she expects (16-17). This theory states that the occurrence of future behaviors in the individual is a function of the individual's desires. Intentions are considered as motivational structures reflecting the extent to which individuals intend to participate in a behavior. In the model of the present study, the theory of planned behavior, a cognitive-social theory, is integrated with the theory of self-determination, which is inherent in the organism. Research has shown that these two theories can be well

combined to explain the occurrence of human behaviors (28-29). According to this hybrid model, autonomous motivation along with the formation of socio-cognitive beliefs can drive future behaviors. Deci and Ryan (11-15) stated that the process establishing the relationship between the behavioral settings is based on the theory of self-determination; in addition to the self-based structures in the theory of planned behavior, which are generally induced from the satisfaction of basic psychological need and internalization. Deci and Ryan (11-15) pointed out that experiencing an activity as an autonomous motivating one and incorporating it in a set of behaviors that satisfy the basic psychological needs and could lead to the intention to seek out that activity in the future to repeat the pleasant results. Creating autonomous motivation along with the formation of a person's beliefs in performing physical activity in leisure time can be a vital and strategic component. That is because it facilitates the formation of a desire for physical activity in the person, which he or she subsequently tends to follow as a need-satisfying activity (22).

There might be some reasons to why cognitive-social beliefs in future participation in an activity may be associated with autonomic behavioral regulations. Primarily, beliefs about the extent to which a person engages in the activity will result in the consequences related to the individual's personality (attitude) and second, beliefs about the capability to participate in an activity (perceived behavioral control) is associated with autonomous motivation (30-31).

The most important strength of the current study was that the associations between autonomous motivation and participation of children in the physical activity were examined applying the theory of planned behavior; it is one of the most famous theories in studying the predictors of people's behavior. Furthermore, the limitation of this research is its cross-sectional research design, creating limitations for examining the causal effects of motivational and social beliefs' processes on the participation of children in sport and physical activity.

5. Conclusion

This study aimed to investigate a hybrid model of motivational and social beliefs' processes based on the self-determination theory and planned behavior, the

theory of the participation of children students in the physical activity. The major finding was that autonomous motivation positively affected attitude, subjective norms, and perceived behavioral control. Subsequently, these components positively influenced physical activity in children independently or with the mediation of intention to physical activity. Accordingly, it could be stated that the motivational factors proposed in the theory of self-determination significantly affected the intention to physical activity through mediation by attitude, subjective norms, and perceived behavioral control.

Ethical Approval

This study is part of a PhD thesis by Mr. MehdiGholi Gholidahaneh. The Ethics Committee of Islamic Azad University of Aliabad Katoul approved the study with the code of IR.IAU.AK.REC.1398.001. The participants voluntarily participated in the present study, and the subjects and their parents signed written informed consent.

Acknowledgments

We are grateful to all teachers, administrators, students, and parents who helped us in this research.

Conflicts of Interest: None declared.

References

1. Lahart I, Darcy P, Gidlow C, Calogiuri G. The Effects of Green Exercise on Physical and Mental Wellbeing: A Systematic Review. *Int J Environ Res Public Health*. 2019;16(8):1352. doi: 10.3390/ijerph16081352. PubMed PMID: 30991724; PubMed Central PMCID: PMC6518264.
2. Schwartz J, Rhodes R, Bredin SSD, Oh P, Warburton DER. Effectiveness of Approaches to Increase Physical Activity Behavior to Prevent Chronic Disease in Adults: A Brief Commentary. *J Clin Med*. 2019;8(3):295. doi: 10.3390/jcm8030295. PubMed PMID: 30832260; PubMed Central PMCID: PMC6462966.
3. Malm C, Jakobsson J, Isaksson A. Physical Activity and Sports-Related Health Benefits: A

- Review with Insight into the Public Health of Sweden. *Sports*. 2019;7(5):127. doi: 10.3390/sports7050127. PubMed PMID: 31126126; PubMed Central PMCID: PMC6572041.
4. Miles L. Physical activity and health. *Nutrition Bulletin*. 2007;32(4):314-363. doi: 10.1111/j.1467-3010.2007.00668.x.
 5. Huotari P, Nupponen H, Mikkelsen L, Laakso L, Kujala U. Adolescent Physical Fitness and Activity as Predictors of Adulthood Activity. *J Sports Sci*. 2011;29(11):1135-41. doi: 10.1080/02640414.2011.585166. PubMed PMID: 21777154.
 6. Telama R, Yang X, Viikari J, Välimäki I, Wanne O, Raitakari O. Physical Activity from Childhood to Adulthood: A 21-Year Tracking Study. *Am J Prev Med*. 2005;28(3):267-73. doi: 10.1016/j.amepre.2004.12.003. PubMed PMID: 15766614.
 7. Ghorbani S, Noohpishah S, Shakki M. Gender Differences in the Relationship Between Perceived Competence and Physical Activity in Middle School Students: Mediating Role of Enjoyment. *Int J School Health*. 2020;7(2):14-20. doi: 10.30476/intjsh.2020.85668.1056.
 8. Gholidahaneh MG, Ghorbani S, Esfahaninia A. Effects of Basic Psychological Needs Satisfaction in the Physical Education on Leisure-Time Physical Activity Behavior of Primary School Students: Mediating Role of Autonomous Motivation. *Int J School Health*. 2020;7(2):46-53. doi: 10.30476/intjsh.2020.86028.1068.
 9. Sfandyari B, Ghorbani S, Rezaeeshirazi R, Noohpishah S. The Effectiveness of an Autonomy-Based Exercise Training on Intrinsic Motivation, Physical Activity Intention, and Health-Related Fitness of Sedentary Students in Middle School. *Int J School Health*. 2020;7(1):40-47. doi: 10.30476/intjsh.2020.84678.1046.
 10. Hosseini FB, Ghorbani S, Rezaeshirazi R. Effects of Perceived Autonomy Support in the Physical Education on Basic Psychological Needs Satisfaction, Intrinsic Motivation and Intention to Physical Activity in High-School Students. *Int J School Health*. 2020;7(4):39-46. doi: 10.30476/intjsh.2020.88171.1106.
 11. Deci EL, Ryan RM. *Intrinsic Motivation and Self-Determination in Human Behavior*. New York: Plenum Press; 1985.
 12. Ryan RM, Deci EL. Intrinsic and Extrinsic Motivations: Classic Definitions and New Directions. *Contemporary Educational Psychology*. 2000;25(1):54-67. doi: 10.1006/ceps.1999.1020.
 13. Ryan RM, Deci EL. Brick by Brick: The Origins, Development, and Future of Self-Determination Theory. In Elliot AJ, editor: *Advances in Motivation Science*. Cambridge, MA: Elsevier Inc; 2019. p. 111-156.
 14. Ryan RM, Deci EL. Overview of Self-Determination Theory: An Organismic Dialectical Perspective. In Deci EL, Ryan RM, editor: *Handbook of Self-Determination Research*; 2002. p. 3-33.
 15. Ryan RM, Bradshaw EL, Deci EL. A History of Human Motivation Theories in Psychology. In Sternberg RJ & Pickren WE. Cambridge, UK: Cambridge University Press; 2019. p. 391-411.
 16. Ajzen I. From intentions to actions: A Theory of Planned Behavior. In Kuhl J & Beckmann J, editors: *Springer Series in Social Psychology*. Berlin, Germany: Springer; 1985. p. 11-39.
 17. Ajzen I. *The Theory of Planned Behavior*. Organizational Behavior and Human Decision Processes. 1991;50(2):179-211. doi:10.1016/0749-5978(91)90020-T.
 18. Fishbein M, Ajzen I. *Belief, Attitude, Intention and Behavior: An Introduction to Theory and Research*. Reading, MA: Addison-Wesley; 1975.
 19. Tsorbatzoudis H. Evaluation of a School-Based Intervention Programme to Promote Physical Activity: An Application of the Theory of Planned Behavior. *Percept Mot Skills*. 2005;101(3):787-802. doi:10.2466/pms.101.3.787-802. PubMed PMID: 16491680.
 20. Jackson C, Smith A, Conner M. Applying an Extended Version of the Theory of Planned Behaviour to Physical Activity. *J Sports Sci*. 2003;21(2):119-33. doi: 10.1080/0264041031000070976. PubMed PMID: 12630791.
 21. Bae J, Won D, Lee C, Park SM. Adolescent Participation in New Sports: Extended Theory of Planned Behavior. *Journal of Physical Education and Sport*. 2020; 20:2246-2252. doi: 10.7752/jpes.2020.s3301.
 22. Chatzisarantis NLD, Hagger MS. Effects of a

- Brief Intervention Based on the Theory of Planned Behavior on Leisure-Time Physical Activity Participation. *Journal of Sport and Exercise Psychology*. 2005;27(4):470-487. doi: 10.1123/jsep.27.4.470.
23. Chatzisarantis NLD, Hagger MS, Biddle SJH, Karageorghis C. The Cognitive Processes by which Perceived Locus of Causality Predicts Participation in Physical Activity. *J Health Psychol*. 2002;7(6):685-99. doi: 10.1177/1359105302007006872. PubMed PMID: 22113410.
24. Pelletier LG, Rocchi MA, Vallerand RJ, Deci EL, Ryan RM. Validation of the Revised Sport Motivation Scale (SMS-II). *Psychology of Sport and Exercise*. 2013;14(3):329-341. doi: 10.1016/j.psychsport.2012.12.002.
25. Hagger MS, Chatzisarantis NLD, Culverhouse T, Biddle SJH. The Process by Which Perceived Autonomy Support in Physical Education Promote Leisure-Time Physical Activity Intentions and Behavior: A Trans-Contextual Model. *Journal of Educational Psychology*. 2003;95(4):784-795. doi: 10.1037/0022-0663.95.4.784.
26. Tenenhaus M, Amato S, Esposito Vinzi V. A Global Goodness-of-Fit Index for PLS Structural Equation Modelling. *Proc XLII SIS Sci Meeting*. 2004;739-742.
27. Wetzels M, Odekerken-Schröder G, Van Oppen C. Using PLS Path Modeling for Assessing Hierarchical Construct Models: Guidelines and Empirical Illustration. *MIS Quarterly*. 2009;33(1):177-195. doi: 10.2307/20650284.
28. Hagger MS, Armitage CJ. The Influence of Perceived Loci of Control and Causality in the Theory of Planned Behavior in a Leisure-Time Exercise Context. *Journal of Applied Biobehavioral Research*. 2004;9(1):45-64. doi: 10.1111/j.1751-9861.2004.tb00091.x.
29. Hagger MS, Chatzisarantis NLD, Biddle SJH. The Influence of Autonomous and Controlling Motives on Physical Activity Intentions within the Theory of Planned Behaviour. *Br J Health Psychol*. 2002;7:283-297. doi: 10.1348/135910702760213689. PubMed PMID: 12614501.
30. McLachlan S, Hagger M. Associations between Motivational Orientations and Chronically-Accessible Outcomes in Leisure-Time Physical Activity. *Research Quarterly for Exercise and Sport*. 2013;81(1):102-107. doi: 10.1080/02701367.2010.10599633.
31. McLachlan S, Hagger MS. The Influence of Chronically-Accessible Autonomous and Controlling Motives on Physical Activity within an Extended Theory of Planned Behaviour. *Journal of Applied Social Psychology*. 2011;41(2):445-470. doi: 10.1111/j.1559-1816.2010.00721.x.