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Integrating Mental Health Education into Physical Education: Designing and Evaluating a Mindfulness-Based PE Module for Enhancing Student Well-Being

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Abstract

Purpose

This study presents the design, implementation, and evaluation of a mindfulness-based Physical Education (PE) module that integrates mental health education to enhance psychological well-being among school-aged children. The research addresses the critical gap between traditional PE curricula, which prioritize physical fitness, and contemporary mental health challenges affecting adolescent development.

Methodology

A quasi-experimental pre-test/post-test control group design was employed with 60 school-aged participants (experimental group, n=30; control group, n=30). The experimental group participated in an 8-week mindfulness-based PE intervention (2–3 sessions/week, 40–50 minutes/session) incorporating body awareness, guided breathing techniques, relaxation protocols, and structured reflection sessions. The control group maintained standard PE curricula. Primary instruments included the Rosenberg Self-Esteem Scale (RSES), Spence Children's Anxiety Scale (SCAS), and a validated Mental Wellness Scale. Data analysis employed paired *t*-tests and analysis of covariance (ANCOVA) to assess within- and between-group differences while controlling for baseline measurements.

Results

The mindfulness-based PE intervention produced statistically significant improvements across all measured outcomes. Self-esteem increased significantly in the experimental group (pre: M = 21.8, SD = 3.2; post: M = 27.3, SD = 3.5) compared to controls (post: M = 22.5, SD = 3.1), $t(58) = 5.62$, $p < 0.001$. Anxiety decreased substantially in the experimental group (pre: M = 28.4, SD = 4.1; post: M = 19.2, SD = 3.8) relative to controls (post: M = 27.5, SD = 4.0), $t(58) = 8.16$, $p < 0.001$. General well-being improved significantly (experimental pre: M = 45.2, SD = 5.4; post: M = 54.0, SD = 5.1 vs. control post: M = 46.7, SD = 5.2), $t(58) = 6.72$, $p < 0.001$. PE engagement rates were substantially higher in the experimental group (M = 95.3%, SD = 4.8) compared to controls (M = 72.5%, SD = 6.3). ANCOVA results confirmed statistically significant effects of the intervention on all outcomes after controlling for baseline differences ($p < 0.001$ for all measures).

Conclusion

Integration of mindfulness-based mental health education into school PE curricula represents a viable, evidence-supported strategy for enhancing student psychological well-being, reducing anxiety, and increasing physical activity engagement. The findings support a holistic educational model addressing both physical and mental health needs through a unified pedagogical framework.

Keywords

mindfulness-based intervention; mental health education; physical education; student well-being; self-esteem; anxiety reduction; school-based health promotion; holistic development

1. Introduction

Physical Education has conventionally focused on developing physical fitness, motor skills, and athletic competence among students (Delgado-Montoro, 2022). Through systematic physical activity, structured exercise protocols, and sport-specific training, PE programs aim to enhance cardiovascular fitness, muscular strength, flexibility, and neuromusculoskeletal coordination—foundational elements of lifelong health and disease prevention. However, emerging epidemiological evidence demonstrates a significant bidirectional relationship between physical activity and mental health, including documented effects on mood regulation, stress reduction, cognitive function, and emotional resilience (Johnson et al., 2023).

Despite empirical validation of this mind-body connection, contemporary school PE curricula remain predominantly focused on physical outcomes, with limited structural integration of psychological skill development or mental health education. This curricular gap occurs at a critical developmental period when adolescents face escalating mental health challenges. Global epidemiological data indicate rising prevalence of anxiety disorders, depression, low self-esteem, and psychosocial distress among school-aged populations, with contributing factors including academic pressure, social challenges, digital media influences, and lifestyle changes (González-Martín et al., 2023).

Schools represent uniquely positioned institutional settings for comprehensive health promotion, as they provide structured environments conducive to integrated physical and psychological development. Within this context, mindfulness-based interventions have demonstrated substantial empirical support for anxiety reduction, self-esteem enhancement, attentional improvement, and psychological well-being promotion in educational settings (Işıkgöz, 2025; Khanbeiki, 2024). Mindfulness practices—characterized by sustained present-moment awareness, non-judgmental observation, and acceptance—offer practical pedagogical mechanisms for developing emotional regulation, stress management, and psychological resilience.

To date, limited research has systematically designed, implemented, and rigorously evaluated integrated mindfulness-PE modules that explicitly combine physical activity with structured mental health education (Oh, 2024; Upsher et al., 2022). The present study addresses this research lacuna by developing, implementing, and evaluating a comprehensive mindfulness-based PE module for school-aged children, hypothesizing that such integration produces synergistic benefits encompassing physical fitness, psychological resilience, and emotional regulation.

1.1 Research Problem

Traditional school PE programs predominantly emphasize physical fitness and motor skill acquisition while systematically overlooking opportunities for psychological skill development and mental wellness promotion. This curricular fragmentation leaves students inadequately equipped with evidence-based strategies for stress management, emotional regulation, mindfulness, and psychological coping—skills increasingly critical for managing contemporary developmental challenges. Although emerging evidence supports the efficacy of integrated mindfulness-physical activity interventions, empirical research remains limited, and evidence-based pedagogical models for school implementation remain underdeveloped.

The present research addresses this gap by systematically designing, implementing, and rigorously evaluating a mindfulness-based PE module tailored for school-aged populations. This evidence-based approach aims to provide practical implementation guidance for educational administrators, PE teachers, and curriculum developers seeking to adopt holistic health promotion frameworks aligned with contemporary adolescent mental health needs.

1.2 Scope of the Study

This research is circumscribed to examine the integration of mental health education and mindfulness practices into school-based PE through the development and evaluation of a structured intervention module. The study specifically targets school-aged children (10–14 years), focusing on measurable psychological outcomes including self-esteem, anxiety symptomatology, general psychological well-being, and PE participation engagement. By providing a evidence-based implementation model, this research aims to inform curriculum planning, teacher professional development, and institutional policy regarding holistic health promotion in school settings, though generalizability may be limited by sample-specific and context-specific factors.

1.3 Study Limitations

The present study acknowledges several methodological and contextual limitations:

1. **Sample characteristics and generalizability**: The study sample comprises school-aged participants from selected institutions, potentially limiting generalizability to other age groups, geographic contexts, or cultural settings.

2. **Intervention duration**: The 8-week intervention window may not capture long-term effects or sustained behavioral changes beyond the active intervention phase, limiting conclusions regarding intervention persistence.

3. **Measurement methodology**: Reliance on self-reported psychological measures introduces potential response bias, social desirability bias, and reporter-specific limitations inherent to subjective assessment protocols.

4. **Implementation variability**: Heterogeneity in teacher training, instructional delivery fidelity, and adherence to module protocols across intervention settings may introduce outcome variability not attributable solely to the intervention.

5. **Mental health scope**: The study focuses specifically on anxiety, self-esteem, and general well-being. Clinical mental health disorders, behavioral pathology, and comprehensive psychological domains remain outside the study scope.

6. **Extraneous variables**: Environmental factors external to the school setting—including family dynamics, socioeconomic conditions, media exposure, and extracurricular activities—may influence mental health outcomes, limiting attributional inferences regarding intervention effects.

1.4 Delimitations

To maintain scientific rigor and operational feasibility, this study is deliberately delimited as follows:

1. The study targets school-aged children (10–14 years) enrolled in selected schools; findings may not apply to preschool, post-secondary, or clinical populations.

2. The intervention focuses exclusively on mindfulness-based PE; other mental health intervention modalities (cognitive-behavioral therapy, peer support programs, professional counseling) are excluded.

3. The intervention period is fixed at 8 weeks; long-term follow-up and sustained outcome tracking beyond the intervention phase are not included.

4. The study is conducted within specific regional and institutional contexts; results generalizability to geographically distinct or culturally different school systems requires cautious interpretation.

5. Psychological assessment focuses on self-esteem, anxiety, and well-being; comprehensive psychometric domains and physical fitness outcomes beyond intervention scope are not assessed.

6. Evaluation methodology emphasizes quantitative measures; extended observational studies and longitudinal tracking are excluded.

These delimitations ensure focused, feasible research design while yielding actionable insights for evidence-based educational practice.

2. Methodology

2.1 Research Design

A quasi-experimental pre-test/post-test control group design was employed to evaluate intervention effectiveness. This design permits comparison of pre-intervention and post-intervention psychological outcomes within and between experimental and control groups while permitting statistical control for baseline differences through covariance analysis.

2.2 Population and Sampling

Population: School-aged children (10–14 years) enrolled in selected schools.

Sample: A total of 60 participants (Mage = 11.93 years, SD = 1.44) were recruited through purposive sampling, stratified by grade level and gender balance. Sample division: experimental group (n = 30) and control group (n = 30).

Inclusion criteria:

- Current enrollment in selected schools
- Age range 10–14 years
- Written parental informed consent
- Student assent to participation

Exclusion criteria:

- Severe physical or psychiatric conditions precluding PE participation
- Pre-existing formal mindfulness or mental health intervention participation
- Absence of informed consent documentation

2.3 Intervention Design and Development

The mindfulness-based PE module was developed through systematic literature review, expert consultation, and adaptation of established mindfulness-based interventions in educational settings. The module encompasses four integrated components:

1. **Mindful warm-up protocols**: Structured body awareness exercises, progressive muscle relaxation, and controlled breathing techniques (diaphragmatic breathing, box breathing, 4-7-8 breathing).

2. **Mindfulness-integrated physical activity**: PE exercises delivered with explicit attention to movement quality, postural awareness, proprioceptive feedback, and present-moment attention.

3. **Structured mindfulness training**: Guided meditation, progressive relaxation techniques, visualization protocols, and body-scan exercises.

4. **Reflection and metacognitive processing**: Journaling exercises, guided group discussion, emotional processing, and self-awareness development.

Implementation parameters: 2–3 sessions weekly over 8 weeks, 40–50 minutes per session. The control group maintained standard PE curricula without specific mental health components.

2.4 Measurement Instruments

Self-Esteem Assessment: The Rosenberg Self-Esteem Scale (RSES)—a validated, 10-item unidimensional scale measuring global self-worth through 4-point Likert-scale responses ($\alpha > 0.77$ across populations).

Anxiety Assessment: The Spence Children's Anxiety Scale (SCAS)—a psychometrically sound 44-item instrument measuring anxiety symptomatology across multiple dimensions with demonstrated reliability ($\alpha = 0.92$) and criterion validity.

Psychological Well-Being Assessment: A validated mental wellness scale for school-aged populations, measuring general psychological well-being, life satisfaction, and emotional functioning.

PE Engagement Measurement: Attendance records, structured teacher observation checklists, and activity participation logs providing objective engagement metrics.

2.5 Data Collection Procedures

Pre-intervention assessment: Both groups completed baseline psychological assessments (RSES, SCAS, Mental Wellness Scale) and PE engagement documentation prior to intervention initiation.

Intervention implementation: The experimental group participated in the structured mindfulness-based PE module for 8 weeks. Weekly implementation logs documented attendance, fidelity metrics, and adherence indicators.

Post-intervention assessment: Following intervention completion, both groups completed identical assessment instruments.

Data management: All data were coded for confidentiality protection. Digital records were encrypted and stored on secured servers with restricted access. A master database integrated pre-test and post-test scores for statistical analysis.

2.6 Statistical Analysis

Descriptive statistics computed means, standard deviations, and distributional characteristics for all study variables.

Inferential analysis employed:

- Paired *t*-tests to evaluate pre/post changes within groups
- Independent samples *t*-tests comparing post-test scores between groups
- Analysis of covariance (ANCOVA) to examine group differences while controlling for baseline measurements
- Effect size calculations (Cohen's *d*, eta-squared) to determine practical significance

Significance threshold: $p < 0.05$ for statistical significance.

2.7 Ethical Considerations

The research protocol obtained institutional ethics committee approval prior to implementation. Written informed consent was obtained from parents/guardians; student assent was documented. Participation was voluntary with explicit withdrawal rights without penalty. Participant confidentiality was maintained through coded identification systems. All findings are reported in aggregate form precluding individual identification.

3. Results

3.1 Participant Characteristics and Baseline Equivalence

The final sample comprised 60 participants (experimental, $n = 30$; control, $n = 30$) with mean age 11.93 years (SD = 1.44). Gender distribution was balanced across both groups. Independent samples *t*-tests confirmed baseline equivalence across all psychological measures (Table 1).

3.2 Primary Outcome: Self-Esteem

Pre-intervention RSES scores demonstrated no significant between-group difference (experimental: M = 21.8, SD = 3.2; control: M = 22.1, SD = 3.0), $t(58) = 0.44$, $p > 0.05$. Post-intervention, the experimental group demonstrated significantly elevated self-esteem (M = 27.3, SD = 3.5) compared to controls (M = 22.5, SD = 3.1), $t(58) = 5.62$, $p < 0.001$, with a large effect size (Cohen's $d = 1.46$). Within-group analysis via paired *t*-tests revealed substantial self-esteem improvement in the experimental group ($t(29) = 8.75$, $p < 0.001$) but minimal change in controls ($t(29) = 0.74$, $p > 0.05$).

3.3 Secondary Outcome: Anxiety Reduction

SCAS scores at baseline were equivalent between groups (experimental: M = 28.4, SD = 4.1; control: M = 27.9, SD = 4.3), $t(58) = 0.52$, $p > 0.05$. Post-intervention, the experimental group exhibited significantly reduced anxiety (M = 19.2, SD = 3.8) relative to the control group (M = 27.5, SD = 4.0), $t(58) = 8.16$, $p < 0.001$, with a very large effect size (Cohen's $d = 2.02$). Paired *t*-test analysis showed substantial within-group anxiety reduction in the experimental condition ($t(29) = 12.62$, $p < 0.001$) versus minimal change in controls ($t(29) = 0.92$, $p > 0.05$).

3.4 Tertiary Outcome: Psychological Well-Being

Mental wellness scale scores increased substantially in the experimental group from pre-intervention (M = 45.2, SD = 5.4) to post-intervention (M = 54.0, SD = 5.1), representing a change of 8.8 points. The control group exhibited minimal change (pre: M = 46.1, SD = 5.0; post: M = 46.7, SD = 5.2). Between-group post-intervention comparison revealed significant superiority of the experimental condition ($t(58) = 6.72$, $p < 0.001$, Cohen's $d = 1.74$). Paired analysis demonstrated robust within-group improvement in the experimental condition ($t(29) = 8.35$, $p < 0.001$) with negligible control group changes ($t(29) = 0.63$, $p > 0.05$).

3.5 Physical Education Engagement

Post-intervention PE engagement rates were substantially higher in the experimental group (M = 95.3%, SD = 4.8) compared to controls (M = 72.5%, SD = 6.3), $t(58) = 15.48$, $p < 0.001$, with an extremely large effect size (Cohen's $d = 3.89$). This pattern suggests that mindfulness-based PE integration enhanced student motivation and participation.

3.6 ANCOVA Results: Controlling for Baseline Differences

Analysis of covariance controlling for pre-test scores confirmed statistically significant intervention effects across all outcome measures:

Outcome Variable	F(Group)	p-value	η^2
Self-Esteem	45.28	< 0.0001	0.44
Anxiety	52.16	< 0.0001	0.48
Well-Being	48.93	< 0.0001	0.46
PE Engagement	89.35	< 0.0001	0.61

Table 1: ANCOVA Results: Group Effects on Psychological Outcomes After Controlling for Baseline Measures

ANCOVA analysis revealed large effect sizes ($\eta^2 > 0.40$ for psychological outcomes), indicating that the mindfulness-based PE intervention explained substantial outcome variance independent of baseline differences.

4. Discussion

4.1 Interpretation of Findings

The present study systematically evaluated the efficacy of a mindfulness-based PE module for school-aged children. Results demonstrate statistically significant and practically meaningful improvements across self-esteem, anxiety symptomatology, psychological well-being, and PE engagement metrics.

Self-Esteem Enhancement: The substantial improvement in global self-worth (effect size = 1.46) aligns with existing literature demonstrating mindfulness-based intervention effects on adolescent self-perception (Işıkgöz, 2025). The mechanism likely involves heightened body awareness, acceptance-based approaches to self-judgment, and enhanced perceived physical competence through structured physical activity. This finding substantiates the hypothesis that mindfulness-integrated PE provides psychological benefits beyond traditional physically-focused curricula.

Anxiety Reduction: The marked anxiety reduction (effect size = 2.02, change = –9.2 points on SCAS) exceeds typical pharmacological intervention effect sizes and approaches outcomes observed in clinical cognitive-behavioral interventions. The intervention's integration of breathing techniques, progressive relaxation, and present-moment awareness likely activated parasympathetic nervous system functioning, thereby reducing physiological arousal and anxiety symptomatology. This outcome suggests mindfulness-PE as a feasible, scalable anxiety reduction strategy in school settings.

Psychological Well-Being Improvement: Global well-being enhancement (effect size = 1.74) indicates comprehensive psychological benefit beyond anxiety reduction. This likely reflects improved emotional regulation, enhanced stress-coping capacity, increased sense of agency, and developed psychological resilience through systematic mindfulness practice. The finding extends prior research suggesting mindfulness interventions' multidimensional psychological benefits.

PE Engagement Elevation: The dramatically increased engagement rates (95.3% vs. 72.5%, effect size = 3.89) suggest that mindfulness-PE integration enhances student motivation and participation beyond traditional curricula. Enhanced engagement may reflect increased perceived autonomy, reduced performance anxiety through acceptance-based frameworks, and improved mind-body connection facilitating flow states. Elevated engagement represents a critical outcome, as increased physical activity engagement contributes to lifelong health promotion.

4.2 Theoretical Alignment and Mechanisms

These findings align with theoretical models positing bidirectional mind-body relationships and integrated psychological-physical development. The intervention leverages several evidence-based mechanisms:

1. **Autonomic nervous system regulation**: Mindfulness practices activate parasympathetic functioning, reducing physiological stress responses.
2. **Emotional regulation**: Present-moment awareness and acceptance-based approaches develop metacognitive capacity for emotion management.
3. **Self-efficacy enhancement**: Structured physical accomplishment within supportive mindfulness context increases perceived competence.
4. **Flow facilitation**: Present-moment attention during physical activity increases intrinsic motivation and engagement.

4.3 Contextual Significance and Educational Implications

These results support policy-level curricular reform integrating mental health education into PE. Given escalating adolescent mental health challenges and limited access to specialized mental health services in many school systems, PE-embedded mindfulness provides a scalable, universally accessible intervention framework. The integration addresses existing curricular fragmentation where physical and mental health education remain institutionally separated despite documented interconnections.

4.4 Comparison with Existing Literature

The effect sizes observed in this study substantially exceed those reported in prior physical activity-only or mindfulness-only interventions, suggesting additive or synergistic benefits of integration (Johnson et al., 2023; Khanbeiki, 2024). The PE engagement finding aligns with self-determination theory predictions that autonomy-supportive, psychologically-informed PE pedagogy increases intrinsic motivation.

4.5 Limitations and Delimitations in Context

While this study demonstrates substantial intervention effectiveness, several limitations warrant consideration. The 8-week intervention duration may not reflect long-term sustainment of psychological benefits. The school-based sample may not generalize to clinical populations or geographically/culturally distinct contexts. Self-report measurement introduces response bias, though validated instruments minimize this limitation. Implementation fidelity variability across instructors represents an uncontrolled confound. These limitations suggest directions for future research including extended follow-up designs, multi-site investigations, and longitudinal outcome tracking.

4.6 Clinical and Educational Recommendations

Based on empirical findings, we recommend:

1. **Systemic curricular integration** of mindfulness-based components into school PE programs, particularly for grades 5–8 where mental health challenges emergently manifest.
2. **Teacher professional development** emphasizing mindfulness pedagogy, mental health literacy, and trauma-informed instructional approaches.
3. **Institutional collaboration** between PE teachers, school counselors, and mental health professionals to optimize implementation and ensure evidence-based practice fidelity.

4. **Longitudinal outcome monitoring** of student well-being across multiple psychological domains to assess intervention sustainability.

5. **Expansion research** examining intervention efficacy across diverse populations, age groups, and cultural contexts.

5. Conclusion

This research empirically validates the effectiveness of a systematically designed, mindfulness-based PE module for enhancing school-aged children's psychological well-being. The intervention significantly improved self-esteem, reduced anxiety symptomatology, enhanced global well-being, and increased PE participation—outcomes achieved within a scalable school-based delivery framework. These findings support a reconceptualization of PE as a vehicle for comprehensive health promotion addressing both physical and psychological developmental needs. Given escalating adolescent mental health challenges and PE's universal school accessibility, mindfulness-PE integration represents a evidence-supported, practically feasible approach for promoting holistic student development. Future research should examine long-term outcomes, dissemination strategies, and implementation across diverse educational contexts.

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Appendix: Detailed Statistical Tables

Variable	Experimental Pre	Experimental Post	Control Pre	Control Post
Self-Esteem	21.8 ± 3.2	27.3 ± 3.5	22.1 ± 3.0	22.5 ± 3.1
Anxiety	28.4 ± 4.1	19.2 ± 3.8	27.9 ± 4.3	27.5 ± 4.0
Well-Being	45.2 ± 5.4	54.0 ± 5.1	46.1 ± 5.0	46.7 ± 5.2
PE Engagement (%)	—	95.3 ± 4.8	—	72.5 ± 6.3

Table 2: Descriptive Statistics: Pre-Test and Post-Test Measurements Across Study Groups