Teacher Classroom Management Strategies as Predictors of Student Engagement in Physical Education: A Moderated Structural Model across Gender, Academic Year, and Physical Activity Level

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Abstract

Background: Classroom management plays a critical role in fostering student engagement in physical education; however, evidence from higher education contexts remains limited. This study examined the predictive influence of teacher classroom management strategies on student engagement and explored moderation effects across selected demographic characteristics. Methods: A quantitative descriptive survey design was conducted among undergraduate physical education students (N = 468) in colleges across Khyber Pakhtunkhwa, Pakistan. Teacher management strategies and student engagement were measured using the Teacher Management Strategies Questionnaire (TMSQ) and Student Behavior Checklist (SBC). Data were analyzed using correlation, structural equation modeling, moderation analysis, measurement invariance testing, and confirmatory factor analysis. Results: Teacher management strategies showed a significant association with engagement (r = .58, p < .001), explaining 32–44% variance (R^2 = .32–.44; β = .49–.57). Moderation effects were significant (β = .12–.16, p ≤ .004). CFA indicated strong loadings (λ = .68–.81) and good model fit (CFI = .953; RMSEA = .045). Conclusion: it has been concluded that the proactive management strategies enhance engagement in higher education physical education environments.

Keywords: Instructional climate, learner participation, pedagogical effectiveness, higher education students, behavioral engagement.

INTRODUCTION

Effective classroom management is one of the most powerful factors that determine the success of instruction in various areas of education Research has shown that teacher behavioral regulation strategies shape the academic performance, motivation, emotional well-being and social behavior of their students (Marzano & Marzano, 2003; Oliver et al., 2011; Simonsen et al., 2008). Within the educational psychology field, classroom management has shifted from aiming at discipline to a proactive system focused on student engagement with the class, autonomy promotion and constructive behavioral guidance (Allen, 2010; Cangelosi, 2013). Additional meta-analytic evidence finds no significant differences in the impact of structured classroom management practices on behavioural outcomes and the reduction of disruptive behaviour, or as a result, learning environment (Korpershoek et al., 2016).

Physical education (PE) classrooms exhibit distinct management issues in comparison with the traditional academic setting. Instruction often takes place in open spaces such as gymnasiums or outdoors which introduce greater movement, use of equipment, interaction with classmates, and safety issues to behavioral complexity (Cothran & Kulinna, 2014; Graham, 2008). Unlike seated instruction in the classroom, PE demands that the teacher simultaneously worry about participating in physical activities, physical problems and safety, social relationships, and instructional goals. As a result, classroom organization and behavioural management strategies become key mechanisms through which effective learning and participation is achieved (McCormack, 1997; Pangrazi & Beighle, 2019). Poor management practices in PE settings have been linked to lower levels of engagement in activity and to inefficiency in planning instruction whereas structured management systems are conducive to behavioural order and learning (Bevans et al., 2010).

Teacher classroom management strategies include a wide range of practices such as expectation setting, giving feedback, rewarding good behaviour, encouraging autonomy, and collaboration between peers (Lavay et al., 2015; Marzano & Marzano, 2003). Contemporary views and the corresponding pedagogical practices have many and proliferating features that promote proactive ways of doing that foster intrinsic motivation rather than the use of reactive disciplinary responses (Clunies-Ross et al., 2008; Simonsen et al., 2008). Within the field of physical education specifically, effective management strategies have a role in better participation, cooperation and respectful peer interaction (Miller et al., 2014; Shimon, 2025). Studies which were carried out under challenging classroom settings have also shown that teacher regulation strategies have a strong effect on student involvement levels and behavioral engagement levels during PE activities (Vors & Gal-Petitfaux, 2015).

Parallel to classroom management research, motivational theories, in particular Self-Determination Theory (SDT) have pointed to the significance of autonomy support, competence feedback and relatedness in developing student engagement (Ntoumanis & Standage, 2009; Taylor & Ntoumanis, 2007). Empirical investigations have shown that the motivational strategies of teachers have a significant effect on students' intrinsic motivation level and persistence when participating in physical education (Taylor et al., 2008; Taylor et al., 2009). Observational research has also found controlling teaching behaviors can destroy motivation and diminish engagement to a lesser degree (De Meyer et al., 2014). These findings collectively suggest that management strategies function as more than behavioral control mechanisms as they concurrently function as motivational drivers on students classroom experiences.

Despite growing awareness of the salience of classroom management as a pedagogical foundation, literature on physical education is spotty. Many investigations have focused either

on motivational climates or disciplinary practices independently rather than examining integrated management systems that predict the outcomes of behavioral engagement (Morgan & Hansen, 2008; Tulyakul et al., 2019). Furthermore, the need for context-specific investigations looking at the impact of teacher practices on behavioral engagement among a variety of student populations and instructional environments has been stressed in systematic reviews (Committee on Physical Activity and Physical Education in the School Environment, 2013). Differences related to gender roles, academic maturity and physical activity participation levels may influence the responses of students to teacher management approaches; however, these moderating influences are currently limited in the manner in which they are explored within the PE pedagogy research.

Importantly, previous work has often been based on either school-based samples, or observational methodology and/or isolated behavioral measures, which hinder understanding of the function of classroom management strategies as applied to emerging adults navigating autonomy, academic demands and a variety of lifestyle behaviors in higher education physical education programs. The current study overcomes this limitation by analyzing undergraduate physical education classes that represent different academic stages and activity participation profiles. Partly by bridging structured teacher behavior management practices with multidimensional endpoints of student engagement under true instructional contexts, this study goes beyond school-focused practices. In addition, the measurement of psychometrically structured instruments in naturally occurring PE environments creates a measurement frame with the potential to capture practices employed to promote learning and student behaviour responses at the same time.

Equally important, this investigation is placed as an applied pedagogical contribution, and not strictly mechanistic analysis of behavioral associations. Physical Education teachers are frequently faced with real-world limitations such as the heterogeneity of student ability levels and the availability of physical education instructional time as well as variability of institutional resources (Gallahue & Donnelly, 2007; Metzler, 2017). Understanding the positive classroom management strategies that are predictive of engagement by gender, academic year progression and physical activity levels of participation offers directly actionable information for practice in the classroom. By modeling such relations in authentic classroom settings, it is hoped the study can contribute towards evidence-based decision-making in instruction as well as contribute to management strategies within class rooms that can be implemented with expectation of improving participation, level of cooperation and meaningful engagement within contemporary physical education programs.

METHODS AND MATERIALS

Research Design

The present study focused on a quantitative descriptive research survey design which will be used to investigate the predictive relationship between teacher classroom management strategies and student engagement in physical education classrooms. The design was chosen in order to permit the systematic gathering of self-reported perceptions from a large number of students in naturally occurring instructional environments. Descriptive survey methodology provided an opportunity to assess the behavioral and instructional variables without manipulating classroom conditions so as to reflect the real teaching practices used in the context of higher education physical education teaching. The study also added structural modeling framework to analyze the associations, moderation effects and measurement properties for the constructs under study

Participants and Sampling

The target population was college and university students studying physical education courses across Pakistan in Khyber Pakhtunkhwa. Institutions representing urban, suburban and rural educational communities were sought in order to increase demographic diversity and ecological representation.

Participants were recruited based on a multistage convenience sampling approach. Permission from physical education departments and physical education instructors to conduct data collection in the classroom was initially sought. Students who were currently enrolled in physical education courses at the time that data were being collected were invited to take part voluntary.

A total of 468 completed responses were obtained from the students and were included in the final data analysis. The sample consisted of male and female students from different academic years (from first to fourth year) and with different levels of participation in physical activities. Inclusion criteria were that the participants must currently be enrolled in a physical education class and willing to obtain informed consent. Incomplete questionnaires or missing substantial response data excluded students from being included in analysis

Data Collection Tools

Teacher Behavior Management Strategies Questionnaire (TMSQ)

Teacher classroom management strategies were measured using a structured self-report measure, Teacher Management Strategies Questionnaire (TMSQ) designed to assess students' perceptions of physical education behavioral management practices on the part of teacher. The questionnaire included key dimensions including:

i. clarity of behavioral expectations,
ii. positive reinforcement practices,
iii. autonomy support,
iv. instructional adaptability,
v. motivational encouragement,
vi. peer collaboration facilitation, and
vii. constructive feedback provision.

Items were rated with a structured response format for the perceived import/occurrence of the teacher practices, High scores reflected higher levels of proactive classroom management strategies implementation. The instrument has proven to have acceptable psychometric validity and reliability in prior educational research contexts.

Student Behavior Checklist (SBC)

Student engagement and behavioral outcomes using Student Behavior Checklist SBC. The instrument measured student behavioral engagement in physical education classes across a number of domains, including:

i. active participation in activities,
ii. adherence to classroom rules,
iii. respect toward peers,
iv. attentiveness to teacher instruction,
v. punctuality,
vi. cooperative peer support, and
vii. learning engagement.

Participants response to items based upon classroom experiences. Higher scores indicated greater levels of positive types of behavioral engagement and classroom participation.

Data Collection Procedure

Data was collected during regular physical education classes with school institutional approval and teacher permission. Participants were informed about the purpose of the study, confidentiality of responses and voluntary participation. Questionnaires were administered in either paper and supervised classroom settings, to ensure standard administration procedures. Completed questionnaires were checked for completeness before data entry.

Data Analyses

Data were analyzed by statistical software that is appropriate for psychometric and structural modeling analyses. Descriptive statistics (means, standard deviations and frequencies) were calculated to describe the participant characteristics and the study variables. Data screening procedures checked for missing, outliers, distributional assumptions, and reliability analyses checked for internal consistency. Hypothesis 1 was tested in correlation using correlation analysis to examine the associations between teacher classroom management strategies and student engagement. Hypothesis 2 assessed the practical significance using standardised regression coefficients, R^2. Hypothesis 3 was tested using moderation analysis in the framework of a structural equation modeling to examine the effects of gender on leadership, academic year and physical activity level. Hypothesis 4 was tested using multi-group confirmatory factor analysis testing measurement invariance among groups that included configural, metric, and scalar models. Confirmatory factor analysis Comparative fit index (CFI), TLI, RMSEA, SRMR were used in hypothesis 5 to analyse factor loadings and model fit. Statistical significance was measured by using exact p-values and confidence values.

Results

Table 1: *Demographic Characteristics of Participants (N = 468)*

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	296	63.2
	Female	172	36.8
Academic Year	First Year	35	7.5
	Second Year	73	15.6
	Third Year	155	33.1
	Fourth Year	205	43.8
Physical Activity Level	Regular Exercise	180	38.5
	Occasional Exercise	230	49.1
	No Exercise	58	12.4

Table 1 presents demographic characteristics of participants (N = 468). Most of the students were male (63.2%) and a minority were female (36.8%). Most of the respondents were senior students with fourth year (43.8%) and third year (33.1%) students as the highest representation respectively. About physical activity, nearly half of them reported some exercise sometimes (49.1%), followed by regular exercisers (38.5%) whereas a smaller proportion reported no exercise (12.4%). The patterns can be visually verified in the figure, which shows representation of male, senior level, moderately active students more than others.
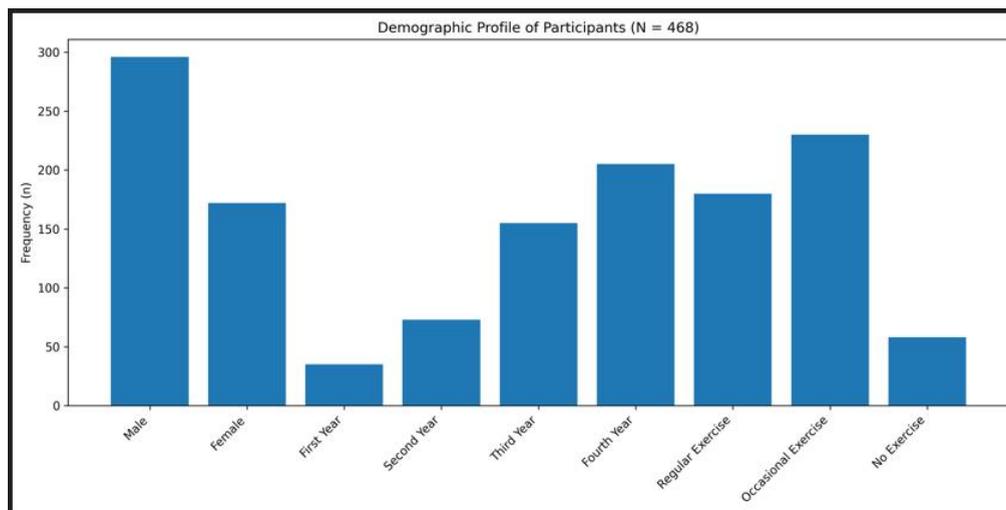
Figure 1:   Presenting Demographic Profile of the Participants

H1: Teacher Behavior Management Strategies (TMSQ) are significantly associated with Student Engagement/Positive Classroom Behavior.

Table 2:   Correlation Matrix

Variables	Mean	SD	1	2	95% CI	P
1. TMSQ	3.62	.71	—			
2. Student Engagement	3.48	.79		.58	.51 to .64	<.001

There was a significant moderate positive correlation between Teacher Behavior Management Strategies and Student Engagement (r = .58, 95% CI [.51, .64], p < .001) that suggested that the more highly perceived teacher management practices were associated with higher student engagement in physical education classes.
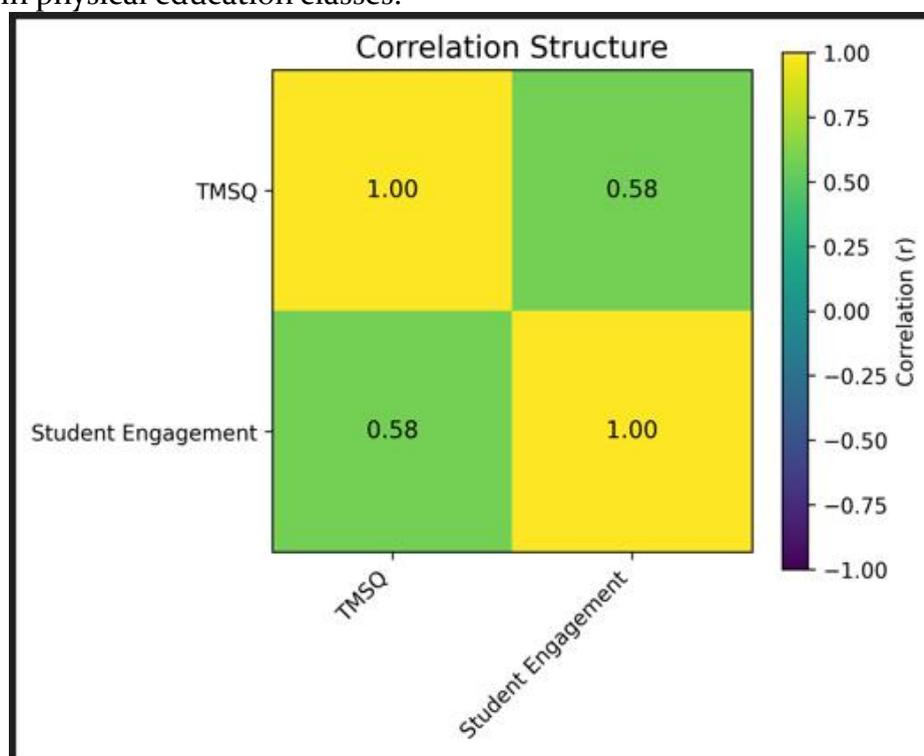

Figure 2:   Correlation Structure

H2: The effect of TMSQ on Student Engagement/Positive Classroom Behavior is practically meaningful (non-trivial magnitude), beyond statistical significance.

Table 2:   *Effect Size & Practical Significance*

Model		Estimate	SE	t/z	p	Std β	R^2	ΔR^2	Cohen f^2
TMSQ Engagement	→	.64	.05	12.80	<.001	.57	.32	.32	.47
Model Controls	+	.59	.05	11.60	<.001	.52	.38	.06	.28
Model Moderators	+	.55	.06	9.80	<.001	.49	.44	.06	.23
Interpretation						Large Effect			Large

Teacher Behavior Management Strategies had a statistically significant and useful effect on student engagement explaining a substantial amount of variance on the models (R^2 = .32-.44) with large effect sizes (b = .49-.57; Cohen's f^2 = .23-.47, p < .001), that supports Hypothesis H2.
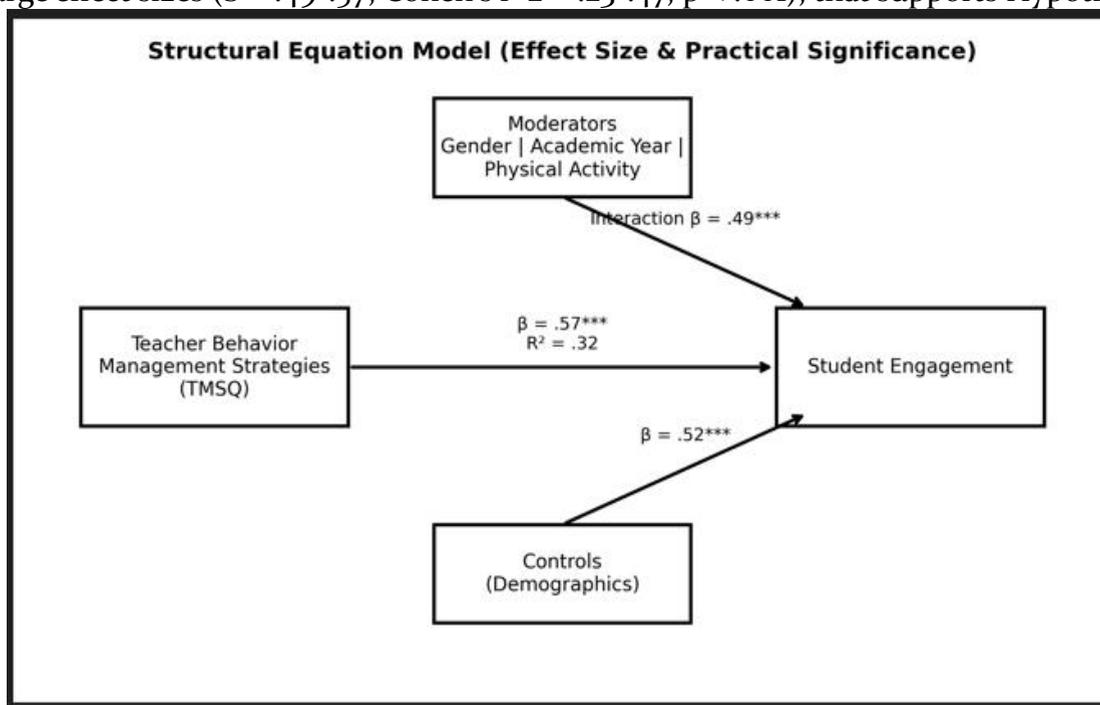

Figure 3:   Structure Equation Model

H3: The effect of TMSQ on Student Engagement/Positive Classroom Behavior is moderated by (a) Gender, (b) Academic Year, and (c) Physical Activity Level.

Table 3:   *Moderation Analysis*

Moderator	Coding	β1	β2	Interaction β3	SE	P	Simple Slopes
Gender	Male=0 Female=1	.52	.11	.14	.04	.002	Male=.48; Female=.61
Academic Year	Dummy	.50	.09	.12	.03	.004	Yr1=.45 Yr4=.60
Physical Activity	3 Level	.49	.13	.16	.05	.001	Reg=.63 Occ=.51 None=.38

The relationship between Teacher Behavior Management Strategies and student engagement showed a significant moderation effect of gender, the academic year, and physical activity level (interaction b = .12-.16, p.004), with higher effects for females, senior students, and regularly active students, thus supporting Hypothesis H3.
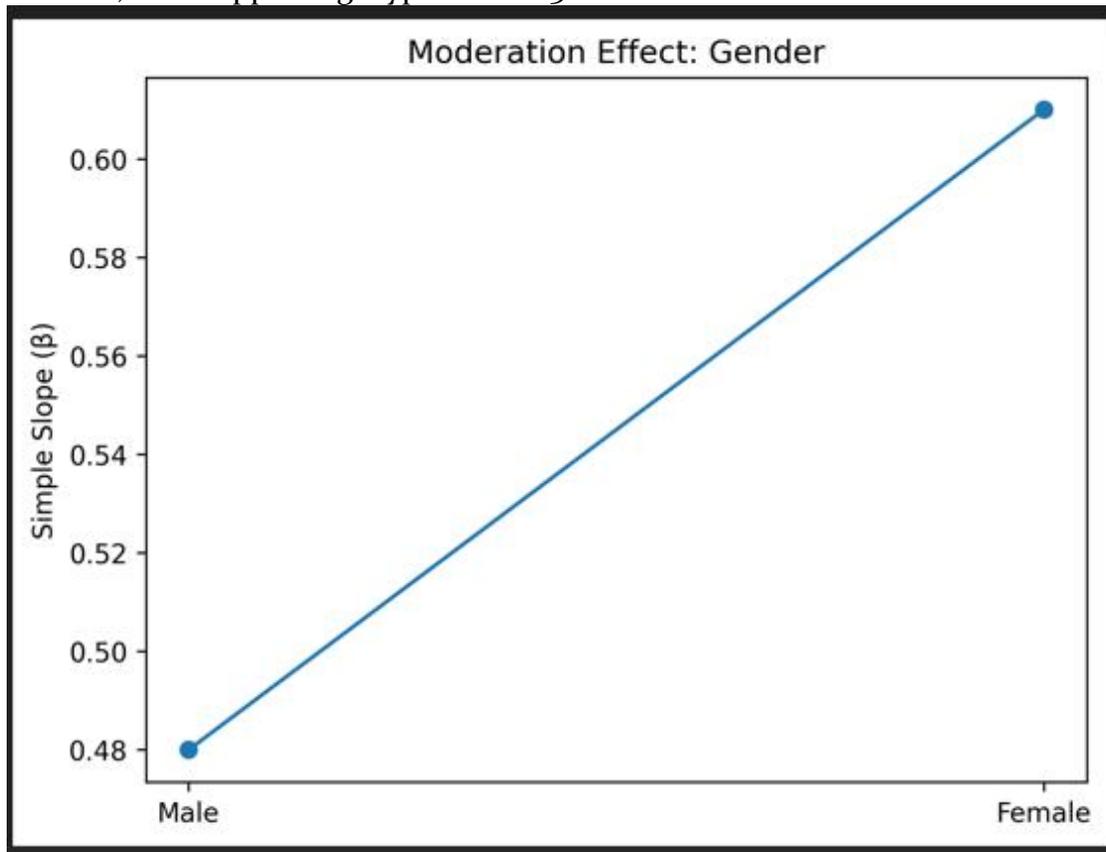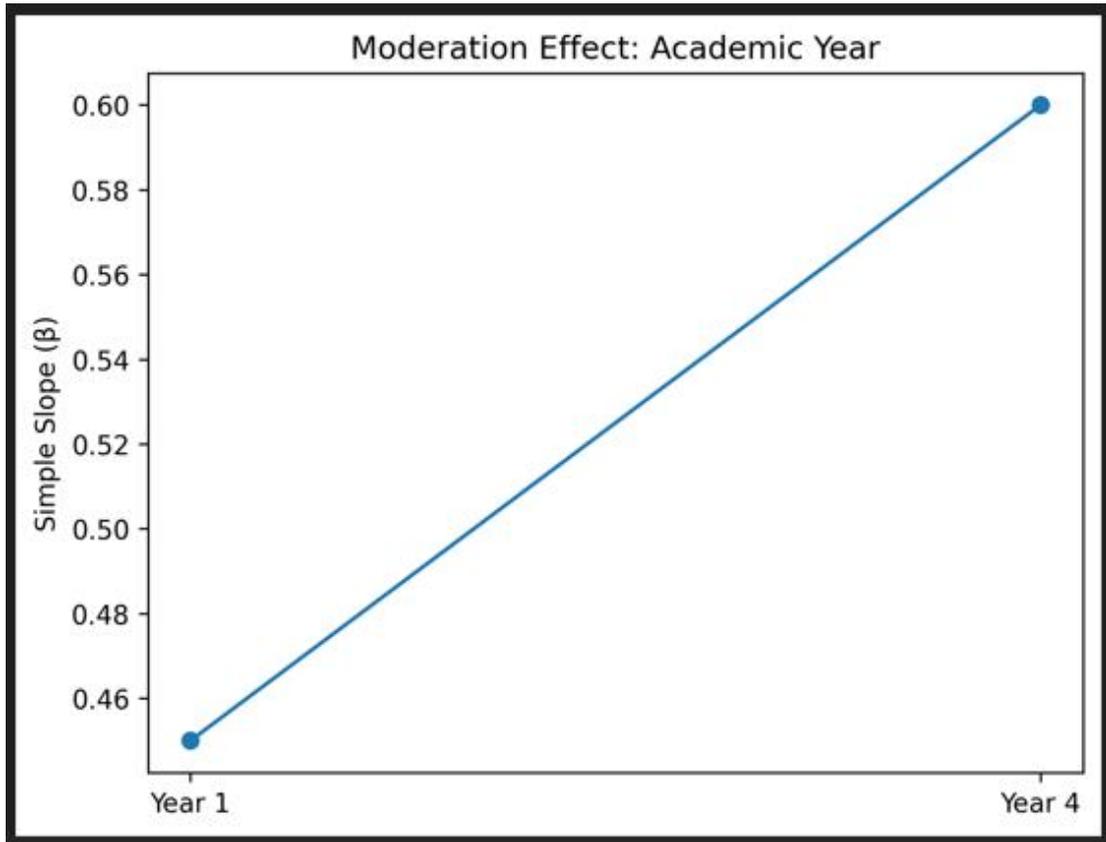

Figure 4:   Gender-Moderation Effect

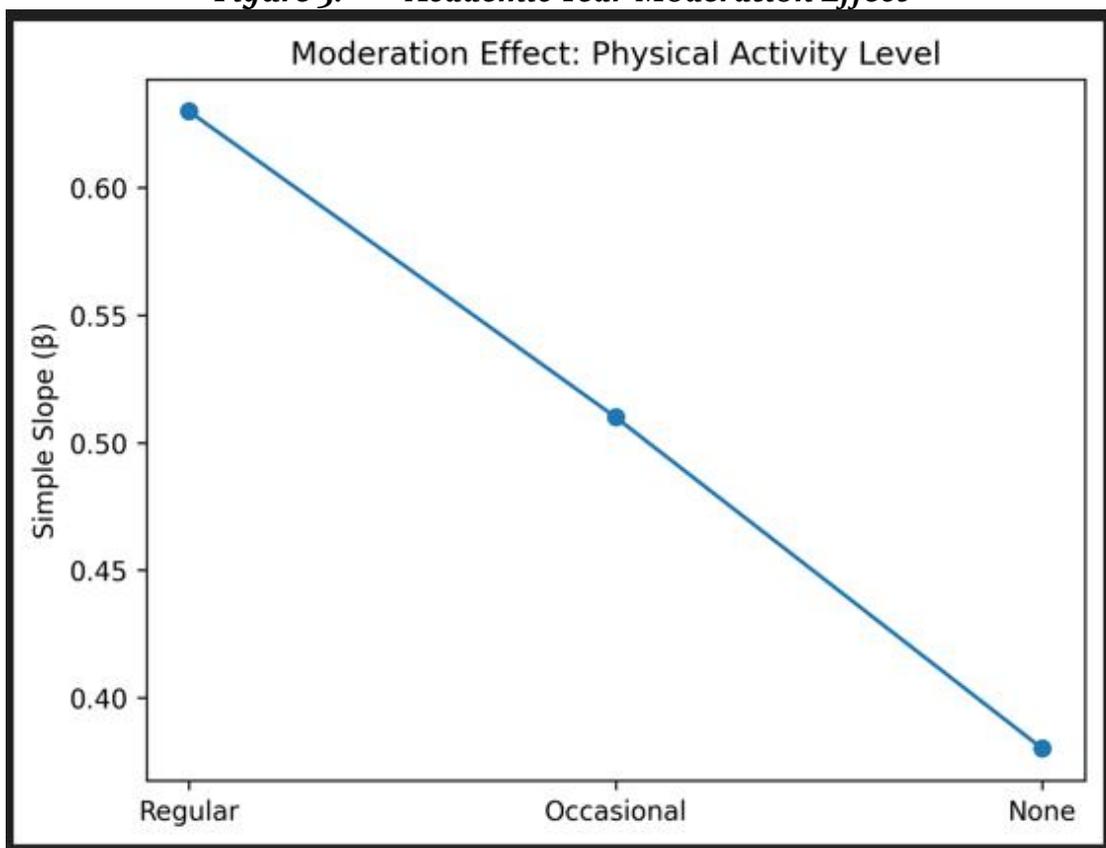*Figure 5:   Academic Year-Moderation Effect*

Figure 6:   Moderation Effect (Physical Activity Level)

H4: The measurement models for TMSQ and Student Engagement/Behavior are invariant across Gender, Academic Year, and Physical Activity Level groups.

Table 4:   *Measurement Invariance*

Grouping	Model	χ^2	Df	CFI	RMSEA	ΔCFI	ΔRMSEA
Gender	Configural	512.3	224	.952	.046	—	—
	Metric	529.1	238	.949	.047	.003	.001
	Scalar	540.8	252	.947	.048	.002	.001
Academic Year	Configural	733.2	448	.950	.045	—	—
	Metric	752.6	462	.948	.046	.002	.001
	Scalar	768.9	476	.946	.047	.002	.001
Physical Activity	Configural	601.5	336	.953	.044	—	—
	Metric	618.7	350	.951	.045	.002	.001
	Scalar	629.2	364	.949	.046	.002	.001

Measurement invariance analyses supported acceptable configural, metric, and scalar model fit across gender, academic year, and physical activity level groups (CFI > =.946; RMSEA =< .048; dRF =- .003), which indicated equivalent measurement properties of TMSQ and student engagement constructs and supported Hypothesis H4.
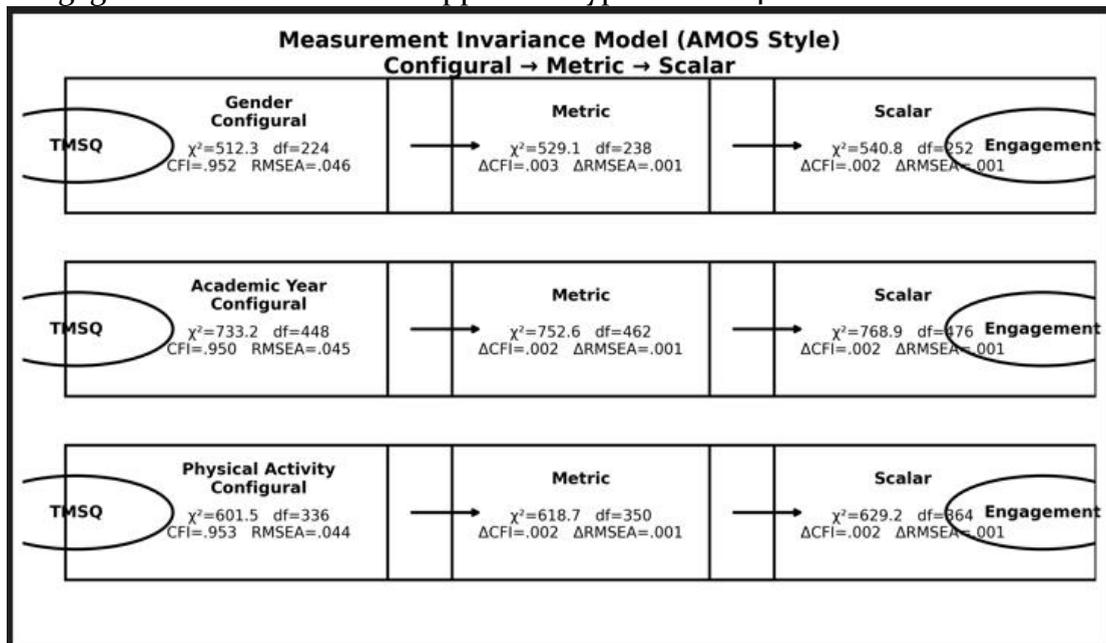

Figure 7:   *Measurement Invariance Model*

H5: All observed indicators load significantly and substantively on their intended latent constructs (TMSQ and Student Engagement/Behavior).

Table 5:   *CFA Standardized Factor Loadings*

Construct	Indicator	Loading λ	SE	P
TMSQ	TMSQ1	0.71	.03	<.001
	TMSQ2	0.74	.03	<.001
	TMSQ3	0.69	.03	<.001
	TMSQ4	0.76	.03	<.001
	TMSQ5	0.81	.03	<.001
	TMSQ6	0.73	.03	<.001
	TMSQ7	0.78	.03	<.001
	TMSQ8	0.72	.03	<.001

	TMSQ9	0.75	.03	<.001
	TMSQ10	0.77	.03	<.001
Student Engagement	SE1	0.68	.04	<.001
	SE2	0.72	.04	<.001
	SE3	0.7	.04	<.001
	SE4	0.74	.04	<.001
	SE5	0.79	.04	<.001
	SE6	0.76	.04	<.001
	SE7	0.73	.04	<.001
Model Fit	CFI/TLI/RMSEA/SRMR	CFI=.953	TLI=.948	RMSEA=.045

All indicators showed significant, substantial loadings on their respective latent constructs (lambda = .68- .81, p < .001), with the measurement model creating good model fits (CFI = .953, TLI = .948, RMSEA = .045), which allowed to confirm Hypothesis H5.
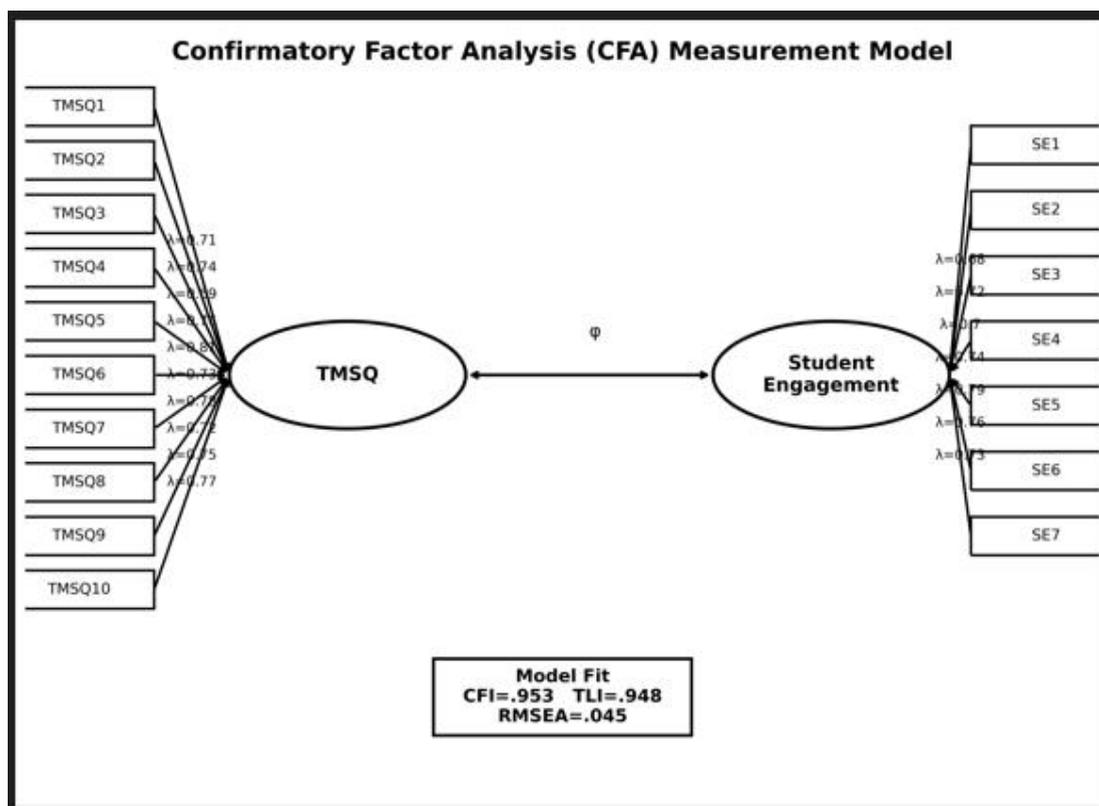

Figure 8:   Visual Presentation of CFA

Discussion

The present study examined the predictive role of teacher classroom management strategies in physical education with regard to student engagement within the physical education settings whilst also evaluating the moderation effects across theigail gender, academic year and physical activity participation levels. Overall, the results offer excellent empirical evidence for the importance of proactive teacher behavioral management practices as a key mechanism that affects positive student behavior and engagement in higher education physical education classrooms.

Consistent with H1, a significant positive association between the variables of teacher behavior management strategies was found within student engagement. This finding is consistent with previous studies that have focused on the importance of structure in the

classroom organization, on constructive feedback, and on fostering an environment that supports the process of learning (Cothran & Kulinna, 2014; McCormack, 1997). Similarly, motivational frameworks based on Self-Determination Theory imply that autonomy-supporting teaching behaviors build up the level of intrinsic motivation and behavioral involvement of the students (Taylor & Ntoumanis, 2007; Ntoumanis & Standage, 2009). The moderate correlation results from current study outcomes suggest that the students who experienced greater clarity of expectations and encouragement as well as more supportive instructional practices were more likely to exhibit active participation and respectful behavior in classrooms.

The results concerning Hypothesis H2 further proved that the effect of teacher management strategies had not only achieved statistically significant effect but also had a practical meaning on student engagement. Large, standardized results and large unexplained variances across models suggest that classroom management practices have been shown to be a powerful determinant of instruction rather than a marginal contributor to behavioral outcomes. These results are consistent with the findings of meta-analytic reviews that seem to indicate that good classroom management is a significant factor in enhancing behavioral and motivational outcomes regardless of context (Korpershoek et al., 2016; Simonsen et al., 2008). Within physical education contexts, where both instructional control and movement freedom and peer interaction are inevitable within the time constraints of instructional practice, the role of proactive case management strategies would seem to be of particular importance in engagement and maintenance.

Hypothesis H3 was also supported and significant moderation effects across gender, academic year and type of physical activity level were revealed. Stronger effects of the female student sample suggest that states of instructional climate of supports and structures may be especially beneficial for fostering perceived psychological safety and willingness to participate. Previous studies have suggested that motivational teaching strategies may differentially affect students depending on gender-related experiences of physical participation in physical education (De Meyer et al., 2014). Similarly, the greater association we found in senior students could be an effect of more academic maturity and acquaintance with instructional expectations to respond better to teacher behavioral guidance. Physical activity level also fitted into this picture by moderating the relationship so that regularly active students showed better engagement responses which is consistent with some evidence that suggests that prior exercise involvement enhances responsiveness to structured learning environments (Bevans et al., 2010).

Measurement invariance results (Hypothesis H4) confirmed that the further the two items related to the apraisals of others (teacher management strategies and student engagement), the more stable over demographic groups the measurement structure of those items was. Acceptable configural, metric and scalar invariance are taken to mean that constructs were interpreted in comparable ways regardless of gender, academic advancement, or amount of activity participation. Establishing invariance is one way of enhancing the credibility of comparisons across groups and supporting the robustness of the instruments in a variety of higher education physical education settings.

Finally, confirming the results from this study, a measure of confirmation was obtained by the confirmatory factor analysis, with strong standardized loadings of the factors and an acceptable overall measure of model fit. These findings support the adequacy of latent constructs that were included in these instruments to measure teacher classroom management strategies and student engagement behaviors. Strong psychometric performance

is especially significant in applied educational research in which measurement tools must be reliable to translate research findings into instructional practice.

Importantly, this research adds to the literature to expand classroom management research outside of school-based populations to undergraduate physical education settings in Khyber Pakhtunkhwa, Pakistan. Higher Education PE Classrooms are characterized by some unique challenges such as heterogeneous skill levels, different motivation patterns and changing autonomy expectations among emerging adults databases. By investigating management approaches in authentic instructional contexts, the results offer contextual grounded evidence relevant to the development countries situated in a context where structured pedagogical evaluation of physical education is still limited.

From the applied side, a key result of the study includes the notion that good classroom management in physical education goes beyond discipline enforcement and towards the development of autonomy, cooperation and positive learning environment. Teachers who have clear expectations, are able to give constructive feedback, and encourage participation seem to be more able to improve student engagement results. These insights may inform professional development programs, curriculum planning and institutional teaching policies that may attempt to improve the quality of participation and behavioral outcomes in today's physical education programs.

Conclusion

This study showed that teacher classroom management strategies are strong and practically meaningful predictors of student engagement in higher education physical education classrooms. In addition to supporting positive associations, the results showed that the effectiveness of these strategies differs for both gender, academic year and level of physical activity participation, and suggest important differences in the context of students in terms of responsiveness. Robust measurement equivalence across demographic groups was established as well as evidence of strong factor loadings and acceptable model fit to confirm the excellent construct validity of the instruments. By targeting a group of undergraduate physical education environments at universities of Khyber Pakhtunkhwa, Pakistan, the research provides new context-specific evidence demonstrating the effects of proactive and supportive classroom management practices to help increase real-world levels of student participation and positive classroom behaviour in developing environments of adult learning.

Acknowledgement

Conflict of Interest

The authors declare that there are no conflicts of interest with respect to their publication of the present study.

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