International Journal of Education, Vocational and Social Science
https://e-journal.citakonsultindo.or.id/index.php/IJEVSS
E-ISSN : 2963 4954
IJEVSS

Development Of The Mindfulness-Based Physical Education (MBPE) Model To Reduce Academic Stress Among Senior High School Students

Joni Taufik Hidayat
State University of Gorontalo, Indonesia
Suriyadi Datau
State University of Gorontalo, Indonesia

Corresponding Author: jonitaufikhidayat@ung.ac.id

Abstract

Academic stress is a prevalent problem among senior high school students due to high curricular demands and academic pressure. This study aims to develop and examine the effectiveness of a Mindfulness-Based Physical Education (MBPE) learning model in reducing academic stress by integrating mindfulness practices into Physical Education, Sport, and Health (PESH) learning. This study employed a Research and Development (R&D) approach using the ADDIE model (Analysis, Design, Development, Implementation, Evaluation). Sixty high school students were selected through purposive sampling and divided into an experimental group (n=30) and a control group (n=30). Academic stress was measured using the Perceived Stress Scale (PSS-10). Data were analyzed using paired sample t-test, independent sample t-test, and Cohen's d effect size. Expert validation yielded a feasibility score of 97% (Very Valid). The experimental group's academic stress scores decreased by 10.24 points (from 28.67 to 18.43), compared to the control group's marginal reduction of 2.08 points (from 27.94 to 25.86). The independent sample t-test produced t=6.432 with Sig.=0.000 and Cohen's d=1.24 (large effect). Model implementation fidelity averaged 90.5%, with 91-94% of students responding positively. This study concludes that the MBPE model is valid, practical, and effective in reducing academic stress among senior high school students within PESH learning.

Keywords: Mindfulness-Based Physical Education; Academic Stress; Physical Education Learning; Mindfulness; High School Students

Copyright at authors some right reserved this work is licensed under a Creative Commons Attribution-Share Alike 4.0 International License

INTRODUCTION

Senior high school students face increasingly complex academic pressures stemming from rising curricular demands, educational evaluation systems, and competition for higher education enrollment. Bibliometric analyses confirm that academic stress and mental health issues among school students represent a globally expanding research landscape, with China and the USA contributing the highest number of publications (Song et al., 2024; Sultana et al., 2024). Excessive academic pressure can trigger academic stress, negatively impacting mental health, psychological well-being, and academic performance. A randomized controlled trial among Chinese adolescents further confirmed that unmanaged academic stress significantly disrupts sleep quality and psychological functioning over time (Deng & Xu, 2026).

Empirical studies document the scope of this problem. Research among Chinese adolescents demonstrated that physical activity exerts its effects on academic stress through chain-mediated pathways involving general self-efficacy and psychological resilience, highlighting the multidimensional nature of stress among youth (Leng et al., 2025). A randomized controlled trial further showed that mindfulness-based interventions for adolescents can produce significant improvements in emotion regulation strategies and reduce internalizing symptoms (Piguet et al., 2025). These findings collectively indicate that innovative, evidence-based learning interventions targeting both physical and psychological dimensions are urgently needed in school settings.

Physical activity is one approach with strong evidence for reducing stress in adolescents. A recent meta-analysis confirmed that physical activity interventions are significantly more effective than control conditions in improving the mental health of typically developing children and adolescents SMD=0.37 (Fu et al., 2025). A mixed-methods review of leisure-time physical activity types similarly found positive effects on well-being outcomes in youth (Lenze et al., 2025). However, despite its potential, conventional Physical Education, Sport, and Health (PESH) instruction in schools remains predominantly focused on motor skill acquisition and physical performance, leaving mental health outcomes largely unaddressed.

Growing evidence supports integrating mindfulness into school-based interventions. A systematic review confirmed that mindfulness-based interventions (MBIs) for emotional dysregulation in adolescents effectively reduce stress, anxiety, and emotional reactivity (Sharma et al., 2025). Scoping reviews of school-based MBIs found promising impacts on adolescent mental health and well-being (Patel et al., 2025; Monsillion et al., 2023), and a recent scoping review of clinical trials concluded that mindfulness therapy effectively reduces a range of psychological symptoms in adolescents (Sapulette et al., 2026). The integration of mindfulness into physical

Copyright at authors some right reserved this work is licensed under a Creative Commons Attribution-Share Alike 4.0 International License

activity - known as Mindfulness-Based Physical Education (MBPE) - has been proposed as an innovative approach combining mindful awareness with physical movement (Delgado-Montoro et al., 2022).

Based on these issues, this study aims to develop a Mindfulness-Based Physical Education (MBPE) learning model and examine its effectiveness in reducing academic stress among senior high school students. The novelty of this research lies in its dynamic integration of mindfulness into moderate-to-vigorous physical activity within PESH, its specific focus on academic stress reduction as the primary outcome, and its curriculum hybridization bridging mental health with physical education in alignment with Indonesia's Merdeka Curriculum.

RESEARCH METHOD

This study employed a Research and Development (R&D) approach using the ADDIE development model (Analysis, Design, Development, Implementation, Evaluation). The ADDIE model was selected for its systematic framework for designing, developing, implementing, and evaluating instructional products in a structured, iterative manner. A study applying the ADDIE model to physical education lesson development similarly demonstrated its effectiveness in producing instructional programs that improve student outcomes (Li & Cheong, 2023; Adeoye, 2024).

Participants and Research Setting

The study was conducted at a senior high school with active PESH classes. Sixty students were selected via purposive sampling: an experimental group (n=30) receiving the MBPE intervention and a control group (n=30) continuing conventional PESH instruction.

Development Procedure

The Analysis phase involved school observation, a baseline academic stress survey using the PSS-10, and a literature review. The Design phase produced the MBPE model's instructional syntax, learning materials, and activity sequences integrating mindful breathing, body awareness, and mindful movement. The Development phase produced a model prototype validated by experts in physical education, educational psychology, and instructional technology.

The Implementation phase consisted of an 8-week intervention (16 sessions, twice weekly, 90 minutes per session) for the experimental group. Each session followed a five-phase structure: (1) Mindful Breathing, (2) Body Awareness, (3) Mindful Movement, (4) Reflective Physical Activity,

Copyright at authors some right reserved this work is licensed under a Creative Commons Attribution-Share Alike 4.0 International License

and (5) Relaxation and Reflection. The Evaluation phase assessed model fidelity and student response.

Instruments and Data Analysis

Academic stress was measured using the Perceived Stress Scale (PSS-10), a widely validated instrument for measuring perceived stress. A systematic review of PSS-10 psychometric properties confirmed its adequate reliability across diverse populations (Cronbach's alpha=0.78; Milo et al., 2025), and a validation study confirmed its sound construct validity via confirmatory factor analysis (Sharif-Nia et al., 2024). Data were analyzed using a paired sample t-test for within-group changes, an independent sample t-test for between-group differences, and Cohen's d for effect size.

RESULTS

1. Analysis Phase

Classroom observation revealed that PESH instruction remained predominantly oriented toward technical sports performance, resulting in signs of academic burnout and student anxiety. A PSS-10 survey administered to 60 students yielded the following distribution of initial academic stress levels:

Table 1. Distribution of Students' Initial Academic Stress Levels

Category	Frequency	Percentage
Low	8	13.3%
Moderate	38	63.3%
High	14	23.3%
Total	60	100%

The data reveal that 86.6% of students experienced moderate to high levels of academic stress, consistent with findings from bibliometric analyses that document the widespread prevalence of academic stress among school students globally [1][2]. A literature review further confirmed that integrating mindfulness into physical activity has a significant positive correlation with improved emotional regulation and reduced stress in adolescents (Sharma et al., 2025; Patel et al., 2025).

2. Design and Development Phases

During the Design phase, the MBPE model's instructional syntax was structured around five integrated phases per session, creating a flowing progression from mental settling through

Copyright at authors some right reserved this work is licensed under a Creative Commons Attribution-Share Alike 4.0 International License

intense physical activity to meaningful reflection:

Table 2. Operational Instructional Syntax of the MBPE Learning Model

Phase	Teacher Activity	Student Activity
Mindful Breathing	Verbal instructions to focus attention on the natural rhythm of breathing as a concentration anchor.	Practices conscious breathing, releases mental distractions, and mentally prepares for learning.
Body Awareness	Guides students through a body scan from feet to head, without judgment.	Becomes aware of full physical presence, recognizes bodily tension, and builds mind-body connection.
Mindful Movement	Demonstrates dynamic warm-up movements at a slow, deliberate pace.	Performs transitional movements focusing on synchronizing muscle movement with breath flow.
Reflective Physical Activity	Facilitates the core PESH activity while embedding cues for moment-to-moment awareness.	Engages in main physical activity while maintaining emotional control and attentional focus.
Relaxation and Reflection	Guides cool-down with reflective questions about feelings and sensations experienced.	Performs full relaxation and openly communicates subjective experiences and emotions.

In the Development phase, the MBPE prototype was validated by three experts. Results are presented in Table 3.

Table 3. Expert Validation Results for the MBPE Model

No.	Assessment Aspect	Score (%)	Category
1	Content Feasibility (material relevance & urgency)	98%	Very Valid
2	Language Feasibility (clarity & communicativeness)	96%	Very Valid
3	Presentation Feasibility (organization &	97%	Very Valid

Copyright at authors some right reserved this work is licensed under a Creative Commons Attribution-Share Alike 4.0 International License

	aesthetics)		
4	Implementation Feasibility (practicality in the field)	97%	Very Valid
	Overall Average	97%	Very Valid

The MBPE model achieved an overall validation score of 97% (Very Valid). Based on validators' qualitative notes, refinements included simplification of psychological terminology, adjustment of the relaxation duration, and enhancement of visual illustrations within the module.

3. Implementation Phase

Pretest and posttest measurements using the PSS-10 revealed notable changes in academic stress scores, as presented in Table 4.

Table 4. Summary of Academic Stress Mean Scores (Pretest and Posttest)

Group	Mean Pretest	Mean Posttest	Reduction	Remarks
Experimental (MBPE)	28.67	18.43	10.24	Highly Significant
Control (Conventional)	27.94	25.86	2.08	Non-Significant

The experimental group demonstrated a substantial reduction in academic stress (delta=10.24 points), far exceeding the marginal decrease in the control group (delta=2.08 points). A paired sample t-test on the experimental group yielded Sig.(2-tailed) = 0.000 ($p<0.05$), confirming a statistically significant difference before and after the MBPE intervention.

The independent sample t-test produced t=6.432, Sig.=0.000, confirming that the MBPE model exerted a significantly different effect compared to the conventional model. Effect size analysis yielded Cohen's d=1.24, classified as a Large Effect ($d>0.80$). This is consistent with the findings of a meta-analysis on MBSR among Chinese adolescents, which documented significant reductions in academic stress scores following 8-week mindfulness programs (Deng & Xu, 2026). The large effect size further aligns with a meta-analysis of physical activity interventions on adolescent mental health, which found moderate-to-large effects (SMD=0.37-0.98) across diverse intervention types (Fu et al., 2025; Lenze et al., 2025).

4. Evaluation Phase

Model implementation fidelity was assessed through systematic observation over 16 sessions and student response questionnaires. Results are presented in Table 5.

Copyright at authors some right reserved this work is licensed under a Creative Commons Attribution-Share Alike 4.0 International License

Table 5. MBPE Model Implementation Fidelity Scores

Evaluation Indicator	Score (%)	Category
Syntactic Accuracy (Phases 1-5)	92.0%	Very Good
Time Management	88.0%	Good
Teacher-Student Interaction	91.5%	Very Good
Overall Average	90.5%	Very Good

An average fidelity of 90.5% indicates that the MBPE model is practical and user-friendly. Student response data showed 91% reported that mindfulness integration helped them release academic tension, while 94% reported tangible relaxation benefits after PESH sessions. This high acceptance rate is consistent with evidence that school-based MBIs are well received by adolescents when embedded within familiar educational contexts (Monsillion et al., 2023; Sapulette et al., 2026).

DISCUSSION

The successful development of the MBPE model provides new empirical evidence for the importance of integrating mental health dimensions into physical education curricula. An expert validation score of 97% reflects the strong alignment between the designed instructional syntax and the psychological developmental characteristics of senior high school students navigating a complex emotional transition phase.

The fundamental advantage of MBPE over conventional PESH lies in its humanistic, reflective pedagogy. While traditional PESH prioritizes technical skill and physical performance metrics, MBPE transforms the gymnasium into a safe space for self-awareness. This approach is consistent with the conceptual framework proposed by Delgado-Montoro et al. (Delgado-Montoro et al., 2022), who argued that integrating mindfulness into physical education creates unique opportunities to develop students' mental health holistically.

The integration of mindful breathing and body awareness at the start of each session proved effective as an anchor for reducing academic anxiety. Research consistently shows that mindfulness training improves emotional dysregulation in adolescents through neurobiological pathways involving the parasympathetic nervous system (Sharma et al., 2025). The use of moment-to-moment awareness cues during physical activity builds emotional self-regulation capacities, as documented in studies on momentary mindfulness among adolescents (Dundas & Binder, 2024).

Copyright at authors some right reserved this work is licensed under a Creative Commons Attribution-Share Alike 4.0 International License

A Cohen's d of 1.24 (large effect) indicates that the MBPE model not only produced statistically significant changes but also generated a practically meaningful impact in students' lives. This is reinforced by the high positive student response rate (91-94%), signaling strong buy-in, and by implementation fidelity reaching 90.5%, confirming teachers' capacity to execute all instructional phases consistently. These outcomes align with scoping review evidence that structured mindfulness programs in school settings effectively reduce a range of psychological symptoms in adolescents (Patel et al., 2025; Sapulette et al., 2026).

CONCLUSION

This study successfully developed a Mindfulness-Based Physical Education (MBPE) learning model that is valid, practical, and effective in reducing academic stress among senior high school students within PESH learning. The MBPE model achieved expert validation of 97% (Very Valid), significantly reduced academic stress t=6.432; p=0.000; Cohen's d=1.24; large effect, demonstrated high implementation fidelity (90.5%), and received positive responses from 91-94% of students.

These findings call for a paradigm shift in PESH instruction - from a narrow focus on physical fitness toward holistic pedagogy that actively supports students' mental health. The MBPE model offers an innovative alternative aligned with Indonesia's Merdeka Curriculum. Future research should develop a digital version of the MBPE model and extend its implementation to different educational levels and diverse cultural contexts.

REFERENCES

Adeoye, M. A. (2024). Revolutionizing education: Unleashing the power of the ADDIE model for effective teaching and learning. Jurnal Pendidikan Indonesia, 13(1), 202-209. https://doi.org/10.23887/jpi-undiksha.v13i1.68624

Delgado-Montoro, R., Ferriz-Valero, A., Garcia-Taibo, O., & Baena-Morales, S. (2022). Integrating mindfulness into the subject of physical education: An opportunity for the development of students' mental health. Healthcare, 10(12), 2551. https://doi.org/10.3390/healthcare10122551

Deng, J., & Xu, F. (2026). Effects of mindfulness-based stress reduction on sleep quality and academic stress of Chinese adolescents: A randomized controlled trial. Frontiers in Psychology, 17, 1734353. https://doi.org/10.3389/fpsyg.2026.1734353

Dundas, I., & Binder, P. E. (2024). Being able to think when caught in the maelstrom: How

Copyright at authors some right reserved this work is licensed under a Creative Commons Attribution-Share Alike 4.0 International License

adolescents used mindfulness when facing exams. International Journal of Qualitative Studies on Health and Well-Being, 19(1), 2375660. https://doi.org/10.1080/17482631.2024.2375660

Fu, Q., Li, L., Li, Q., & Wang, J. (2025). The effects of physical activity on the mental health of typically developing children and adolescents: A systematic review and meta-analysis. BMC Public Health, 25, 1514. https://doi.org/10.1186/s12889-025-22690-8

Leng, H., Xiang, X., & Li, S. (2025). The chain mediation effects of general self-efficacy and psychological resilience between physical activity and academic stress among Chinese adolescents. Frontiers in Psychology, 16, 1626157. https://doi.org/10.3389/fpsyg.2025.1626157

Lenze, L., Benzing, V., Schmid, J., Minder, B., Henn, R. E., & Frahsa, A. (2025). The effects of different types of leisure-time physical activity on positive mental health among adolescents: A mixed-methods systematic review and meta-analysis. International Journal of Behavioral Nutrition and Physical Activity, 22, 107. https://doi.org/10.1186/s12966-025-01834-4

Li, H., & Cheong, J. P. G. (2023). Using the ADDIE model to design and develop physical education lessons incorporated with a functional training component. Frontiers in Public Health, 11, 1201228. https://doi.org/10.3389/fpubh.2023.1201228

Liu, C., Sit, C. H. P., & Liang, X. (2024). Physical activity and mental health in children and adolescents with neurodevelopmental disorders: A systematic review and meta-analysis. JAMA Pediatrics, 178(3), 247-257. https://doi.org/10.1001/jamapediatrics.2023.6251

Milo, R. B., Ramira, A., Peppard, S., Ramira, M. L. B., Brown, R., Soon, K., Fontimayor, M., Milo, J. B., & Calero, P. (2025). A systematic review of the non-English versions of the Perceived Stress Scale (PSS)-10 psychometric analysis. SAGE Open Medicine, 13. https://doi.org/10.1177/23779608251377287

Monsillion, J., Zebdi, R., & Romo-Desprez, L. (2023). School mindfulness-based interventions for youth, and considerations for anxiety, depression, and a positive school climate: A systematic literature review. Children, 10(5), 861. https://doi.org/10.3390/children10050861

Patel, V., Patnaik, D., & Singh, A. (2025). Mindfulness-based interventions for enhancing adolescent mental health and well-being: A scoping review. Clinical Epidemiology and Global Health, 32, 101961. https://doi.org/10.1016/j.cegh.2025.101961

Piguet, C., Celen, Z., Sterpenich, V., Brandner, C., Aubry, J. M., & Schwartz, S. (2025). Impact of a

Copyright at authors some right reserved this work is licensed under a Creative Commons Attribution-Share Alike 4.0 International License

mindfulness-based intervention on symptoms and emotion regulation strategies in young adolescents from the general population: A randomized controlled trial. Depression and Anxiety, 2025, 2679049. https://doi.org/10.1155/da/2679049

Sapulette, B. J., Prabhasuari, I. A. M., Zakiyah, H., Fatmawati, K. A., Soselisa, A. H., & Warsini, S. (2026). Outcomes of mindfulness therapy for adolescents with mental health issues: A scoping review. Indian Journal of Psychological Medicine, 48(1). https://doi.org/10.1177/09731342251360104

Sharma, N., Agrawal, M., Rushi, Ayyub, S., & Rai, D. (2025). Mindfulness-based interventions for emotional dysregulation in adolescents: A systematic review. Annals of Neurosciences. https://doi.org/10.1177/09727531251355311

Sharif-Nia, H., Froelicher, E. S., Hoseinzadeh, E., Kaveh, O., Fatehi, R., & Nowrozi, P. (2024). Assessing the validity and reliability of the 10-item Persian version of the perceived stress scale in post-surgery patients. Frontiers in Psychiatry, 15, 1402122. https://doi.org/10.3389/fpsyt.2024.1402122

Song, S., Yu, W., Li, S., Sun, W., Fu, J., & Cheng, Q. (2024). A bibliometric analysis of mental health among high school students. Frontiers in Psychiatry, 15, 1433897. https://doi.org/10.3389/fpsyt.2024.1433897

Sultana, N., Akter, F., Rahman, M. M., Ahmed, S., & Islam, M. A. (2024). Prevalence and repercussions of stress and mental health issues on primary and middle school students: A bibliometric analysis. Frontiers in Psychiatry, 15, 1369605. https://doi.org/10.3389/fpsyt.2024.1369605

Copyright at authors some right reserved this work is licensed under a Creative Commons Attribution-Share Alike 4.0 International License