



Analysis of the Effects of Physical Activity on Executive Functioning of University Students: Mediating Role of Physical Education Teacher

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Abstract

The present study provides in-depth analysis of the effects of physical activity upon executive functioning of university students, with mediating role of physical education teachers. Executive functioning includes cognitive processes such as cognitive flexibility, working memory, attention control, and problem-solving abilities that are crucial for the academic success. Despite growing evidence supportive cognitive reimbursements of physical activity, the mechanisms underlying this relationship remain underexplored, particularly in education contexts. This study investigates the impact of physical activity on executive functioning of university students, while examining mediating role of physical education teachers. In order to examine these relationships, the study employed quantitative research design involving representative sample of the university students participating in varied frequencies and intensities of physical activity. The data were collected over standardized executive function assessments alongside self-reported measures of physical activity levels. Moreover, students' perceptions about teachers' support, including individualized attention, instructional quality, and motivational strategies, that were evaluated using validated questionnaires for data collection. The study examined both direct impact of physical activity on executive functioning and indirect effects mediated by role of physical education teachers. The findings indicate significant positive relationship amid executive functioning and physical activity, confirming that students engaged in regular physical activity prove superior cognitive performance. More significantly, analysis reveals that physical education teachers' motivational support and individualized consideration serve as important mediators, amplifying the beneficial effects of physical activity on executive functions. This research underlines the importance of teachers not only as facilitators of physical activity but also as critical agents who enhance cognitive outcomes through encouragement and personalized support. The study contributes to understanding of how educational environments can optimize the cognitive assistances of physical activity by fostering effective teacher-student interactions. The implications of findings suggest that universities should prioritize all-inclusive physical education programs that emphasize teacher training focused on individualized student motivation and support. Thus,



integrating these practices may lead towards improved executive functioning and academic performance among the students, thereby supporting their educational development and ultimate success.

Keywords: *Physical Activity, Executive Functioning, And Physical Education Teacher, University Students: Mediation Analysis*

Introduction

The executive functioning is an amalgamation of cognitive processes essential for goal-directed behaviors, including cognitive flexibility, working reminiscence, exploitive control, planning and problem-solving. These functions allow individuals to control their emotions, views and actions to adapt efficiently to changing demands and environments [1]. The physical activity is defined as physical movement resulting in energy expenditure, has been recognized widely as valuable for physical wellbeing [2]. The university students, as emerging adults, rely heavily on executive functioning to manage time management, academic tasks, complex problem-solving, and social exchanges which are critical for personal development and academic success [3]. As, engaging in regular physical activity are linked to enhanced cognitive performance leading towards desired leading outcomes.

The existing literature provide suitable support towards positive impact upon cognitive functions, mainly executive functioning [4]. In context of university students, cognitive benefits of physical activity are particularly significant given the demands of higher education, that require sustained adaptability, concentration, and decision-making skills [5]. The studies conducted on various age groups, including youths, children and adults, validate reliably that physical activity improves aspects of the executive functioning, likewise working memory, attention control, and inhibitory processes [6]. Despite these findings, role of physical education teachers as mediators in the links remains under-explored. Their pedagogical approaches, inspiration, and feedback can shape how students perceive and participate in physical activity, potentially strengthening cognitive benefits derived from activities.

The physical education teachers do not only ease physical activity over structured programs but influence students' attitude, motivation, and engagement toward physical fitness [7]. Conversely, ineffective teaching strategies and lack of encouragement may diminish these positive outcomes. Moreover, university setting presents unique opportunities and challenges for physical activity interventions [8]. Thus, the mediating role of physical education teachers is crucial because their effectiveness in fostering a motivating and supportive environment may enhance the frequency, intensity and quality of students' physical activity [9]. This, in turn, lead to greater improvements in executive functioning. In this connection, factors such as social pressures, academic workload, and lifestyle changes that can influence the students' participation in physical activity for desired outcomes for developments.

Literature Review

The interconnectedness between physical activities, students' executive functioning, and role of physical education teacher forms inclusive context that climaxes that how cognitive, physical, and educational factor contribute to student developments [14]. Regular engagement in activities promotes changes



like neuroplasticity and increased cerebral blood flow that directly enhance the executive functions like working memory, cognitive flexibility, and inhibitory control [17]. The physical activities, encircling a variety of exercises such as anaerobic, aerobic, and coordinative movements, serve as a fundamental driver for improving cognitive abilities in students. Students' executive working is cognitive outcome influenced by physical activities [21]. These executive functions are vital for effective problem-solving, learning, and adapting to academic challenges in the students' careers.

The consistency and excellence of physical activity affect significantly the executive functioning enhancement as strong executive functions enable students to plan effectively, regulate attention, inhibit distractions and switch tasks flexibly, thereby supporting personal development academic and achievement [25]. Thus, motivating students to partake persistently and actively in physical activities over feedback, encouragement, and creating supportive environment [28]. As designing and executing physical activity programs that are inspiring cognitively and engaging physically. Thus, educating students upon health and cognitive benefits of physical activity to foster intrinsic motivation [30]. The physical education teacher's role is critical in mediating and enhancing the students' participation in physical activities, ensuring that are optimally designed to stimulate the executive functioning.

Similarly, promoting inclusivity and addressing individual differences to ensure that all students use physical activity opportunities. The improved executive functioning, in turn, supports holistic student growth and better academic performance [34]. The physical activities act as the medium over which cognitive benefits, mainly in executive functions, are realized. Conversely, physical education teacher's efforts yield utmost impact when alongside evidence-based physical activity practices that promote executive functioning [37]. This inclusive relationship highlights that the physical activity alone is insufficient for optimal cognitive benefits unless facilitated effectively by supportive and competent physical education teachers [39]. Recognizing and strengthening these interconnected roles can foster effective approach to academic success, student well-being, and vigorous behaviors.

The inclusive relationships among students' executive functioning, physical activities, and role of physical education teacher create all-inclusive model for the attractive physical and cognitive development in educational settings [6]. The executive functioning is a set of advanced cognitive processes including cognitive flexibility, inhibitory control, planning, and problem-solving [11]. The university students must manage challenging diverse cognitive tasks like organizing study schedules the multitasking, analyzing complex materials, and adapting to academic settings [17]. These functions are vital for students in institutions, wherein academic tasks demand complex thinking, effective self-regulation, and sustained attention, activities ranging from exercises like running and swimming to coordination and balance exercises is shown to positively influence executive functioning.

The strong executive functioning skills enable them to perform tasks capably, by contributing to personal development and better academic outcomes, reduced stress and improved mood, which help optimize cognitive performance [21]. The studies within higher education settings suggest that students who participate regularly in physical activities show advances in working memory,



cognitive flexibility, attention control, and inhibitory control [24]. The mechanisms behind this enhancement include, increased cerebral blood flow, which supplies nutrients and oxygen to the brain involved in executive functions, integrating physical activities programs within academic schedules [27]. Thus, providing access to fitness facilities and sports, despite its profits, physical activity decay during university years due to the factors like academic workload, sedentary habits and lack of motivation.

These challenges can affect adversely students' executive functioning and well-being. Promoting alertness about cognitive and health benefits of physical activity. Moreover, studies may consider individual differences, like gender, baseline fitness and academic discipline [30]. The physical activities serve as powerful, non-pharmacological intervention to enhance executive functioning in students attending higher institutions. Encouraging participation through student organizations and events [32]. Further research is needed to explore intensities, optimal types, and durations of physical activity that maximize executive functioning benefits in university student populations [31]. Executive functioning includes critical cognitive skills such as working, inhibitory control, flexibility, planning, and problem-solving that are essential for students' academic achievement and overall development.

By fostering active lifestyle, universities can support academic success, cognitive development, and student well-being. These biological changes support efficiency and development of brain regions involved in executive functioning, notably the prefrontal cortex [27]. Moreover, physical activities reduce stress, improve mood, and enhance sleep quality that indirectly help executive functions for cognitive processing by creating optimal conditions [19]. Physical activities have been widely recognized as means to enhance executive functions over various physiological and psychological mechanisms. The regular physical activity also inspires attention regulation, self-discipline, and emotional control, strengthening executive skills [24]. By fostering the positive, inclusive setting and using techniques, teachers increase student participation and adherence to physical activity routines.

The physical education teachers create exercise programs that are not only physically inspiring but also require coordination, strategic thinking, and decision-making, which inspire executive functions. The constructive feedback helps students to develop goal-setting skills, self-regulation that align closely with executive functioning [10]. The combined effect of structured physical activity and physical education teaching creates environment conducive to cognitive enrichment [14]. The physical education teachers act as catalysts who transform the physical activities into opportunities for cognitive growth [17]. The physical education teachers educate students about cognitive and health benefits of regular physical activity, inspiring lifelong healthy habits. The training programs for teachers may include components upon cognitive growth and strategies to engage executive functions.

The collaboration between educators, cognitive scientists, and health professionals can lead to innovative curricula that integrate cognitive and physical developments. The universities should emphasize the standing of quality physical education as a cornerstone of holistic education [24]. Physical activities have been widely recognized as a means to enhance these executive functions through various physiological and psychological mechanisms.



Encouraging participation through student organizations and events [23]. Physical activities have a profound impact on boosting students' executive functioning, and physical education teachers play a crucial role in facilitating this process [30]. Through well-designed motivation, activities, supportive teaching strategies, teachers help students bind cognitive benefits of physical activity, promoting academic success and enduring well-being.

Research Methodology

This study is quantitative in nature that aims to examine relationship in chasing the hypotheses and reaching conclusion. The positivism approach was used to chasing relationships among research variables (physical activity, executive function, and physical education teacher) of study. The research approach specifies the way through which data is collected from the respondents by retrieving them to reach their answers about variables of research in order to reach required conclusion through justification towards desired outcomes. The population of interest in this research is students hailing from colleges in KP, Pakistan wherein 3655 students from colleges wherein a sample is drawn from population (361), has been extracted by using the sampling formula widely used in the social research studies. Thus, 361 questionnaires were distributed among which 332 were recollected and used for analysis. Similarly, the random simple technique was used to access the population of study which comes under the non-probability technique to ensure required data from diverse dimensions. Also, both secondary and primary data were used to collect data from respondents and from existing knowledge databased to analyze data to reach conclusion. The questionnaires were adopted from previous studies. Similarly, 5-point Likert scale was used to record responses of respondents about research issues in particular context to access respondents and achieving desired outcomes.

Results of Study

Descriptive Statistics

Descriptive Statistics

	N	Minimum	Maximum	Mean	SD
Physical Activity	344	2.47	3.36	4.4943	.73388
Physical Education Teacher	344	1.25	4.44	3.8361	1.14071
Executive Functioning	344	1.25	4.54	3.0558	.50678
Valid N (listwise)	344				

The descriptive statistics deals with summarizing and organizing data be easily understood and unlike inferential statistics, descriptive statistics simply describes in the data set. The descriptive statistics in vital tool in quantitative studies as it helps in providing details regarding description of research variables in terms of the sample, mean, minimum and maximum response rates, and standard deviation. The outcomes of descriptive statistics provide the significant information in measuring the research issues that are within the threshold and required values and thus results are thus important for extracting the required information for reaching the desired conclusion in the particular context.

H-No.1 There is significant association among physical activity, physical education teacher and executive functioning of university students (correlation).



Correlation Analysis

Correlations		[1]	[2]	[3]
Physical Activity [1]	Pearson Correlation	1	.398**	.450**
	Sig. (2-tailed)		.000	.000
	N	344	344	344
Physical Education Teacher [2]	Pearson Correlation	.398**	1	.260**
	Sig. (2-tailed)	.000		.000
	N	344	344	344
Executive Functioning [3]	Pearson Correlation	.450**	.260**	1
	Sig. (2-tailed)	.000	.000	
	N	344	344	344

** . Correlation is significant at the 0.01 level (2-tailed).

The correlation procedure was used to examine the association amongst the research variables in terms strength and direction in relationships among physical activity, physical education teacher and executive functioning of university students. The results of correlation procedure confirmed association wherein predictors and significantly association with dependent variable (executive functioning), like physical activity (R = .450 & P = .000), physical education teacher (R = .260 & P = .000), and therefore, from the results of correlation analysis, the hypothesis is accepted from the correlation outcomes.

H-No. 2 There is positive impact of physical activities, coping strategy, and intellectual capital on academic achievement (H2).

Regression Analysis

Model Summary					
Model	R	R Square	Adjusted Square	R Std. Error of Estimate	
1	.590a	.348	.342	.50305	

Regression Analysis

ANOVA						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	42.956	3	14.319	56.582	.000b
	Residual	80.473	318	.253		
	Total	123.428	321			

Table 4.10 Regression Analysis

Model Summary					
Model	R	R Square	Adjusted Square	R Std. Error of Estimate	
1	.459a	.210	.206	.45164	

a. Predictors: (Constant), Physical Education Teacher, Physical Activity



Table 4.13 Regression Analysis

ANOVA						
Model		SS	df	MS	F	Sig.
1	Regression	18.535	2	9.268	45.433	.000b
	Residual	69.558	341	.204		
	Total	88.093	343			

a. Dependent Variable: Executive Functioning
 b. Predictors: Physical Education Teacher, Physical Activity

Regression Analysis

Coefficients						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	SE	Beta		
1	(Constant)	1.614	.153		10.526	.000
	Physical Activity	.285	.036	.412	7.859	.000
	Physical Education Teacher	.142	.023	.095	1.817	.040

a. Dependent Variable: Executive Functioning

The regression procedure was used to examine the cause-and-effect relationship among research variables of current study. The results of regression offer important information in reaching the desired conclusion. The results revealed that there is 21% variance in executive functioning is due to physical activity and physical education teacher with the significant impact likewise physical activity ($\beta = .285$ & P-value = .000) and physical education teacher ($\beta = .142$ & P-value = .040) which thus confirmed the significant impact and thus hypothesis is accepted based upon results from regression procedure in order to confirm the cause-&-effect relationship amid the research variables of current study.

H-No. 3 There is significant partial mediating role of physical education teacher in relationship between physical activity and executive functioning (mediation).

First Mediation Steps (a)

Model Summary						
R	R Square	MSE	F	df1	df2	p
.3983	.1587	1.0980	47.6603	1.0000	342.0000	.0000

Coefficients of Regression

Model	Coefficient	se	t	P	LLCI	ULCI
Constant	1.0535	.3850	2.7366	.0065	.2963	1.8107
Physical Activity	.6191	.0897	6.9036	.0000	.4427	.7955

Predicting Variable: Physical Activity

Criterion Variable: Physical Education Teacher



Mediation Second & Third Steps (b & c)

Model Summary

R	R Square	MSE	F	df1	df2	p
.4587	.2104	.2040	36.1759	2.0000	341.0000	.0000

Coefficients of Regression

Model	Coefficient	se	t	p	LLCI	ULCI
Constant	1.6136	.1643	9.8205	.0000	1.2905	1.9368
Physical Education Teacher Physical Activity	.2847	.0403	7.0681	.0000	.2055	.3640

Predicting Variable: Physical Activity, Physical Education Teacher

Criterion Variable: Executive Functioning

Mediation Fourth Step (c)

Model Summary

R	R Square	MSE	F	df1	df2	p
.4503	.2028	.2054	68.0256	1.0000	342.0000	.0000

Coefficients of Regression

Model	Coefficient	se	t	p	LLCI	ULCI
Constant	1.6583	.1642	10.0968	.0000	1.3352	1.9813
Physical Activity	.3109	.0377	8.2478	.0000	.2368	.3851

Predicting Variable: Physical Activity

Criterion Variable: Executive Functioning

The mediation procedure was used to examine the mediating role of physical education teacher in relationship between physical activity and executive functioning by using the four different paths of mediation wherein the results provide significant information about the all the paths for determining the direct and indirect relationships among the research issues under considerations. The results of mediation confirmed that physical education teacher partially mediated the links between physical activity and executive functioning. The results discovered the reduction in the coefficient value from (.3109) in direct relationship to (.2028) in indirect relationship while the significant values remained unchanged and thus from the mediation outcomes, the hypothesis is partially accepted in study.

Discussion

The physical activity enhances capacity to manipulate and hold information provisionally, which helps in problem-solving and learning and exercise interventions in university settings improve mental flexibility, attention span, self-regulation [20]. The active students report often better sleep quality, supports executive processes memory and consolidation as physical activity helps reduce anxiety and stress, which indirectly benefits executive functioning by lowering cognitive load and enhancing emotional regulation [25]. The lifestyle factors and academic workload may limit students' capability to maintain



consistent physical activity. The physical activity improves motivation, leading to higher cognitive engagement [26]. Exercise encourages social interaction and teamwork, indirectly contributing to cognitive skills development. Thus, integrating regular, structured physical activity programs within the universities can support the cognitive health and academic achievements.

The relationship amid physical activity, executive functioning of students and physical education teacher is consistent and dynamic, reflecting how cognitive, behavioral, and educational factors collectively influence students' development [27]. Thus, strengthening and recognizing this role led to effective physical activity programs that promote cognitive and physical development of students [28]. The regular engagement in physical activity inspires regions critical for these functions, such as prefrontal cortex, by increasing blood flow, and neural plasticity. The physical activity is strongly linked to enrichments in executive functioning cognitive courses that include working recall, cognitive flexibility, planning, and problem-solving [29], leads to improvements in attention, memory, and self-regulation abilities crucial for academic and everyday functioning in university students.

The consistency and excellence of physical activity affect significantly the executive functioning enhancement as strong executive functions enable students to plan effectively, regulate attention, inhibit distractions and switch tasks flexibly, thereby supporting personal development academic and achievement [21]. Thus, motivating students to partake persistently and actively in physical activities over feedback, encouragement, creating supportive environment [31]. As designing and executing physical activity programs that are inspiring cognitively and engaging physically. Thus, educating students upon health and cognitive benefits of physical activity to foster intrinsic motivation [32]. The physical education teacher's role is critical in mediating and enhancing the students' participation in physical activities, ensuring that are optimally designed to stimulate the executive functioning.

Recommendations

1. The education institutions may appoint well-trained and motivational physical education teachers, as their diverse roles are vital in guiding students and improving their executive functioning for desired outcomes.
2. The universities should encourage students to take part in physical activities regularly by offering accessible gym facilities, sports programs, and fitness events as required towards desired developments and success.
3. The awareness campaigns should be held to inform students about how physical activity not only improves health but also boosts the brain functions like focus, memory, and self-control, required in diverse situations.
4. The physical activity should be integrated into the academic routine, especially during the stressful exam periods, to help students to manage stress, improve cognitive performance for attaining the outcomes.

References

- [1] Zhao, G., Sun, K., Fu, J., Li, Z., Liu, D., Tian, X., Yang, J., & Zhang, Q. Impact of physical activity on the executive functions: Moderated mediation model. *Frontiers in Psychology*, 14:1226667. (2024).
- [2] Singh, A., Uijtdewilligen, L., Twisk, J. W., van Mechelen, W., &



- Chinapaw, M. J. Physical activity and performance at school: A systematic review of the literature including a methodological quality assessment. *Archives of Pediatrics & Adolescent Medicine*, 166(1), 49-55. **(2012)**.
- [3] Gerber, M., Pühse, U., & Roth, V. Physical activity, extracurricular sports, and health. In C. R. Reynolds, K. J. Vasa, & R. M. Keith (Eds.), *Handbook of school psychology* (4th ed., pp. 659–682). John Wiley & Sons. **(2009)**.
- [4] Singh, A., Uijtdewilligen, L., Twisk, J. W. R., Mechelen, W., & Chinapaw, M. Physical activity and performance at school: A systematic review of the literature including a methodological quality assessment. *Archives of Pediatrics & Adolescent Medicine*, 166(1), 49–55. **(2012)**.
- [5] Biddle, S., Soos, I., & Chatzisarantis, N. Predicting physical activity intentions using goal perspectives and self-determination theory approaches. *European Psychologist*, 4, 83–89. **(1999)**.
- [6] McKenzie, T. L., & Kahan, D. (Eds.). *Physical activity and health: A report of the Surgeon General*. Human Kinetics. **(2017)**.
- [7] Harwood, C., Keegan, R., Smith, M., & Raine, A systematic review of the intrapersonal correlates of motivational climate perceptions in sport and physical activity. *Psychology of Sport and Exercise*, 18, 9-25. **(2015)**.
- [8] Li, F., Harmer, P., McAuley, E., & Duncan, T. E. Motivators of physical activity in active and inactive older adults: A multidimensional approach. *Journal of Aging and Physical Activity*, 9(3), 254-266. **(2001)**.
- [9] Hellison, D. R. *Teaching personal and social responsibility through physical activity* (3rd ed.). Human Kinetics. **(2011)**.
- [10] Jones, A., Jason, M., & Hart, B. Let's Take a Break: The Impact of Physical Activity on Academic Motivation. *International Journal of Teaching and Learning in Higher Education*, 33 (2), 110-118. **(2022)**.
- [11] Türker, Ü., & Kul, M. "The Effects of Exercise and Physical Activities on Life Satisfaction Levels of Elderly People Living in Nursing Homes", *Academic Studies in Sport Sciences-II*, In (Chapter 14/211-221). Night Library. **(2020)**.
- [12] Chen, S., Ho, Y., & Ahmed, D. Physical activity and its relationship with life satisfaction among middle school students: a cross-culture study. *Sustainability* 12, 6932. **(2020)**.
- [13] Fornés, J., García, A., Serra, J., & Martínez, A. University students perceived parental support and its relationship with physical activity and well-being. *International Journal of Environmental Research and Public Health*, 17(5), 1646. **(2020)**.
- [14] McMahan, E.M., Corcoran, P., Cannon, M., Carli, V., Wasserman, D. Physical activity in European adolescents and associations with anxiety, depression and well-being. *European Child & Adolescent Psychiatry*, 26(1), 111–122. (2017).
- [15] Cox, A. E. Duncheon, N. & McDavid, L. Peers and teachers as sources of relatedness perceptions, motivation, and affective responses in physical education. *Research Quarterly for Exercise and Sport*. 80: 765-773. **(2009)**.
- [16] Gruno, J. Gibbons, S.L. Condie, R. & Wilton, D. Girls in action: Fostering relatedness in and beyond physical and health education.



- Strategies*. 31: 19-25. **(2018)**.
- [17] Allen, M. S., and Laborde, S. The role of personality in sport and physical activity. *Curr. Dir. Psychol. Sci.* 23, 460–465. **(2014)**.
- [18] Biddle, S., Soos, I., & Chatzisarantis, N. Predicting physical activity intentions using goal perspectives and self-determination theory approaches. *European Psychologist*, 4, 83–89. **(1999)**.
- [19] McKenzie, T. L., & Kahan, D. (Eds.). Physical activity and health: A report of the Surgeon General. Human Kinetics. **(2017)**.
- [20] Harwood, C., Keegan, R., Smith, M., & Raine, A systematic review of the intrapersonal correlates of motivational climate perceptions in sport and physical activity. *Psychology of Sport and Exercise*, 18, 9-25. **(2015)**.
- [21] Li, F., Harmer, P., McAuley, E., & Duncan, T. E. Motivators of physical activity in active and inactive older adults: A multidimensional approach. *Journal of Aging and Physical Activity*, 9(3), 254-266. **(2001)**.
- [22] Hellison, D. R. Teaching personal and social responsibility through physical activity (3rd ed.). Human Kinetics. **(2011)**.
- [23] Jones, A., Jason, M., & Hart, B. Let's Take a Break: The Impact of Physical Activity on Academic Motivation. *International Journal of Teaching and Learning in Higher Education*, 33 (2), 110-118. **(2022)**.
- [24] Chen, S., Ho, Y., & Ahmed, D. Physical activity and its relationship with life satisfaction among middle school students: a cross-culture study. *Sustainability* 12, 6932. **(2020)**.
- [25] Zhang, Y., Xiao, C., Zhao, 1, & Jiang, F. The Effect of Strengthened Physical Education on Academic Achievements in High School Students: A Quasi-Experiment in China. *International Journal of Environmental Research and Public Health*, 16, 4688, 2-11. **(2019)**.
- [26] Ardoy, D., Fernán, M., Jiménez, D., Castillo, R., Ruiz, J., Ortega, B. Physical education trial improves adolescents' cognitive performance and academic achievement: The EDUFIT study. *Scand. J. Med. Sci. Sports*, 24, e52. **(2014)**.
- [27] Valero, A., Østerlie, O., Martínez, S., & García, M. Gamification in Physical Education: Evaluation of Impact on Motivation & Academic Performance within Higher Education. *Int. J. Environ. Res. Public Health*, 17, 4465. **(2020)**.
- [28] Hagger, M., Chatzis, N., Culverhouse, T., & Biddle, J. The processes by which perceived autonomy support in physical education promotes leisure-time physical activity intentions and behavior: A trans-contextual model. *J. Educ. Psychol.*, 95, 784–795. **(2003)**.
- [29] Trudeau, F., & Shephard, R. J. Physical education, school physical activity, school sports and academic performance. *International Journal of Behavioral Nutrition and Physical Activity*, 5(1), 10. **(2008)**.
- [30] Gutiérrez, M.; López, E. Motivational climate, reasons for discipline and behavior in physical education. *Rev. Int. Med. Cienc. Act. Fis. Dep.*, 12, 235–251. **(2012)**.