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Evaluating the Impact of School-Based Smoking Prevention Interventions on Students' Physical Activity Intentions, Perceived Social Expectations, and Self-Efficacy

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ABSTRACT

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This study evaluates the impact of school-based smoking prevention interventions on students' physical activity intentions, perceived social expectations, and self-efficacy. With increasing rates of adolescent smoking and its associated health risks, school-based interventions have been widely promoted as effective strategies to prevent smoking initiation. However, little research has been conducted in Pakistan to assess their broader effects on health behaviors. This study addresses this gap by analyzing data from 240 school students in Lahore, Pakistan, using a structured questionnaire. The respondents were approached while visiting at their schools. The data was obtained using simple random sampling technique from one of the Lahore based elite private school. The findings reveal significant positive relationships between the interventions and all three outcome variables. Smoking prevention programs had the strongest effect on physical activity intentions ($\beta = 0.4441$), followed by perceived social expectations ($\beta = 0.3359$) and self-efficacy ($\beta = 0.3089$). These results suggest that these interventions not only reduce smoking tendencies but also encourage broader health-promoting behaviors among students. By promoting positive social expectations, self-efficacy, and physical activity, these interventions can create a lasting impact on adolescent health. Future research should focus on the long-term sustainability of these outcomes and their potential application to other health areas.

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1.0 Introduction

People develop health habits throughout their adolescence that frequently last into adulthood. A small group of youngsters may believe they should follow the smoking habits of people around them and in their community (Halloran, 2024). Young smokers' nicotine addictions tend to worsen, and they suffer from a variety of health issues (Marynak, 2024). According to WHO, tobacco-related diseases kill 7.9 million people worldwide each year, making them the leading cause of avoidable deaths (Hampsher-Monk et al., 2024). To address this rising health concern, different attempts have been launched in schools to educate young people how to avoid tobacco before they develop smoking addictions. When campaigns aim to reduce tobacco use, children learn about the risks and how to avoid peer pressure. The programs use the Social Cognitive Theory Rubenstein et al. (2018) and the Theory of Planned Behavior Ajzen (2011) to show how beliefs and social environment influence health decisions. The findings show that these initiatives reduced smoking uptake rates; nevertheless, they often miss its influence on linked health behaviors such as physical activity. More study is needed since the apparent benefits of exercise for kids are known, including enhanced academic achievement and reduced health risks.

According to research, smoking and decreased physical activity often coexist due to similar environmental and societal circumstances (Wen et al., 2024). Regular exercisers are less likely to smoke, whereas ex-smokers are less likely to exercise Kaczynski et al. (2008) Improving youth health is heavily dependent on the role of schools in developing physical fitness goals. Young adults' exercise and smoking cessation decisions are influenced by their feelings of self-worth and peer relationships (Rai Gupta, 2024). Self-efficacy measures how much we feel we can do an action. In contrast to societal standards for specific conduct. The link between these practices and tobacco avoidance in schools is seldom investigated in research (Angeli et al., 2024). A lot of studies look at the effectiveness of smoking cessation programs without considering their link to active lifestyles like physical exercise. The primary purpose of this study is to address this gap by examining how smoking prevention initiatives in schools influence students' exercise preferences and social pressure perceptions. It wishes to participate in the development of integrated health promotion programs that emphasize the relationships between various juvenile health behaviors.

This research looks at the lack of knowledge about how programs aimed at decreasing smoking influence a variety of health behaviors, including exercise objectives and community norms. Although schools promote anti-smoking measures, student engagement in physical activities requires more investigation (Geier & Bogner, 2010) Current teenagers are incentivized to participate in physical activities depending on their health status, yet they usually fail to meet the recommended targets. Young people participating in sports behave differently depending on their social and mental links to smoking. Investigating how smoking cessation techniques function reveals their reciprocal effects. This topic requires more research for a variety of reasons. During a critical time of development, young people form long-term behaviors that impact their health; they must be aware of many hazards. Both smoking and poor physical exercise indicate an urgent need for concerted action on both issues. If we do not consider alternate health goals while implementing smoking cessation techniques, the efficacy of these efforts may be compromised.

Despite quitting smoking and excelling in their fitness regimen, a student is still at risk for a variety of health difficulties, including obesity and mental health problems. Dealing with this unresolved problem in research might lead to more effective and consistent strategies of improving health among young people (Larsson et al., 2018).

Professional insights may strengthen present behavioral theories by exploring the link between quitting smoking and motivation for physical exercise. When the Social Cognitive Theory and the Theory of Planned Behavior are intelligently used in community settings, belief patterns change. These techniques often emphasize specific behaviors while ignoring the link between a behavior change and its impact on related activities. This study focuses on the relationship between smoking cessation programs and physical activity ambitions in order to better understand health behavior interactions. The results may help to shape larger school-based initiatives. School-based programs have the potential to involve a wide and diverse population of students while also influencing teenage wellbeing(Azzopardi et al., 2024). To increase the efficacy of these treatments, we should integrate all of the kids' health habits. Examining how attempts to reduce smoking impact exercise objectives and community variables helps authorities and educators develop stronger overall health programs rather than focusing just on individual goals.

Many factors contribute to the significance of this research. It makes a significant addition to the literature by investigating whether school-based smoking prevention programs influence students' behaviors and exercise commitments. According to WHO, a lack of physical activity among kids worldwide creates major health problems, with more than 80% failing to follow important workout guidelines (Organization, 2019) The purpose of this research is to assess the impact of tobacco cessation programs on physical activity in order to assist health promotion efforts. The purpose of this study is to determine the influence of peer groups on young people's health choices. Despite the fact that these consequences are important for smoking behaviors and active lives, they have received little attention in academia. When examining how tobacco smoking cessation programs effect student views and group interactions, the findings reveal the psychological elements that influence behavior change. Obtained insights may expand existing behavioral frameworks and facilitate the development of novel ways to meeting the needs of young pupils. The study's results have practical implications for schools and their workers. Students may learn health skills and get compassionate help at school. Developing inclusive techniques that include several health emphasis areas will considerably enhance the results of educational health initiatives. Based on the findings of this research, schools will coordinate efforts to promote health and reduce smoking prevalence while also promoting students' fitness goals. This study is becoming more important as global health initiatives for young people expand. According to the Global Health Goals, advancing health and well-being for all is critical, with a special emphasis on vulnerable youth. Stressing a variety of health habits has a favorable impact on young people's future health and helps to achieve worldwide health objectives based on findings from educational health initiatives (Call et al., 2002)

1.1 Objectives of the Study

1. To analyze the regression model of school-based smoking prevention interventions toward

school students perceived social expectations, self-efficacy and physical activities intentions

2. To see the correlation between school-based smoking prevention Interventions, school students perceived social expectations, self-efficacy and physical activities intentions

2.0Literature Review

The literature on smoking prevention and physical activity among adolescents provides a strong foundation for understanding the interconnection between these two health behaviors. However, the specific impact of school-based smoking prevention interventions on physical activity intentions, perceived social expectations, and self-efficacy remains underexplored. This review synthesizes the existing research on adolescent smoking prevention interventions, the role of physical activity in health promotion, and relevant theories that explain behavior change in this context. Theories such as the Social Cognitive Theory and the Theory of Planned Behavior offer frameworks for understanding how these interventions influence adolescents' health behavior. Based on this review, hypotheses are developed to guide future research (Luszczynska & Schwarzer, 2015).

2.1 School-Based Smoking Prevention Interventions

Efforts to stop smoking in adolescents are critical in order to lengthen the time before they begin that activity. These programs demonstrate how destructive smoking can be to one's health and help pupils develop a defense against societal influences while fostering positive communal practices. The findings suggest that effective implementation of these steps in health programs addressing diverse hazards leads to a reduction in smoking initiation. According to data published by (Scholten et al., 2019), school programs that combine learning principles with peer influence significantly lower smoking prevalence. Using this strategy, students increase their understanding of smoking dangers and develop their ability to resist social temptations while changing their attitude toward smoking. Though the programs reduced smoking prevalence, their impact on habits such as exercise is difficult to assess.

2.2 Physical Activity Intentions and Smoking Behavior

For teenage wellbeing and health outcomes, both are critical. Working exercise has several benefits for both mental and physical health. Exercising helps individuals resist the impulse to smoke by reducing stress and imposing social responsibilities. Participating in fitness challenges often enhances self-reliance in resisting undesirable activities such as cigarettes. There is little evidence to support the straightforward link between smoking cessation programs and physical fitness. Several studies aimed at reducing adolescent smoking focus only on individual smoking behaviors, failing to examine the impact on students' desire to engage in physical activities (Bitar et al., 2024). People are becoming more aware of how health habits interact and how programs focusing on one habit might influence various acts. According to Dobbins and colleagues (Dobbin & Kalev, 2022), schools that include wellness and stress release into their tobacco prevention initiatives attract more kids to physical activity. By emphasizing health and wellness in schools, we can increase physical engagement among children who may consider smoking.

2.3 Perceived Social Expectations and Health Behaviors

Individuals in their teens often incorporate their opinions regarding societal norms into their decisions. Individuals' attitudes toward social standards, according to the Theory of Planned conduct, govern their conduct. Teens' perceptions of their peers' attitudes can lead to health behaviors such as habit smoking and physical activity (Gottlieb & Baker, 1986) By creating a welcoming atmosphere for individuals who do not smoke, pupils have a better knowledge of the problems associated with cigarettes. There has been little research on this area, which investigates how various techniques impact individual beliefs about radically diverse health practices. If children see their professors and classmates encourage physical activity, they are more likely to want to stay active. When students' attitudes about health shift as a result of smoking prevention programs, they may become more motivated to engage in physical exercise (Murnaghan et al., 2010)

2.4 Self-Efficacy and Behavior Change

Understanding your capacity to complete a certain activity is critical for both the Social Cognitive Theory and the Theory of Planned Behavior. According to Bandura's (Calicchio, 2023) study, faith in resisting social temptation to smoke or exercise is strongly dependent on individual self-confidence. Building faith in oneself via successes or accolades may lead to higher quality living behaviors. The findings show that efforts that improve students' comprehension of refraining from smoking result in decreased smoking prevalence. There has been little research on how these treatments affect self-efficacy in terms of exercise. When teens believe they have the ability to choose better lifestyles, such as quitting smoking, they feel more confident in their ability to participate actively in wellness activities. Smoking prevention strategies that include physical activity targets rely primarily on people's perceived ability.

2.5 Theoretical Framework

2.5.1 Theory of Planned Behavior (TPB)

Developed by (Ajzen, 2011) the Theory of Planned Behavior posits that behavior is determined by behavioral intentions, which are influenced by three key factors: attitude toward the behavior, subjective norms (perceived social expectations), and perceived behavioral control (similar to self-efficacy). In the context of smoking prevention interventions, TPB suggests that by changing students' attitudes toward smoking, altering their perceptions of social norms, and increasing their perceived control over their ability to resist smoking, the interventions can reduce smoking intentions. However, TPB also implies that changes in these factors may extend to other behaviors, such as physical activity intentions, particularly if students begin to perceive physical activity as a normative and desirable behavior.

2.5.2 Social Cognitive Theory (SCT)

Social Cognitive Theory, developed by Bandura (Bandura, 2001), emphasizes the role of observational learning, social influence, and self-efficacy in behavior change. According to SCT, individuals are more likely to engage in behaviors they believe they can successfully perform, and they learn by observing others, particularly role models such as peers and teachers. In school-based smoking prevention programs, enhancing students' self-efficacy to resist smoking is a critical

component. SCT suggests that if interventions also promote self-efficacy in relation to physical activity, students may be more likely to engage in physical activity as a result of the intervention.

2.6 Hypotheses Development

Based on the literature review and theoretical framework, the following hypotheses are proposed:

1. **Hypothesis 1 (H1**): School-based smoking prevention interventions will have a positive impact on students' physical activity intentions.

2. Hypothesis 2 (H2): School-based smoking prevention interventions will positively influence students perceived social expectations regarding physical activity.

3. Hypothesis 3 (H3): School-based smoking prevention interventions will increase students' self-efficacy to engage in physical activity.

3.0 Methodology

The study adopts a quantitative cross-sectional design to measure the effect of school-based smoking prevention interventions at a single point in time. The current study is part of Ph.D. Sociology dissertation project of the first author. The title of the PhD study is "*Effectiveness of Intervention for Tobacco and Vape Abuse Prevention among Adolescents in Schools in Lahore, Pakistan"* and ethical approval of the current study was approved from the Advanced Studies and Research Board of University of the Punjab, Lahore Pakistan's in meeting held on 11-10-2023 with notification number 8622. A structured questionnaire was used to collect data from students in public schools across Lahore, Pakistan. The rationale for using this design is to capture immediate impacts and associations between smoking prevention interventions and health-related outcomes among adolescents. The universe of the study comprised school-going adolescents in Lahore, Pakistan. Lahore, being the second-largest city in Pakistan, has a diverse population of students in both public and private educational institutions. However, the focus of this study was on public schools, where smoking prevention programs are more likely to be implemented at a larger scale through government initiatives.

Adolescents aged 13-18 years were chosen as the target group because this age range is a critical period for smoking initiation and the development of health-related behaviors. A sample size of 240 students was selected based on the population of students in private schools in Lahore. To obtain a 5% error and a 95% confidence interval, the sample size was estimated using Cochran's methodology. An innovative process was used to verify that the sample reflected the full population. Initially, private schools were selected from various parts of Lahore at random. To guarantee equivalent age group representation, children were drawn from those schools during the following selection step using stratified sampling. The data were obtained using a standardized questionnaire split into four components. In the School-Based Smoking Prevention Interventions section, students' involvement in anti-smoking programs was examined. The Youth Tobacco Survey (Schreuders, #23) tools enable us to identify smoking-reduction measures and increase health participation. A four-item measure was created to examine students' attitudes on smoking and health behavior. This scale identifies changes related to the Health Belief Model (HBM), which emphasizes how society influences health habits. A 6-question survey based on the Theory

of Planned Behavior (TPB) was used to assess students' variables influencing physical activity. This scale measures how often students are to participate in physical exercise while expressing their thoughts and perspectives. To test students' belief in their ability to quit smoking, a four-item scale based on Bandura's Self-Efficacy Scale was developed. This component evaluated students' belief in avoiding smoking and living a healthy lifestyle. For each measure, we used a five-point response scale ranging from one to five. To ensure clarity and dependability, the questionnaire was administered to 30 students for testing. Their replies resulted in revisions. SmartPLS was used for data analysis, specifically Partial Least Squares Structural Equation Modeling. PLS-SEM stood out for its capacity to handle sophisticated models and manage sample groups ranging from 20 to 100. The measurement model's validity and reliability were evaluated by examining its outer loadings. Figure points less than 0.5 prompted an evaluation of the requirement of modifying or removing such components to improve model conformance. The study's methods were guided by ethical standards. Both pupils and their parents offered their assent while school officials issued authority. Students believed their contributions would be protected, which enabled them to express true emotions. Students were able to leave the study whenever they pleased.

4.0 Findings and Results

4.1 Reliability Analysis

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Perceived Social Expectations	0.8264	0.828	0.8847	0.6575
Physical Activity Interventions	0.8106	0.8284	0.8602	0.5032
School Based Smoking Prevention Interventions	0.8784	0.8896	0.898	0.5512
Self-Efficacy	0.8632	0.8759	0.9062	0.7072

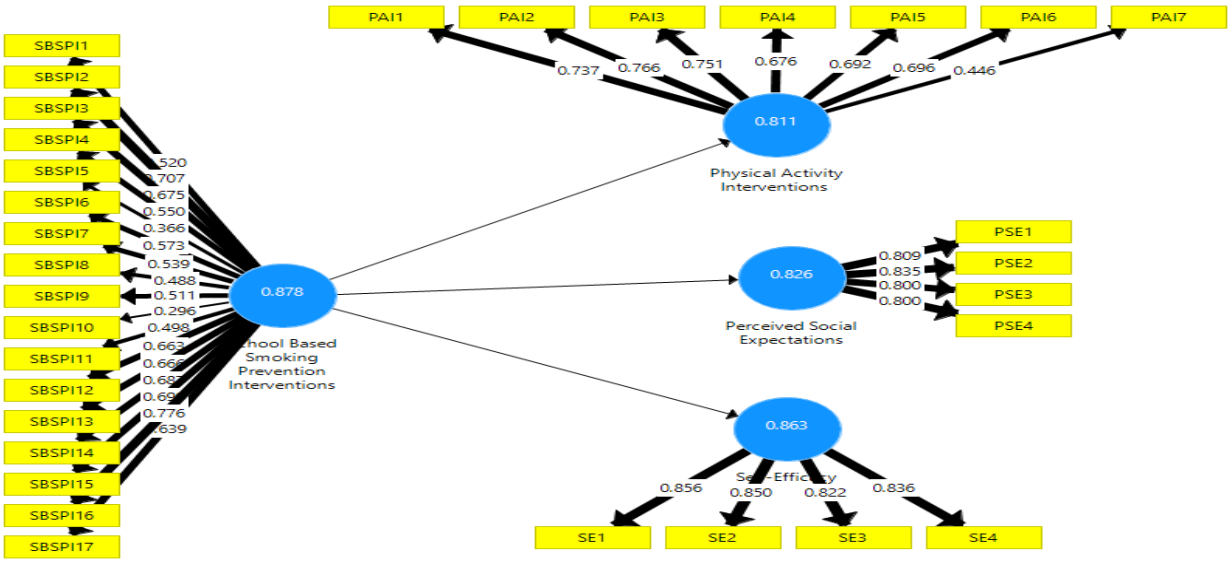

Figure 4.1: Measurement Model

The reliability analysis for the constructs demonstrates strong internal consistency and validity. For Perceived Social Expectations, Cronbach's Alpha of 0.8264 and Composite Reliability of 0.8847 indicate good internal consistency, meaning the responses are reliable. The Average Variance Extracted (AVE) of 0.6575 suggests that the construct explains 65.75% of the variance in its indicators, indicating good convergent validity. For Physical Activity Interventions, Cronbach's Alpha of 0.8106 and Composite Reliability of 0.8602 reflect acceptable reliability, though slightly lower than other constructs. The AVE of 0.5032 is just above the threshold of 0.50, showing the construct explains slightly over 50% of the variance, which points to adequate convergent validity. School-Based Smoking Prevention Interventions show high reliability, with a Cronbach's Alpha of 0.8784 and Composite Reliability of 0.898. The AVE of 0.5512 suggests the construct explains 55.12% of the variance, indicating satisfactory convergent validity. Finally, Self-Efficacy demonstrates very good internal consistency with a Cronbach's Alpha of 0.8632 and Composite Reliability of 0.9062. The AVE of 0.7072 is the highest among the constructs, meaning it explains 70.72% of the variance, providing strong evidence of convergent validity. Overall, the analysis shows that all constructs have acceptable reliability and convergent validity, though some constructs are stronger than others.

Table 4.2 Validity Analysis (HTMT)

	Perceived Social Expectations	**Physical Activity Interventions**	**School Based Smoking Prevention Interventions**	**Self-Efficacy**
Perceived Social Expectations				
Physical Activity Interventions	0.4663			
School Based Smoking Prevention Interventions	0.3803	0.5114		
Self-Efficacy	0.3209	0.3957	0.3397	0

The HTMT (Heterotrait-Monotrait Ratio) analysis shows acceptable discriminant validity between the constructs, as all values are below the recommended threshold of 0.85. Specifically, the relationship between **Perceived Social Expectations** and **Physical Activity Interventions** is 0.4663, indicating a moderate association. The relationship between **Perceived Social Expectations** and **School-Based Smoking Prevention Interventions** is 0.3803, showing a relatively lower but still moderate association. Similarly, **Physical Activity Interventions** and **School-Based Smoking Prevention Interventions** have a correlation of 0.5114, indicating a moderate relationship. The associations between **Self-Efficacy** and the other constructs—**Perceived Social Expectations** (0.3209), **Physical Activity Interventions** (0.3957), and **School-Based Smoking Prevention Interventions** (0.3397)—are moderate to low, reflecting good discriminant validity across all constructs. This indicates that the constructs are distinct from each other and measure different concepts.

Table 4.3 Outer Loadings

	Perceived Social Expectations	Physical Activity Interventions	School Based Smoking Prevention Interventions	Self-Efficacy
PAI1		0.7365		
PAI2		0.7656		
PAI3		0.7515		
PAI4		0.6758		
PAI5		0.6917		
PAI6		0.696		
PAI7		0.4463		
PSE1	0.8086			
PSE2	0.8348			
PSE3	0.7995			
PSE4	0.8			
SBSPI1			0.5198	
SBSPI10			0.2958	
SBSPI11			0.4979	
SBSPI12			0.6632	
SBSPI13			0.6661	
SBSPI14			0.6871	
SBSPI15			0.6991	
SBSPI16			0.7759	
SBSPI17			0.6387	
SBSPI2			0.7066	
SBSPI3			0.6754	
SBSPI4			0.5502	
SBSPI5			0.3664	
SBSPI6			0.5729	
SBSPI7			0.5387	
SBSPI8			0.4879	
SBSPI9			0.5113	
SE1				0.856
SE2				0.85
SE3				0.8217
SE4				0.8356

The outer loadings table presents the relationship between observed variables and their respective latent constructs. For Perceived Social Expectations (PSE), the loadings for all four items (PSE1 to PSE4) are strong, ranging from 0.7995 to 0.8348, indicating that these items are reliable indicators of the construct. In the case of Physical Activity Interventions (PAI), the

loadings are moderate to high for most items, with values between 0.6758 and 0.7656, suggesting they fairly represent the construct. However, item PAI7 shows a weak loading of 0.4463, indicating a weaker relationship with the construct.

For School-Based Smoking Prevention Interventions (SBSPI), several items have moderate loadings, with values typically above 0.5, except for SBSPI10 (0.2958), SBSPI5 (0.3664), and SBSPI11 (0.4979), which have relatively weak loadings and might not effectively represent the construct. Finally, the Self-Efficacy (SE) construct is strongly reflected by its four items, all of which have high loadings (ranging from 0.8217 to 0.856). Overall, the majority of the items are good indicators of their respective constructs, though a few weaker loadings suggest that certain items may require refinement or removal.

4.2 Regression Analysis

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
School Based Smoking Prevention Interventions -> Perceived Social Expectations	0.3359	0.3396	0.0521	6.4428	0
School Based Smoking Prevention Interventions -> Physical Activity Interventions	0.4441	0.448	0.0488	9.1062	0
School Based Smoking Prevention Interventions -> Self-Efficacy	0.3089	0.3127	0.0502	6.1543	0

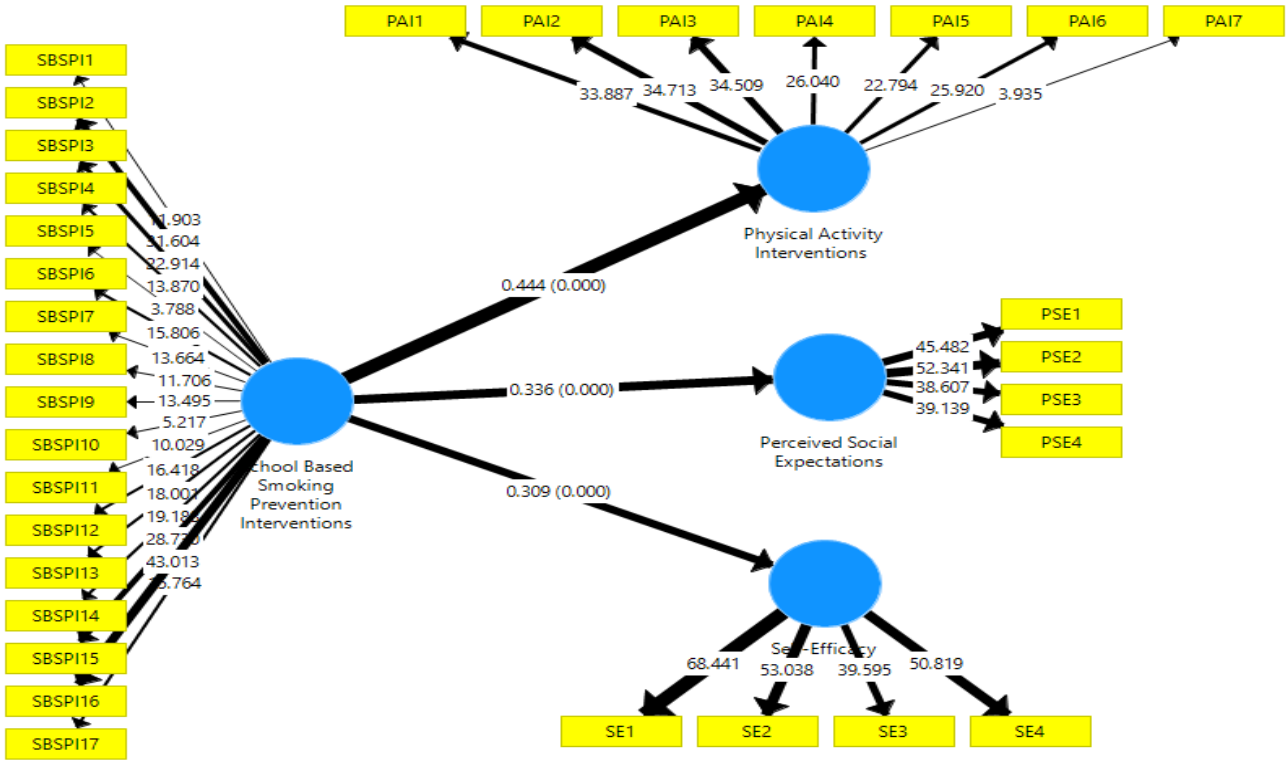

Figure 4.2: Structural Equational Model

The regression study reveals how School-Based Smoking Prevention Interventions affect three main outcomes: peer influence, activity level, and personal confidence. School-based smoking prevention initiatives increase perceived social expectancies, as shown by a coefficient of 0.3359. This impact is highly statistically significant, with a T-statistic of 6.4428 and a P-value of 0. The treatments significantly increase involvement in physical activity attempts, with a value of 0.4441. The pronounced T-statistic of 9.1062 and a P-value of 0 imply that this ties for the most significant of the three results. In addition to the other outcomes, the treatments increase self-efficacy by a coefficient of 0.3089. While the impact is not as significant as the other two, the connection still exists, as shown by a T-statistic of 6.1543 and a P-value of 0. The data reveal that School-Based Smoking Prevention Interventions improve all three outcomes, with Physical Activity Interventions having the highest effect, and are strongly linked to Perceived Social Expectations and Self-Efficacy**.**

5.0 Discussion and Conclusion

Results from this research indicate that school programs dedicated to addressing smoking have a strong effect on students' perceptions of social pressure and their goals regarding fitness and confidence. Findings clarify vital ties between school prevention programs and three major results highlighting the significant role these efforts play in cut-back smoking and enhancing well-being. Decreasing cigarette consumption affects students' attitudes towards community norms and their health practice. Students usually adhere to community values due to their focus on the wants of teachers and peers. Programs at school foster community wellness and increase the drive-in students to maintain non-smoking habits. These findings support earlier research that shows that increasing social standards can greatly affect adolescent behaviors. Communities with outstanding educational programs adopt anti-smoking principles. The rate of starting and keeping up with smoking is lower (Schreuders et al., 2017).

Evidence indicates that going to school to cut down on smoking and taking part in physical activities is linked. The data demonstrates that programs for preventing smoking can shape activities related to wellness. Persons supporting tobacco cessation may improve their grasp of health strategies and urge them to join in exercises. Health education typically highlights wellness which significantly increases physical exercises (Seifert et al., 2012) With these actions in place students' self-esteem rises and they reveal important assets. People who feel secure in what they do usually decide to quit smoking and avoid it in the future. Results indicate programs designed to diminish smoking enhance students' trust in their power to resist smoking and negative habits. High self-belief appears to lower the chances of starting to smoke while increasing the likelihood of stopping it. At school’s support boosts the confidence of learners and leads them to avoid smoking and embrace a healthier existence.

5.1 Policy Implication

Successful programs at schools could reduce cigarette usage and alter social and physical activities. Policymakers should develop thorough approaches at schools for reducing smoking use while adding diverse health promotion tools. To advance better routines and elevate exercise levels as well as raise self-esteem we must embed these programs into the educational offerings.

Formulating effective policies requires shaping a constructive image of smoking. Using this technique enables schools to tackle multiple health behaviors in one go and guarantee a better future for students.

Tehreem Fatima Awan: Problem Identification and Theoretical Framework, Data Analysis
Rubeena Zakar: Supervision and Drafting

Conflict of Interests/Disclosures

The authors declared no potential conflicts of interest in this article's research, authorship,and publication.

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