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ORIGINAL CONTRIBUTION

Interplay Between Gender and Influencing Factors to Determine Physical Activity of School Children

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Abstract— The study aims to examine the relationship between social factors, environmental factors, physical literacy, and individual factors that influence sports participation, physical fitness, and sedentary behaviors. Drawing on gender role theory, the study investigates gender as a moderator. Using a cross-sectional field survey, data from 342 children aged 9-12 years from Pakistani schools were collected. The results revealed a significant relationship among social factors, environmental factors, physical literacy, and individual factors that affect sports participation, physical fitness, and sedentary behavior. We also tested the moderating role of gender with social factors, environmental factors, physical literacy, and individual factors' effect on sports participation, physical fitness, and sedentary behavior; every hypothesis, aspects 6c, 7a, and 8b, was validated. We discuss the findings' importance for gender research and practice, as well as the factors that influence schoolchildren's physical activity levels. Future research directions and policy implications are suggested.

Index Terms— Social factors, Environmental factors, Physical literacy, Individual factors, Sports participation, Physical fitness, Sedentary behavior, Gender

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Introduction

The lifetime growth of children and adolescents depends considerably on physical activity (Shanshan et al., 2025; Xu et al., 2022). Technology and social networking sites have reduced children's need and desire to move and play, and PA engagement declines with age, with a larger fall in females than in boys (Melby, Elsborg, Bentsen, & Nielsen, 2023). These days, the impact of remote learning environments during the worldwide pandemic makes the problem of physical inactivity even more worrisome. Age-appropriate physical activities, passionate leadership, and community and family support can help address the difficulties of getting youngsters moving on a daily basis (Westerbeek & Eime, 2021). Therefore, it is crucial and urgent to synthesize prior empirical data and investigate what kinds of factors can successfully influence daily active play and PA behaviors in childhood and adolescence.

Physical inactivity is not the same as sedentary behavior (Saunders et al., 2020). The Sedentary Behaviour Research Network defines sedentary behavior as "any waking behavior characterized by an energy expenditure ≤1.5 Metabolic Equivalents (METs) while in a sitting, reclining, or lying posture," whereas the latter refers to engaging in insufficient amounts of moderate-to-vigorous physical activity (i.e., failing to meet specified physical activity guidelines) (Stockwell et al., 2021). Sedentary behavior is any time a person is lying down or sitting with little energy expenditure; hence, frequent sedentary behaviors include reading, watching TV, playing video games, using

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computers (together referred to as screen time), and riding in cars (Prince et al., 2020). It is feasible to spend the majority of waking hours seated and still achieve or surpass the public health recommendations for physical exercise (Pinto et al., 2023; Rosenkranz, Mailey, Umansky, Rosenkranz, & Ablah, 2020).

A subset of physical activities performed either alone or in a team is referred to as sport (Eather, Wade, Pankowiak, & Eime, 2023). There are numerous established health advantages for kids and teenagers who participate in sports (Saeterbakken et al., 2022). Playing sports, whether team or individual, has been associated with increased physical activity, weight loss, improved mental and physical health, and personal growth (Chia et al., 2022; Fühner, Kliegl, Arntz, Kriemler, & Granacher, 2021). Participating in sports has numerous health benefits, including improving mental health, strengthening social ties, building resilience and self-esteem, and lowering the risk of chronic illnesses and disability (Stockwell et al., 2021). For example, 93% of Norwegian youths were or had been active in sports groups, according to Basterfield et al. (2022) and Telford et al. (2021). There may be additional mechanisms at play that support the stability of the relationship between parental sports culture and youth sports participation, Given that younger children's involvement in organized sports is largely normatively expected, highly valued, and common Chia et al. (2022) and Strandbu, Bakken, and Stefansen (2020), their involvement may not be as heavily reliant on family sport culture but rather may be more influenced by peer relationships and community factors, indicating that family sport culture is more important for older youths than younger youths.

According to Teeroovengadum (2022), gender roles are particularly prominent in the context of sports, and despite the recent rise in female engagement, gender norms are frequently believed to favor males' participation in sports. This notion aligns with the assertion that "boys achieve status through athletic ability, though research indicates the same is not true for girls" Xu et al. (2022) and that organized sports are a significant platform for fostering and enhancing masculine gender identity (Lago-Ballesteros, García-Pascual, González-Valeiro, & Fernández-Villarino, 2021). According to Sk and Halder (2020), sports are essentially a masculine endeavor; parents may be particularly concerned about encouraging teenage boys to participate; they may also believe that boys' success in sports unquestionably contributes more to their status and recognition than girls' does, and as a result, they will spend more money on their sons' athletic endeavors. Regarding older children and sports engagement, we don't know much about the gendered attitudes and behaviors of parents. Regardless of the child's gender, parents of 14-year-olds strongly support sports as a self-evident aspect of growing up, according to Ruiz-Montero, Chiva-Bartoll, Baena-Extremera, and Hortigüela-Alcalá (2020). However, active fathers who had "laid-back" and indifferent sons voiced worry about their lack of competitiveness Lago-Ballesteros et al. (2021), reflecting notions that link masculinity to physical prowess and a love of rivalry. One theory is that when boys become less interested in sports as they get older, their parents might encourage them more or even put pressure on them to keep playing. It could also be argued that teenage girls would have a greater need for a family sports culture that promotes their participation because they are more likely to view sports as less significant in their social networks Xu et al. (2022) and because their general circumstances for participation are less favorable. According to these presumptions, we may thus anticipate that girls' importance in participating in sports will rise more during adolescence than males'.

Our hypothesis is that social, environmental, and individual level factors might have a greater impact on sports activity adoption than on raising levels of prescribed sports activity. People who currently engage in sports once or twice a week might, for instance, have a social network that includes other sports enthusiasts and may not view safety concerns or travel times to facilities as obstacles to sports participation (Pinto et al., 2023; Shanshan et al., 2025). Individual beliefs like a positive outlook and good self-efficacy may be more significant than environmental concerns in raising this particular group's level of sports participation to the advised level. Regardless of their personal beliefs, environmental issues like a lack of facilities or a tiny social network may be significant deterrents for those who don't participate in sports.

Theoretical Background and Conceptual Model

The model illustrates how individual, social, and environmental factors and physical literacy influence physical activity outcomes in schoolchildren, with gender acting as a moderator. It addresses outcomes such as physical fitness, sports participation, and sedentary behavior.

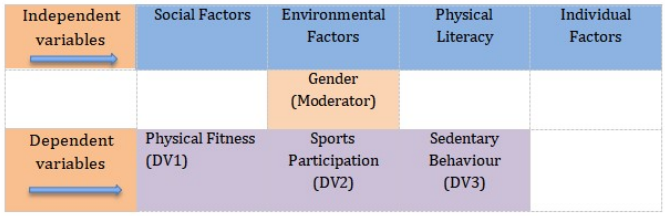


Fig. 1 *Conceptual framework*

Gender role theory

Gender roles address gender disparities in status and power, work segregation, and home labor divides. According to traditional gender roles, men are associated with the "breadwinner" position and women with the "caretaker" role. A fundamental principle of social role theory Muhammad Faizal, Adam Afif, Cassendra, and Syahida (2024), holds that men's presumed agency and women's presumed community come from their historical distribution into occupational roles and homemaker roles, respectively, rather than being innate traits (Franke, Crown, & Spake, 1997; Muhammad Faizal et al., 2024). Although they have marginally changed from earlier decades, researchers continue to find that gender roles are still in place to varied degrees (Crespo et al., 2013). In fact, according to Branscum and Bhochhibhoya (2016), women work mostly in service-related fields and are more likely than men to perform unpaid labor. Additionally, the neo-feminist perspective of "egalitarian existentialism" by Kray, Howland, Russell, and Jackman (2017) has reinforced gender role differences by reconciling the conflict between a focus on the family and a focus on work, career, and provision into the belief that traditional/different gender roles are essentially separate but equal, and feminism is represented by role choice rather than breaking traditional roles. People will use a variety of motivated processes to defend the status quo because they have a basic need to see a social system favorably (Eagly & Sczesny, 2019; Ruiz-Montero et al., 2020; Sk & Halder, 2020). The idea that gender roles are set may have varying effects on how each gender regards itself and the legitimacy of the larger social structure since males hold a privileged position in the social hierarchy and women are submissive ones (Lago-Ballesteros et al., 2021).

Social factors impact on physical fitness, sports participation, and sedentary behavior

Participants have a rare opportunity to participate in health-promoting physical activity of varying intensities, durations, and modes as part of a team or club, and the performance demands are inherent in sports training and competition. Physical, social, psychological, and cognitive health outcomes have been demonstrated to improve with participation in both individual and team sports (Ouyang et al., 2020). The benefits to social factors that come from playing sports frequently outweigh those that come from engaging in other leisure or recreational activities (Ruiz-Montero et al., 2020). Interestingly, similar advantages are seen in a variety of sports and demographics, such as children, adults, senior citizens, both men and women) (Stockwell et al., 2021). The data supporting top athletes' engagement in sports is, however, scant, and what is known suggests that exceptional athletes may be more prone to mental health issues as a result of the high physical and mental demands they face (Telford et al., 2021). Even though playing sports has been shown to improve health and well-being, the level of participation in sports varies by nation. Adolescent sports involvement, for instance, is frequently greater in Western high-income nations, with yearly participation rates ranging from 60% to 80%, although rates vary significantly by age, sex, and ethnicity (Li, Moosbrugger, & Liu, 2021). Nonetheless, the little information on sports participation in many low- and middle-income nations suggests a comparatively low level of participation (Westerbeek & Eime, 2021). Teenagers who participate in sports activities have many opportunities to develop their interpersonal and personal abilities, which will increase their sports competency (Basterfield et al., 2022). However, when it comes to playing sports, girls' perceptions of social competence are lower than boys' Saeterbakken et al. (2022), and this fact needs to be included in research that compares genders. The social factors reflected by Teeroovengadum (2022) and Xu et al. (2022), highlighted the importance of social and environmental elements. A theoretical framework to investigate various factors influencing physical fitness was provided by social factors, which showed that health was impacted by the interaction between an individual's, community's, and environment's physical, social, and political components (Eather et al., 2023; Westerbeek & Eime, 2021). In order to understand when and how people start, adopt, and sustain physically active lives, social factors specifically examine the interactions between the individual and various environmental levels (Pinto et al., 2023).

H1: The direct and significant impact of social factors on (a) Physical Fitness, (b) Sports Participation, and (c) Sedentary Behaviour.

Environmental factors impact on physical fitness, sports participation, and sedentary behavior

In addition to having a measurable, albeit modest, impact on fitness levels in a naval setting (Shanshan et al., 2025) and on participation in vigorous exercise in community settings (Pinto et al., 2023), spatial access was a significant predictor of participation in an executive health program (Melby et al., 2023). Living near the coast was linked to engaging in prescribed exercise, according to Eather et al. (2023). Convenience seems to be crucial. According to Xu et al. (2022), post-coronary patients' evaluations of the ease of a rehabilitation program and parking challenges affected their involvement. In fact, Teeroovengadum (2022) found that exercise self-efficacy, a factor known to affect the intention to be physically active, increased when people had good opinions about the convenience of the facilities and neighborhood safety. There is still no solid proof that regular physical activity is increased just by having access to facilities, despite the suggestion that the finding that close proximity is connected with facility use might "be easily understood by common sense" (Saeterbakken et al., 2022). Regardless of one's socioeconomic factors, Chia et al. (2022) discovered that increased access was linked to higher levels of engagement in vigorous activity. As a result, Chen et al. (2022) showing an unequal distribution of recreational facilities favoring suburbs with

higher socioeconomic status raises concerns that limited access in underprivileged areas leads to lower levels of physical activity participation (Basterfield et al., 2022). There is still no solid proof that regular physical activity is increased just by having access to facilities, despite the suggestion that the finding that close proximity is connected with facility use might "be easily understood by common sense" (Westerbeek & Eime, 2021). Playing sports, whether team or individual, has been associated with increased physical activity, weight loss, improved mental and physical health, and personal growth (Telford et al., 2021). Participating in sports has numerous health benefits, including improving mental health, strengthening social ties, building resilience and self-esteem, and lowering the risk of chronic illnesses and disability (Roy & Behera, 2025; Stockwell et al., 2021). Overall, it has been demonstrated that adolescents who participate in vigorous sports have superior physical, mental, social, and emotional health outcomes throughout their lives. In particular, a recent review found that teens who played team sports seemed to have better psychosocial health than their non-team sports counterparts, with reduced levels of anxiety, sadness, and social issues (Sanchez-Lastra, Varela, Martínez-Aldao, & Ayán, 2021). Regardless of environmental factors, (Jam et al., 2011; Ramirez-Campillo et al., 2021) discovered that increased access was linked to higher levels of engagement in vigorous activity. Teeroovengadum (2022), showing an unequal distribution of recreational facilities favoring suburbs with higher socioeconomic status, raises concerns that limited access in underprivileged areas leads to lower levels of physical activity participation.

H2: The direct and significant impact of environmental factors on (a) Physical Fitness, (b) Sports Participation, and (c) Sedentary Behaviour.

Physical literacy impact on physical fitness, sports participation, and sedentary behavior

In Pakistan, a person's higher education is a crucial phase of their life. From required physical education in junior and middle school to a more autonomous adult physical lifestyle, the educational mode of the person has evolved. Students' levels of physical exercise alter dramatically over the higher education stage (Shanshan et al., 2025). Numerous health behaviors among college students have improved as a result of short-term health interventions (Melby et al., 2023). In an effort to promote physical exercise and health, numerous nations have recently started creating intervention models based on physical literacy (Telford et al., 2021). Physical literacy, which supports the healthy development of the entire person's emotions, body, and cognition, refers to the capacity to be competent and self-assured in a range of sports activities across diverse situations (Melby et al., 2023).. PL is an all-encompassing, multidisciplinary idea. It establishes the basis for people's capacity and propensity to engage in physical activity throughout their lives and is a requirement for people to play and maintain sports throughout their lives (Ouyang et al., 2020). PL has the potential to enhance both the amount and quality of lifelong engagement in physical activity and sports [18]. Developing a population that is physically literate and actively participates in play and physical activity while honing their functional movement abilities in enriched surroundings is also essential. Sedentary behavior has skyrocketed (Farley, Stein, Keogh, Woods, & Milne, 2020). Research has investigated the health effects of sitting in general (Owen et al., 2020; Prince et al., 2020) as well as sitting-related behaviors (Chen et al., 2022; Dempsey et al., 2020; Owen et al., 2020; Pinto et al., 2023). Sedentary activities include driving or sitting in a car, watching television, and doing the majority of desk-based office work. These behaviors can also apply to people who are unable to stand, including wheelchair users. The majority of research studies conducted on ambulatory persons to date have operationalized sedentary behavior as low counts on an accelerometer or activity monitor, television viewing, or total daily sitting time (Chen et al., 2022; Stockwell et al., 2021; Telford et al., 2021). Numerous characteristics, such as engagement in sports, self-acceptance in athletic activities, or physical literacy's assessment of physical competence, might influence how adolescents behave in class or during their free time (Ouyang et al., 2020; Panza et al., 2020; Strandbu et al., 2020). Numerous research has been conducted in this area because it believes that proper physical literacy has a significant impact on teenage and adolescent motivation as well as the degree of control over sedentary behavior (Stockwell et al., 2021; Telford et al., 2021). Because it is predicated on the correlation between an individual's own ideas and their subsequent behavior, physical literacy exhibits a relative value.

H3: The direct and significant impact of physical literacy on (a) Physical Fitness, (b) Sports Participation, and (c) Sedentary Behaviour.

Individual factors impact on physical fitness, sports participation and sedentary behavior

The Theory of Planned Behaviour (Ajzen, 2011) served as the foundation for the individual components that were investigated in this study. People are more inclined to act in ways that they think will lead to highly valued outcomes, according to expectancy-value models, and less inclined to act in ways that they do not think will lead to highly valued outcomes when the expected outcomes are not valued (Franke et al., 1997; Jam, Singh, Ng, & Aziz, 2018). Although the theory has been widely used in studies on physical activity (Buttichak, Leelayuwat, Bumrerraj, & Boonprakob, 2019), its ability to predict outcomes has been constrained by the fundamental theory that an individual's volitional control over conduct is based on a rational decision-making process. This calls for people to possess all the tools, know-how, and capacities needed to carry out the behavior on their own initiative, without assistance from others, and without being constrained by environmental factors (Kaur, Singh, Arya, & Mittal, 2020; Lesinski, Herz, Schmelcher, & Granacher, 2020; Owen et al., 2020; Panza et al., 2020). Recent sports policies have reflected the ever-evolving significance of sports in society (Ouyang et al., 2020). For

instance, less structured, non-competitive, and individual kinds of sports and PA have been more popular in recent years, replacing traditional organized, competitive club-based sports. According to Panza et al. (2020), many people and children are not interested in playing club-based sports. Additionally, additional studies show that not everyone enjoys playing sports; some people have limited or no access, while others do not want to, and that people with disabilities, older adults, women, and married people are less likely to participate in sports (Prince et al., 2020). Additionally, recent studies show that although a large number of people and children participate in sports, many do not do so in conventional club-based environments (Lago-Ballesteros et al., 2021; Ramirez-Campillo et al., 2021; Saunders et al., 2020). The trend of sports participation across the lifespan is evident when we examine organized club-based sports and community-level sports (Mahdavi, Riahi, Vahdatpour, & Kelishadi, 2021). Sports participation is common among kids, but it rapidly declines during puberty (Rhodes, Boudreau, Josefsson, & Ivarsson, 2021). Additionally, adults are more likely to be proactive through generalized physical activity Stockwell et al. (2021), and very few older individuals and few adults participate in sports (Telford et al., 2021).

H4: The direct and significant impact of individual factors on (a) Physical Fitness, (b) Sports Participation, and (c) Sedentary Behaviour.

The moderating effect of gender

In addition to supporting physical health, a recent review of the literature revealed that physical activity interventions for kids and teens have a generally positive impact on a number of mental health determinants, including stress, anxiety, depression, global self-worth, and self-efficacy (Lago-Ballesteros et al., 2021; Ruiz-Montero et al., 2020; Xu et al., 2022). Promoting physical activity during early infancy is crucial for laying the groundwork for enabling and sustaining an active lifestyle that may be carried into adulthood and guarantee long-term health benefits. Few children are active, even though the advantages of physical activity are widely recognized. Gender was linked to physical activities in every study examined in more recent research. Boys are more physically active than girls in almost all research (Eagly & Sczesny, 2019; Sk & Halder, 2020; Teeroovengadum, 2022). For instance, according to Ruiz-Montero et al. (2020), 49% of boys and 35% of girls fulfilled the physical activity criteria. In older adolescent groups, these inequalities persisted but less sharply. Compared to girls in the same age range, boys aged 6 to 11 participated in 20 more minutes of moderate-to-intense physical exercise per day. It's unclear why girls engage in less physical activity than boys (Eagly & Sczesny, 2019). Gender disparities in children's physical activities are probably explained by a variety of factors. Despite the possibility of biological explanations, behavioral scientists are interested in the involvement of modifiable factors in explaining gender disparities in children's physical activities because these factors can be addressed through treatments. Previous studies on this subject suggest that, in comparison to boys, females may have fewer intents and expectations for exercising, poorer perceived behavioral control, lower exercise self-confidence, lower social support, and lesser enjoyment of physical activity and sports involvement. 21–23 Boys and girls are encouraged to play with different toys and may socialize to behave differently from birth (Lago-Ballesteros et al., 2021; Sk & Halder, 2020).

Cultural norms around gender roles and the maintenance of barriers that prevent women from engaging in physical exercise can also have an impact on gender disparities. Finally, a number of environmental elements are also linked to children's physical activities, and depending on how these factors differently encourage or suppress physical activities, the physical environment can reinforce gender differences in physical activities (Ruiz-Montero et al., 2020; Xu et al., 2022). Due to their limited ability to control their own behavior, young children are particularly vulnerable to external effects. Because boys have better access to and marketing of sports than girls do, parents and the physical environment may encourage boys to favor sports more than girls. Physical literacy has been described as a "lifelong journey" and is thought to be a dynamic concept (Teeroovengadum, 2022). However, since this stage of a child's life is crucial for the development of significant physical activity correlates (i.e., gross-motor skills, fine-motor skills, coordination, preferences, and confidence), assessing PL levels in children may be a crucial time. Although children's physical activity and sedentary behavior are well-researched topics in the field of health promotion, potential connections between social, environmental, and individual factors and sports participation, physical fitness, and sedentary behavior have not been thoroughly investigated. Gender is a significant individual difference characteristic, according to scholars (Kray et al., 2017; Lago-Ballesteros et al., 2021; Ruiz-Montero et al., 2020). Examining gender inequalities in the workplace is crucial because, despite social progress towards gender equality, traditional gender role differences are still prevalent there (Sk & Halder, 2020).

H5: Gender moderates the relationship among social factors on (a) Physical Fitness, (b) Sports Participation, and (c) Sedentary Behaviour.

H6: Gender moderates the relationship among environmental factors on (a) Physical Fitness, (b) Sports Participation, and (c) Sedentary Behaviour.

H7: Gender moderates the relationship between physical literacy with (a) Physical Fitness, (b) Sports Participation, and (c) Sedentary Behaviour.

H8: Gender moderates the relationship among individual factors on (a) Physical Fitness, (b) Sports Participation, and (c) Sedentary Behaviour.

Research Methods

Study design

A quantitative cross-sectional study is a research design used to collect and analyze numerical data at a single point in time to examine relationships, prevalence, or patterns within a defined population. This approach is particularly effective for identifying correlations between variables, assessing the frequency of specific phenomena, or measuring outcomes across groups, making it suitable for studies focused on understanding current behaviors, characteristics, or trends.

Ethical considerations

Before data collection, this research has been approved by the University Malaya Research Ethics Committee (UM.TNC2/UMREC_3831) and the School Education Department (SED. Memo No.227/G.B).

Participant

Inclusion and exclusion criteria

This research focused on analyzing inactive children from both public and private schools at the individual level, specifically targeting those aged between 9 and 12 years. The selected children demonstrated a clear lack of interest in sports participation, exhibited sedentary lifestyle behaviors, and showed minimal to no engagement in physical activities. Children with any medical conditions, those who were under or over the specified age group of 9 to 12 years, and children who were already physically active or regularly participating in sports activities were excluded from the study to ensure the focus remained on truly inactive individuals within the target age range.

Table I
Descriptive statistics of demographic information (*N* = 342)

Sr. No	Constructs/ Items	*F*	%
1	Gender Wise Information		
	Boys	223	65.2
	Girls	119	34.8

Sample size

The study utilized the G*POWER software, which is highly scientific, up-to-date, and frequently recommended in research studies. The sample size calculation determined that 109 individuals are necessary, based on an 80% confidence level, a power of 0.8, an effect size of 0.15, and the inclusion of 8 predictor variables. However, the researcher selected 397 students from six public and private schools in South Punjab, Pakistan, ranging in age from 9 to 12 years old, ensuring a sample size more than three times larger and safe from any bias or inactivity. The researcher distributed the research instrument to 397 students, of whom 342 provided complete responses. Here is a figure demonstration using G*power, too.

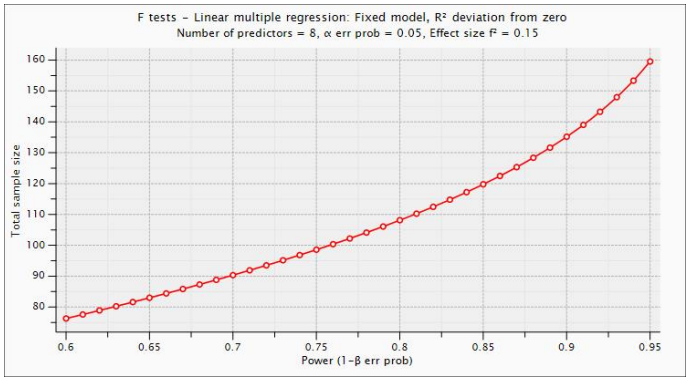


Fig. 2 *G*power*

Instruments To measure individual-level Socio-demographic factors, as well as sports participation, PAQ-C was adopted with its reported reliability (α = 0.82) by (Valenciano Valcárcel et al., 2023; Wilk et al., 2018).To measure the environmental factor, an 8-item scale

and the individual factor, a 5-item scale, was adapted with a reported reliability of (α = 0.7) by (Pan et al., 2009). The social factors were measured using a 3-item scale of psychosocial correlates adapted with reported reliability of (α = 0.7) by (Seabra et al., 2013). To measure physical literacy, the Canadian Assessment of Physical Literacy CAPL-2 adopted a 6-item scale with a reported reliability of (α = 0.82) (Longmuir et al., 2018). The physical fitness was measured using an adopted scale of the EUROFIT test battery with a reported reliability of (α = 0.93) by Ruiz-Montero et al. (2020). The sedentary behavior of inactive school children was measured using the YAP scale with reported reliability of (α = 0.77) by (Segura-Díaz et al., 2021).

Results

All of the variables in this investigation had confirmatory factor analysis (CFA) results using Hair, Sharma, Sarstedt, Ringle, and Liengaard (2024), which supported the proposed measurement model. Table 1 displays the variables' means, standard deviations, and correlations. The nature and strength of variable associations are determined using the Pearson correlation test, which is subsequently utilized to ascertain if the relationships are significant, positive, or negative. Pearson's correlation shows that there is a linear relationship between variables. There is no correlation if the correlation value is zero; positive and negative correlations are present if the correlation value is one or two. A significant and positive correlation between the variables is seen in Table 1. Table 1 displays the results of a two-tailed test, indicating whether the correlation is significant at the 0.01 level and whether it is positive or negative.

Table II
Means, standard deviations, and inter-correlations among variables

	1	2	3	4	5	6	7
SF (342, 3.80, 1.762)	1						
PL (342, 3.05, 4.100)	.467**	-.762**	1				
IF (342, 7.62, 2.934)	.536**	-.538**	.651**	1			
PF (342, 5.54, 2.226)	.642**	-.608**	.668**	.599**	1		
SP (342, 6.01, 2.351)	.497**	-.640**	.753**	.648**	.671**	1	
SB (342, 6.07, 2.432)	.487**	-.645**	.817**	.620**	.676**	.935**	1

Regression analysis was used to test for the relationship between social factors with physical fitness, sports participation, and sedentary behavior. The results show the significance of the relationship between social factors with physical fitness (beta = 4.387.; p= 0.05), sports participation (beta = 3.276.14; p= 0.01), and sedentary behavior (beta = 2.087; p b 0.01). Results show the relationship between environmental factors and physical fitness, sports participation, and sedentary behavior. The results show the significance of the relationship between environmental factors with physical fitness (beta = 7.454.; p= 0.01), sports participation (beta = 12.167; p= 0.09), and sedentary behavior (beta = 6.871; p = 0.00).

Results show the relationship between physical literacy with physical fitness, sports participation, and sedentary behavior. The results show the significance of the relationship between physical literacy and physical fitness (beta = 4.154.; p= 0.00), sports participation (beta = 6.542; p= 0.00), and sedentary behavior (beta = 2.988; p=0.00). Results show the relationship between individual factors with physical fitness, sports participation, and sedentary behavior. The results show the significance of the relationship between individual factors with physical fitness (beta = 5.132.; p= 0.01), sports participation (beta = 11.165; p= 0.03), and sedentary behavior (beta = 5.898; p = 0.00).

Table III
ANCOVA results

Variable	*F*-Statistics for the Dependent Variables		
	Physical Fitness	Sports Participation	Sedentary Behaviour
Social Factor	4.387	3.276	2.087
Environmental Factor	7.454	12.167	6.871
Physical Literacy	4.154	6.542	2.988
Individual Factor	5.132	11.165	5.898

Figs. 3,4 and 5 show the gender as a moderator and for high and low levels of social factors to help better understand the interaction results. In comparison to girls, boys exhibited significantly greater levels of social factors related to physical fitness, sports participation, and sedentary behavior.

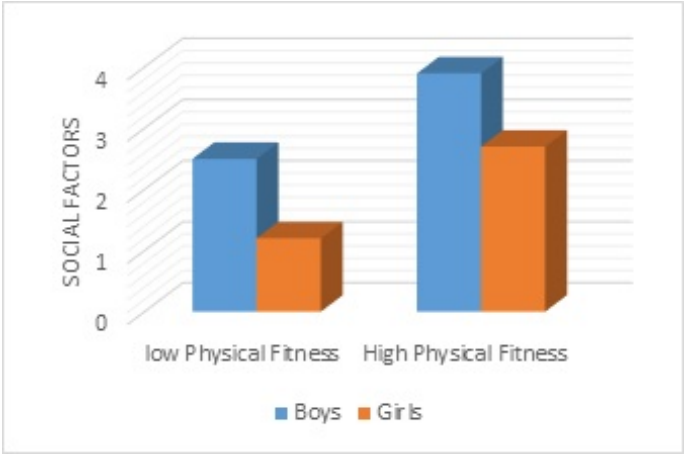


Fig. 3 *Gender interaction with social factors and physical fitness.*

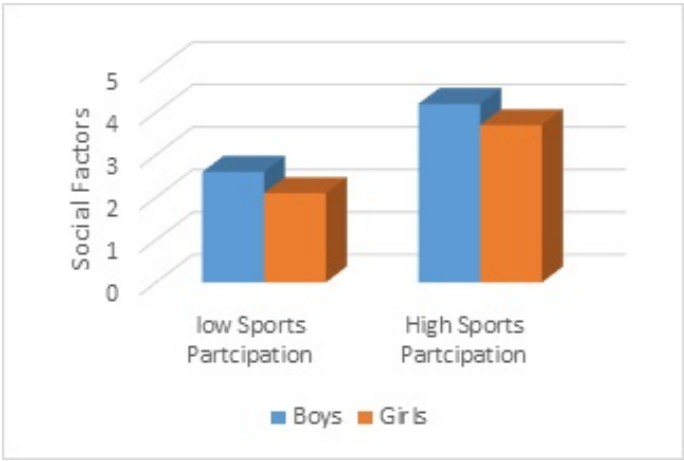


Fig. 4 *Gender interaction with social factors and sports participation*

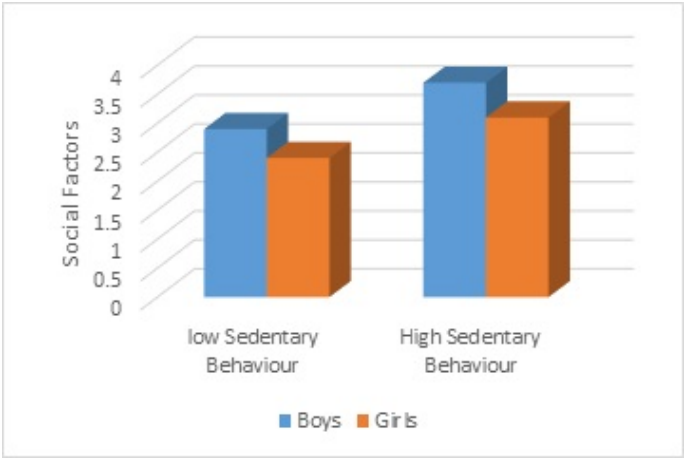


Fig. 5 *Gender Interaction with Social Factors and Sedentary Behaviour*

The moderating effect of gender on the relationship between environmental factors and sedentary behavior, sports participation, and physical fitness is the subject of hypotheses 6a, 6b, and 6c. As demonstrated, there is a substantial (F = 13.265; p=0.01) relationship

between environmental factors and physical fitness, sports participation (F = 12.77; p=0.01), and sedentary behavior (F = 0.27; p=0.05). While hypothesis 6c is not supported, hypotheses 6a and 6b are supported. The relationships between environmental factors and physical fitness, sports engagement, and sedentary behavior are depicted in Figs. 6,7, and 8. Boys were significantly more likely than girls to have sedentary behavior, sports participation, and physical fitness at greater gender levels.

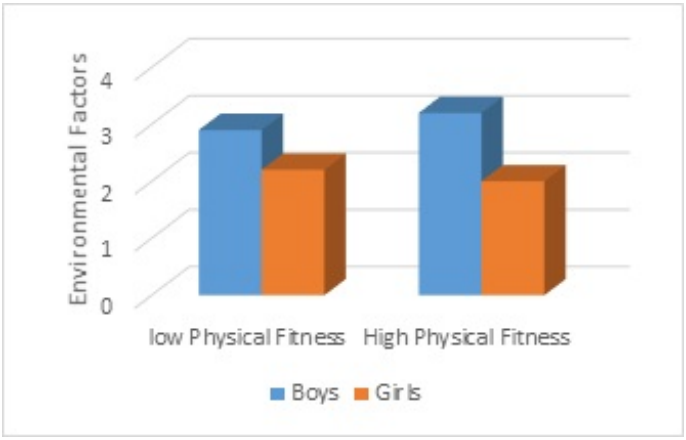


Fig. 6 *Gender interaction with environmental factors and physical fitness*

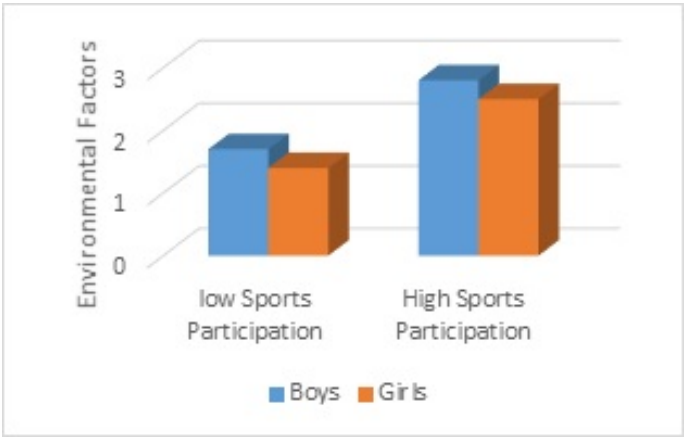


Fig. 7 *Gender interaction with environmental factors and sports participation*

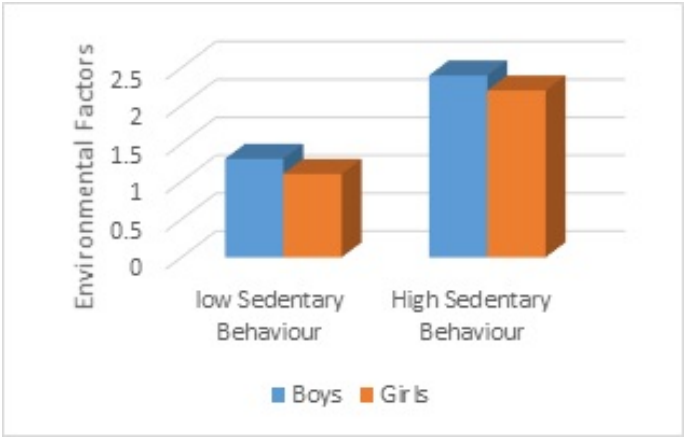


Fig. 8 *Gender interaction with environmental factors and sedentary behavior*

The moderating effect of gender on the relationship between physical literacy and sedentary behavior, sports participation, and physical fitness is the subject of hypotheses 7a, 7b, and 7c. As demonstrated, there is a substantial relationship between physical literacy and physical fitness (F = 0.239; p=0.05), sports participation (F = 11.43; p=0.01), and sedentary behavior (F = 3.286; p=0.00). While hypothesis 7a is not supported, hypotheses 7b and 7c are supported. The relationships between physical literacy and physical fitness, sports engagement, and sedentary behavior are depicted in Figs. 9,10 and 11. Boys were significantly more likely than girls to have sedentary behavior, sports participation, and physical fitness at greater gender levels.

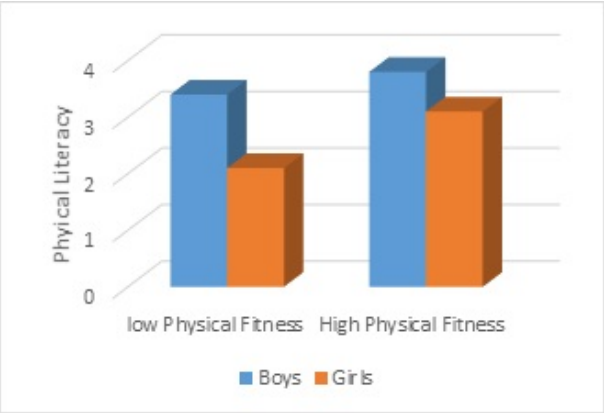


Fig. 9 *Gender interaction with physical literacy and physical fitness*

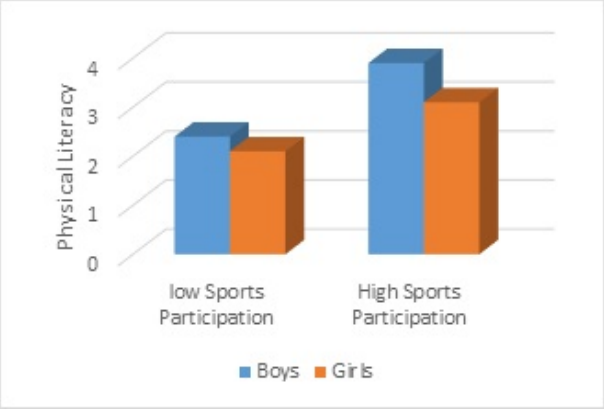


Fig. 10 *Gender interaction with physical literacy and sports participation*

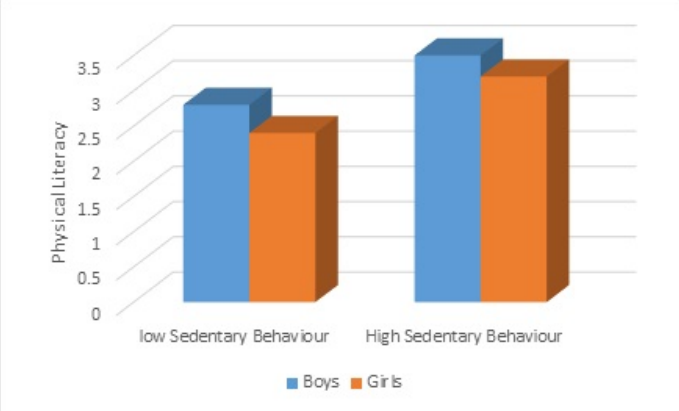


Fig. 11 *Gender interaction with physical literacy and sedentary behavior*

The moderating effect of gender on the relationship between individual factors and sedentary behavior, sports participation, and physical fitness is the subject of hypotheses 8a, 8b, and 8c. As demonstrated, there is a substantial relationship between individual factors and physical fitness (F = 11.28; p=0.01), sports participation (F = 0.43; p=0.05), and sedentary behavior (F = 3.276; p=0.00). While hypothesis 8b is not supported, hypotheses 8a and 8c are supported. The relationships between individual factors and physical fitness, sports engagement, and sedentary behavior are depicted in Figs. 12, 13 and 14. Boys were significantly more likely than girls to have sedentary behavior, sports participation, and physical fitness at greater gender levels.

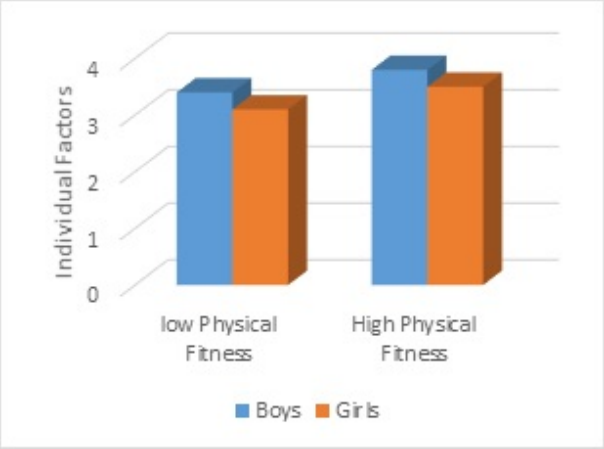


Fig. 12 *Gender interaction with individual factors and physical fitness*

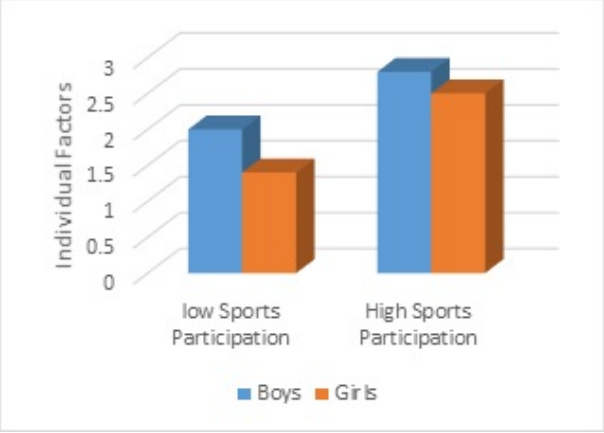


Fig. 13 *Gender interaction with individual factors and sports participation*

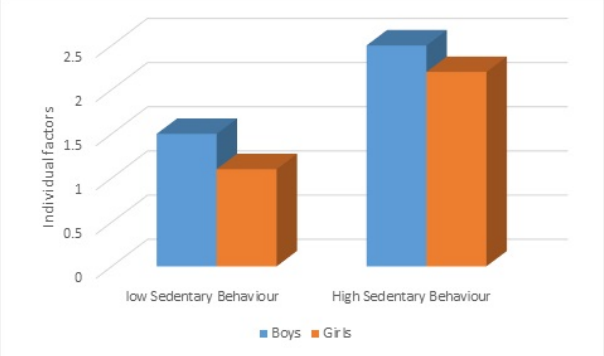


Fig. 14 *Gender interaction with individual factors and sedentary behavior*

Discussion

The main objective of the study is to examine the relationship between social, environmental, and individual factors and physical literacy's impact on physical fitness, sports participation, and sedentary behavior. In addition, the moderating role of gender is tested in this study. The findings suggest that gender has a considerable impact on social factors related to sedentary behavior, sports participation, and physical fitness. Boys are more dedicated to their physical fitness, sports participation, and sedentary behavior, whereas girls engage in fewer physical activities. These findings support gender role theory (Muhammad Faizal et al., 2024), which postulates that boys and girls may react differently to physical activities. According to gender role theory, boys' identities may be heavily influenced by their role identity (Eather et al., 2023). Males have positive attitudes regarding their sedentary behavior, sports involvement, and physical fitness because they believe that being physically fit and physically literate Westerbeek and Eime (2021) in good sports participation. On the other hand, the negative reactions to gender role theory predict that girls may not find their physical fitness, sedentary behavior, and participation in sports (Li et al., 2021). Women may also negate the chance to balance their reputations by playing sports (Saunders et al., 2020). The findings support the idea that females may be more proficient in physical literacy (Ruiz-Montero et al., 2020) and experience distinct social, environmental, and personal aspects associated with physical activities (Saunders et al., 2020). According to Panza et al. (2020), boys who participate in sports more frequently may have selected social, environmental, individual, and physical literacy characteristics. This finding is in line with earlier research in this field, which indicates participation in sports and physical fitness may result in better outcomes (Lago-Ballesteros et al., 2021). Furthermore, people of any gender may have been unconcerned with gender because they were pursuing physical fitness, sports participation, and sedentary behaviors for other reasons. According to Li et al. (2021), when behavior and surroundings deviate from the norm, a negative situational perception results. However, opinions shift in a favorable way as one has more time to dedicate to themselves (Saunders et al., 2020). Such a shift in viewpoint is probably going to encourage the process of self-approval and lead to the discovery of practical solutions for the current circumstance. In this context, new research on interventions motivated by the gender theory and intended to boost physical activity levels in kids and young adults has shown promise (Rhodes et al., 2021; Stockwell et al., 2021).

Implications for theory and practice

The study's findings suggest a number of significant ramifications for researching the idea and practice of caring for Pakistani children. The motivation for additional research into gender role theory in this context should come from the fact that boys had more favorable views than girls towards physical fitness, sports participation, and sedentary behavior. Researchers can directly test for gender influence by taking individual, societal, and environmental aspects into account. It would be intriguing to investigate the potential effects of gender-mediated views of the physical literacy relationship on sedentary behavior, sports participation, and physical fitness. Future studies might go further into how psychological culture may mediate the relationship between gender and attitudes. Future studies can specifically examine the impact of gender on well-being as well as the connection between gender and physical literacy. It may be argued that this study only included fitness enthusiasts who struggled to stop engaging in physical activity for an extended period of time, which is likely why they switched to at-home workouts. Nonetheless, there is little question that the results of this study have shown that regular physical activity might help lessen the negative psychological and physical implications. The results of this study support the suggestions put out by organizations and scholars to perform 150–180 minutes a week of at-home exercises or other similar strategies to improve adherence to physical activity and to do yoga and dance to lower stress, anxiety, and depression as well as enhance sleep quality (Basterfield et al., 2022; Westerbeek & Eime, 2021). In order to include recommendations on how to best foster the physical literacy elements of motivation, confidence, physical competencies, and knowledge and understanding that enable children and adolescents to engage in physical activities, policymakers should think about incorporating a physical literacy perspective alongside national guidelines on physical activities such as physical fitness, sports participation, and sedentary behavior. Boys typically give themselves better ratings for playing sports and engaging in physical activity on a daily basis than girls (Chen et al., 2022). Boys may, therefore, be more active than females, and as a result, social, environmental, and personal variables would influence their higher levels of physical fitness and sports engagement. Conversely, increased involvement in sports is typically associated with many socio-physiological aspects in both boys and girls, serving as a crucial foundation for an active lifestyle.

Limitations and contributions

The existence of common technique bias is one possible limitation. For two reasons, common technique bias is not a significant issue in our study. First, since demographic factors like gender are not perceptual markers, common method bias may not be a significant worry for research that uses them as moderators. Second, in a study design looking at interaction effects, common method bias might not be a big issue. The main disadvantage was the cross-sectional design, which limited the ability to draw conclusions about causation and

provided ambiguity regarding the direction of the connections under investigation. Future studies should use experimental and longitudinal approaches to examine the relationships between physical literacy and physical activity while controlling for socioeconomic status. Although a high completion rate of >70% for those who started the survey, the results may potentially be impacted by the convenience sampling and self-selection of participants. Furthermore, although it was anticipated that some demographic characteristics (such as age and chronic illnesses) would be linked to mental health, further research should be done to determine the impact of shifting work status. However, the fact that 9 out of 12 Pakistani teenagers play sports and that girls do worse than boys highlights the need for policies that encourage sports participation, particularly among girls.

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