

The Role of Physical Education in Cognitive Performance and Sustainable Lifestyle: The Mediating Role of Emotional Violence and Emotional Closeness

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Abstract

The juncture of physical education, sustainable lifestyle and cognitive development choices has increasing garnered scholarly attention during the past decades. The current study explores the complex role of physical education in enhancing fostering long-term sustainable lifestyle habits and cognitive performance, while examining how emotional closeness and emotional violence act as mediating psychological variables in these dynamic relationships. The education significantly contributes to diverse functioning by promoting students' potential towards desired outcomes. The engagement in the regular physical activity through structured physical education programs improves executive functions such as consideration, cognitive flexibility and working memory, skills critical to problem-solving and academic success. The physical education is instrumental in instilling sustainable behaviors, including routine physical activity, eating, psychological well-being and environmental consciousness. Students exposed to quality physical education are likely to adopt and sustain healthy habits that reduce risk of diseases, minimize environmental tracks, and contribute to all-inclusive well-being. This negative affective climate diminishes cognitive gains and disrupts the formation of healthy habits that would otherwise be achieved through active engagement. Conversely, emotional closeness donates to improved cognitive performance and internalization of sustainable lifestyle values, like discipline, responsibility, and community engagement for outcomes. In this drive, for attaining the desired outcomes, data was collected from students, hailing from higher educational institutions from Punjab, Pakistan. The research was focused to examine the hypothesized relationships amid physical education, cognitive performance, sustainable lifestyle, emotional violence and emotional closeness through different hypotheses as extracted from the theoretical framework of study thereby using secondary and primary data sources for collecting the relevant facts and figures and analyzing the data through different procedures for attaining the desired outcomes. This study highlights the dualistic mediating roles of emotional violence and emotional closeness in the relationship between physical education, cognitive performance, and sustainable lifestyle development. Interventions in educational policy and physical education program design should prioritize supportive emotionally environments and address explicitly the reduction of emotional violence to unlock the full developmental potential of students. A holistic approach that integrates cognitive, physical, and emotional dimensions is essential for cultivating resilient, environmentally responsible and cognitively capable, future citizens. The results offered significant information for reaching conclusion and offering recommendations to policy-makers and future researchers.

Keywords: Physical Education, Cognitive Performance, Sustainable Lifestyle, Emotional Violence Emotional Closeness & Mediation

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INTRODUCTION

The sports participation is important phenomenon that helps in nurturing the students' behaviors towards the desirability and commitment for attaining desired outcomes along with improving capabilities related effective planning towards problem solving [1]. Engaging in physical activity increases blood flow to the brain, promotes the release of neurotransmitters like dopamine and serotonin, and stimulates the growth of physical and psychological aspects which contribute to better cognitive performance of physical education and sustainable lifestyle [2]. Physical education lays foundation for a sustainable lifestyle by instilling healthy habits, through physical education classes, students learn the importance of regular exercise, proper nutrition, and well-being. These lessons can lead to lifelong habits that reduce the risk of chronic diseases such as obesity, diabetes, and related problems [3].

The emotional violence, such as bullying, have detrimental effects on both cognitive performance and sustainable lifestyle behavior as victims of emotional violence may experience increased stress and anxiety, which can impair cognitive function and hinder academic performance [4]. Besides, individuals who experience emotional violence may be less likely to engage in physical activity or adopt healthy lifestyle behaviors due to low self-esteem. Emotional closeness, on the other hand, fosters positive mental health and well-being, which enhance cognitive performance and promote sustainable lifestyle choices [5]. Supportive relationships and a sense of belonging contribute to emotional resilience, falling the impact of stress on cognitive function [6]. Besides, individuals who feel fervently close to others likely to engage in physical activity together, reinforcing sustainable lifestyle behaviors.

The mediating role of emotional violence and emotional closeness act as mediators in relationship between physical education, cognitive performance, and sustainable lifestyle [7]. The institutions and communities that prioritize emotional well-being and cultivate a positive social environment within physical education programs are more likely to see improvements in the cognitive function and sustained healthy behaviors among students [8]. Conversely, the environments characterized by emotional violence may undermine the benefits of sports education on cognitive performance and sustainable lifestyle. Still, the effects may be influenced by factors such as emotional violence and emotional closeness [9]. By addressing these factors and fostering supportive environments, physical education programs can maximize their impact on the student well-being and long-term health outcomes.

The research on the role of physical education in cognitive performance and sustainable lifestyle, considering the mediating roles of the emotional violence and emotional closeness, addresses the intersectionality of physical and mental health, social dynamics, and academic outcomes [10]. This interdisciplinary approach draws from the fields like psychology, education, public health, and sociology to understand how various factors interact to influence individuals' overall well-being. Numerous studies have established a positive association between physical activity and cognitive function [11]. The research reveals that regular exercise boosts brain function, leading to advances in reminiscence, care, and executive functions [12]. The physical education programs serve as a structured framework for promoting physical activity among students, potentially translating into cognitive outcomes.

The promotion of sustainable lifestyle behaviors through physical education aligns with broader public health initiatives aimed at combating sedentary lifestyles, obesity, and related chronic diseases [13]. By teaching students about the importance of regular exercise, healthy eating habits, and overall well-being, physical education programs contribute to development of lifelong skills that support sustainable, health-conscious living [14]. Emotional violence, including bullying and peer victimization, has well-documented negative effects on mental

health and academic success [15]. The individuals experience emotional violence may exhibit symptoms of anxiety, depression, and low self-esteem, impair cognitive function and hinder engagement emotional violence within school settings, including during physical education classes and sports activities, may undermine the potential benefits.

LITERATURE REVIEW

The existing literature on the role of physical education in cognitive performance and sustainable lifestyle, considering mediating roles of emotional violence and emotional closeness, is rich and multidisciplinary [29]. Thus, numerous studies have demonstrated positive relationship between physical activity and cognitive performance across various age groups as regular engagement in physical education and exercise has been associated with improved attention, memory, executive function, and academic success [30]. The research exploring the link between physical activity and sustainable lifestyle choices highlighted potential for physical education program to promote environmentally friendly behaviors [31]. The participation in activities, environmental education initiatives, and active transportation modes is linked to increased environmental awareness and pro-environmental behaviors.

The emotional closeness, characterized by strong social connections and supportive relationships, has been consistently linked to positive mental health outcomes and subjective well-being. The research indicates that physical activity, particularly when performed in social settings or team-based environments, can enhance emotional closeness and interpersonal relationships [26]. While limited research specifically addresses the mediating roles of emotional violence and emotional closeness in the relationship between physical education, cognitive performance, and sustainable lifestyle choices [32]. The theoretical frameworks like social cognitive theory, ecological systems theory, and self-determination theory provide insight into potential pathways through which these variables may interact [33], that provide the clues for conducting the research on particular issues in specific context.

The role of physical education in promoting sustainable lifestyles and shaping cognitive abilities has been subject of growing interdisciplinary research in domains of psychology, education, and public health [10]. The physical education is no longer merely seen as the component of physical development but is recognized increasingly for its holistic contributions to emotional resilience, human cognition, and long-term behavioral designs conducive to social and individual well-being [13]. The physical activity has been linked with improved brain function and structure, including increased potential, appearance, enhanced neural connectivity and stimulation of effectiveness in tasks like, which are essential for executive functions of the students [15]. The researchers argue that physical education plays fundamental role in attractive cognitive performance over various required leading mechanisms.

The physical education provides an environment that promotes concentration, goal-setting, traits and discipline that correlate directly with problem-solving skills and academic achievement. The cognitive benefits extend beyond immediate academic outcomes, influencing lifelong adaptability and learning [17]. Regular involvement in structured physical activity improves working memory, and processing speediness, mainly in university students [21]. Thus, the participation in sports and movement-based curricula nurtures teamwork, personal responsibility, and long-term health consciousness. Therefore, parallel to its cognitive impact, physical education serves as a medium for instilling habits and values associated with sustainable living [24]. These programs encourage students to make sure informed choices about stress management, physical health, nutrition, and environmental responsibility.



These behavioral foundations translate into sustainable lifestyle designs that promote the mental, physical, and social well-being. The educational settings, physical activity occurs can instill also social obligation and ecological alertness by nurturing empathy-driven behavior and community participation [26]. A critical yet underexplored dimension of this relationship is emotional and psychological climate where physical education is delivered. It creates a hostile environment that disrupts learning process and affects negatively students' self-esteem, psychological health, and motivation [29]. The emotional violence, encircling behaviors like social exclusion, verbal abuse, bullying, and ridicule, is significant barrier to effectiveness diverse tasks [32]. The victims of such violence show withdrawal, decreased academic focus that undermine both cognitive growth and lifestyle developments.

The emotional violence may overwhelm the cognitive benefits of physical activities by reducing participation, increasing anxiety, and fostering negative overtone with physical measure, thus, emotional closeness promotes psychological safety, is crucial for creative engagement, risk-taking, and internalization of positive health behaviors [7]. Conversely, presence of emotional closeness within physical education settings, branded by positive peer relations, supportive instructors, and culture of empathy, enhance the benefits of physical education [5]. The encouragement and trust embedded in these relationships facilitate cognitive stimulation and reinforcement of pro-social behaviors that donate to community-oriented sustainable lifestyle [9]. In emotionally supportive environments, students are likely more to participate actively, set and achieve personal goals, and develop resilient mindset.

When emotional closeness is prioritized and emotional violence is minimized, the environment becomes conducive to development in socially, cognitively, and behaviorally. Within the physical education, students' engagement, motivation, and behavior are not solely a function of curriculum design but are profoundly shaped by affective experiences and relational dynamics [11]. Recent empirical studies have reinforced these theoretical insights, examining interventions reveals that programs mixing social-emotional learning with physical education yield superior outcomes in academic performance and lifestyle choices [14]. These underlines standing of inserting emotional literacy and psychological safety into pedagogical practices of physical education [17]. Similarly, interventions aimed at reducing boost students' self-regulation, engagement, and commitment to health-promoting behaviors.

The literature supports multidimensional understanding of role of physical education, emotional violence interrupts this potential, while the emotional closeness acts as catalyst, mediating links amid developmental outcomes and physical activity [20]. It is a vital contributor to sustainable living and cognitive performance when supported by emotionally secure environment. The link between cognitive growth, physical education, and adoption of sustainable lifestyle behaviors has been the subject of growing academic inquiry [22]. Thus, future research and educational policy must stress not only the physical but psychological and emotional design of physical education environments to optimize their transformative impact [25]. The scholars recognize that role for encircling emotional, and behavioral domains that collectively shape an individual's capacity for lifelong learning and living.

RESULTS OF STUDY

Descriptive Statistics					
	N	Minimum	Maximum	Mean	SD
Physical Education	344	1.30	4.80	3.3096	.72662
Emotional Violence	344	1.33	4.67	3.2185	.81497
Emotional Closeness	344	1.70	4.70	3.3762	.69451
Cognitive Performance	344	1.60	4.60	3.5237	.65189

Sustainable Lifestyle	344	1.63	4.70	3.4077	.61567
Valid N (listwise)	344				

The descriptive statistics denote to the methods used to organize, summarize, and present data in an understandable and informative manners in order to attain the desired information about the description of research variables. These statistics provide simple quantitative insights about dataset, allowing researchers to describe the basic features of data without making conclusions beyond collected sample. The results of current study provide significant information towards the desired variables' description in terms of required parameters in determining research issues from different dimensions.

H₁: There is positive association among the physical education, emotional violence, emotional closeness, cognitive performance & sustainable lifestyle (H₁).

Correlation Analysis

Correlations		[1]	[2]	[3]	[4]	[5]
Physical Education [1]	Pearson Correlation	1	.214**	.385**	.411**	.617**
	Sig. (2-tailed)		.000	.000	.000	.000
	N	344	344	344	344	344
Emotional Violence [2]	Pearson Correlation	.214**	1	.164**	.087	.242**
	Sig. (2-tailed)	.000		.002	.106	.000
	N	344	344	344	344	344
Emotional Closeness [3]	Pearson Correlation	.385**	.164**	1	.381**	.451**
	Sig. (2-tailed)	.000	.002		.000	.000
	N	344	344	344	344	344
Cognitive Performance [4]	Pearson Correlation	.411**	.087	.381**	1	.491**
	Sig. (2-tailed)	.000	.106	.000		.000
	N	344	344	344	344	344
Sustainable Lifestyle [5]	Pearson Correlation	.617**	.242**	.451**	.491**	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	344	344	344	344	344

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

The correlation results provide significant information about the association among variables like physical education, emotional violence, emotional closeness, cognitive performance & sustainable lifestyle with respect to strength and direction in association wherein the correlation outcomes provide significant information in reaching the conclusion. The results confirmed the significant outcomes about positive and significant association likewise physical education and cognitive performance (R = .411 & P = .000), physical education and sustainable lifestyle (R = .617 & P = .000), emotional violence and cognitive performance (R = .087 & P = .106), emotional violence and sustainable lifestyle (R = .242 & P = .000), emotional closeness and cognitive performance (R = .381 & P = .000), and emotional closeness and sustainable lifestyle (R = .451 & P = .000), and thus hypothesis was accepted.

H₂: There is a positive impact of physical education, emotional violence, and emotional closeness on the cognitive performance (H₂).

Regression Analysis

Model Summary				
Model	R	R Square	Adjusted R Square	SEE
1	.477 ^a	.228	.221	.57540

Regression Analysis**ANOVA**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	33.194	3	11.065	33.419	.000 ^b
	Residual	112.568	340	.331		
	Total	145.762	343			

Regression Analysis**Coefficients**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.814	.198		9.155	.000
	Physical Education	.282	.047	.314	5.997	.000
	Emotional Violence	-.018	.039	-.023	-.471	.638
	Emotional Closeness	.248	.049	.264	5.094	.000

a. Predictors: (Constant), Emotional Closeness, Emotional Violence, Physical Education

b. Dependent Variable: Cognitive Performance

The regression procedure was used to examine the cause-& effect relationship among research variables likewise the physical education, emotional violence, emotional closeness on cognitive performance by using the regression procedure. The results confirmed the prediction of cognitive performance through physical education, emotional violence, emotional closeness wherein 22.8% change was evident in cognitive performance in due to physical education ($\beta = .282$ & P-value = .000), emotional violence ($\beta = -.018$ & P-value = .638), emotional closeness ($\beta = .248$ & P-value = .000), and thus from the results of regression procedure, the hypothesis was accepted and thus substantiated in current study.

H₃: There is a positive impact of physical education, emotional violence, and emotional closeness on the sustainable lifestyle (H₃).

Regression Analysis**Model Summary**

Model	R	R Square	Adjusted R Square	SEE
1	.666 ^a	.443	.438	.46152

Regression Analysis**ANOVA**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	57.593	3	19.198	90.131	.000 ^b
	Residual	72.419	340	.213		
	Total	130.013	343			

Regression Analysis**Coefficients**

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.042	.159		6.560	.000
	Physical Education	.427	.038	.504	11.342	.000

Emotional Violence	.071	.031	.094	2.261	.024
Emotional Closeness	.214	.039	.241	5.479	.000

a. Predictors: Physical Education, Emotional Closeness, Emotional Violence

b. Dependent Variable: Sustainable Lifestyle

The regression procedure was used to examine the cause-& effect relationship among research variables likewise the physical education, emotional violence, emotional closeness on sustainable lifestyle by using the regression procedure. The results confirmed the prediction of the cognitive performance through physical education, emotional violence, emotional closeness wherein 44.3% change was evident in sustainable lifestyle in due to physical education ($\beta = .427$ & P-value = .000), emotional violence ($\beta = .071$ & P-value = .024), emotional closeness ($\beta = .214$ & P-value = .000), and thus from the results of regression procedure, the hypothesis was accepted and thus substantiated in current research study.

H4: There is significant mediating role of emotional violence in linking physical education and cognitive performance (H4).

Mediation First Step (a)

Model Summary

R	R Square	MSE	F	df1	df2	p
.2140	.0458	.6356	17.7276	1.0000	342.0000	.0000

Coefficients of Regression

Model	Coefficient	se	t	p	LLCI	ULCI
Constant	2.4241	.1857	13.0520	.0000	2.0588	2.7894
Physical Education	.2400	.0570	4.2104	.0000	.1279	.3522

Predicting Variable: Physical Education

Criterion Variable: Emotional Violence

Mediation Second & Third Steps (b & c)

Model Summary

R	R Square	MSE	F	df1	df2	p
.4108	.1688	.3553	23.9208	2.0000	341.0000	.0000

Coefficients of Regression

Model	Coefficient	se	t	p	LLCI	ULCI
Constant	2.3050	.2079	11.0847	.0000	1.8960	2.7140
Emotional Violence	-.0005	.0384	-.0118	.9906	-.0759	.0750
Physical Education	.3487	.0534	6.9069	.0000	.2637	.4737

Predicting Variable: Physical Education, Emotional Violence

Criterion Variable: Cognitive Performance

Mediation Fourth Step (c)

Model Summary

R	R Square	MSE	F	df1	df2	p
.4108	.1688	.3543	47.3805	1.0000	342.0000	.0000

Coefficients of Regression

Model	Coefficient	se	t	p	LLCI	ULCI
Constant	2.3039	.1762	13.0724	.0000	1.9572	2.6506
Physical Education	.3686	.0535	6.8833	.0000	.2633	.4739

Education

Predicting Variable: Physical Education

Criterion Variable: Cognitive Performance

The mediating role of emotional violence in linking physical education and cognitive performance was examined through mediation procedure that provides significant information in reaching the desired conclusion that whether it is partial mediation or full mediation through the outcomes of four different paths of mediation in determining the direct and indirect relationships. The results of all the four paths confirmed the partial mediating role of emotional violence in linking physical education and cognitive performance due to decrease in coefficient value from (.3686) in direct relationship to (.3487) that confirmed the partial mediation and thus hypothesis about mediation was hence accepted partially.

DISCUSSION

The sports participation is important phenomenon that helps in nurturing the students' behaviors towards the desirability and commitment for attaining desired outcomes along with improving capabilities related effective planning towards problem solving [1]. Engaging in physical activity increases blood flow to the brain, promotes the release of neurotransmitters like dopamine and serotonin, and stimulates the growth of physical and psychological aspects which contribute to better cognitive performance of physical education and sustainable lifestyle [2]. Physical education lays foundation for a sustainable lifestyle by instilling healthy habits, through physical education classes, students learn the importance of regular exercise, proper nutrition, and well-being. These lessons can lead to lifelong habits that reduce the risk of chronic diseases such as obesity, diabetes, and related problems [3].

The promotion of sustainable lifestyle behaviors through physical education aligns with broader public health initiatives aimed at combating sedentary lifestyles, obesity, and related chronic diseases [13]. By teaching students about the importance of regular exercise, healthy eating habits, and overall well-being, physical education programs contribute to development of lifelong skills that support sustainable, health-conscious living [14]. Emotional violence, including bullying and peer victimization, has well-documented negative effects on mental health and academic success [15]. The individuals experience emotional violence may exhibit symptoms of anxiety, depression, and low self-esteem, impair cognitive function and hinder engagement emotional violence within school settings, including during physical education classes and sports activities, may undermine the potential benefits.

The physical education provides opportunities for the social interaction and teamwork, fostering connections that can motivate individuals to maintain an active lifestyle. By promoting physical literacy and fostering a positive attitude toward exercise [26]. The physical education contributes to the prevention of sedentary behavior and associated health risks such as obesity, diabetes can encourage environmentally sustainable behaviors like active transportation (walking or biking) and recreation, reducing the reliance and promoting environment stewardship [27]. The physical education plays multifaceted role in enhancing cognitive performance and promoting sustainable lifestyle choices [28]. By integrating physical activity, health education & social support, physical education programs contribute to the holistic development of students and lay the foundation for lifelong well-being.

The emotional closeness, characterized by strong social connections and supportive relationships, has been consistently linked to positive mental health outcomes and subjective well-being. The research indicates that physical activity, particularly when performed in social settings or team-based environments, can enhance emotional closeness and interpersonal relationships [26]. While limited research specifically addresses the mediating roles of

emotional violence and emotional closeness in the relationship between physical education, cognitive performance, and sustainable lifestyle choices [32]. The theoretical frameworks like social cognitive theory, ecological systems theory, and self-determination theory provide insight into potential pathways through which these variables may interact [33], that provide the clues for conducting the research on particular issues in specific context. The results are at par with the studies conducted [34].

These behavioral foundations translate into sustainable lifestyle designs that promote the mental, physical, and social well-being. The educational settings, physical activity occurs can instill also social obligation and ecological alertness by nurturing empathy-driven behavior and community participation [26]. A critical yet underexplored dimension of this relationship is emotional and psychological climate where physical education is delivered. It creates a hostile environment that disrupts learning process and affects negatively students' self-esteem, psychological health, and motivation [29]. The emotional violence, encircling behaviors like social exclusion, verbal abuse, bullying, and ridicule, is significant barrier to effectiveness diverse tasks [32]. The victims of such violence show withdrawal, decreased academic focus that undermine both cognitive growth and lifestyle developments.

RECOMMENDATIONS

1. The physical education programs should incorporate activities that stimulate cognitive functions and promote sustainable lifestyle habits, such as health awareness, teamwork, and environmental responsibility.
2. The institutions should prioritize the training educators to foster emotional closeness by building trust, empathy, and inclusivity in physical education settings while reducing the risk of emotional destruction.
3. The institutions and researchers may monitor the emotional climate of physical education classes and evaluate how it impacts students' cognitive performance and lifestyle choices with student development goals.
4. The clear anti-bullying and anti-harassment policies should be enforced within physical education contexts to eliminate emotional violence systems and intervention strategies to protect students' emotional well-being.

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