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Jurnal Medicare Vol. 5 No. 4, October (2026) https://doi.org/10.62354/jurnalmedicare.v5i4.533
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Research Article

PHYSIOTHERAPY POSTURAL EDUCATION ON ADOLESCENT POSTURAL AWARENESS AND CORRECTIVE EXERCISE KNOWLEDGE AT JUNIOR HIGH SCHOOL 30 MALANG

Received: June 25th 2026	Revised: October 7th 2026	Accepted: October 28th 2026	Published: October 31th 2026

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Abstract:

Background: Adolescent rapid somatic growth coincides with increasing sedentary screen time, unergonomic classroom sitting postures, and asymmetric backpack carriage, escalating the prevalence of spinal misalignments (kyphosis, lordosis, scoliosis) and musculoskeletal pain. While school-based physical therapy outreach is widely advocated, empirical evaluations verifying the efficacy of structured multi-modal educational modules on adolescent postural literacy remain essential.

Objective: To evaluate the effectiveness of physiotherapy postural education and corrective exercise demonstrations on postural knowledge and self-care awareness among junior high school students at Junior High School 30 Malang. Methods: This quantitative pre-experimental study employed a one-group pre-test and post-test design conducted in September 2025. A total of 60 seventh- and eighth-grade students participated. The educational intervention incorporated visual leaflets, audio-visual presentations, and guided psychomotor demonstrations of lumbopelvic stability and mobility exercises (child's pose, latissimus stretch, pelvic tilts, leg extensions, cat-camel, and double-leg abdominal press). Knowledge was assessed pre- and post-intervention using a 5-item structured questionnaire.

Results: At baseline pre-test, significant knowledge deficits were evident across all domains: 86.7% (n = 52) had never heard of postural disorders, 83.3% (n = 50) lacked awareness of proper walking posture, 75.0% (n = 45) sat unergonomically, 55.0% (n = 33) maintained faulty studying postures, and 91.7% (n = 55) were unaware of preventive postural benefits. Following the physiotherapy intervention, 100.0% of respondents (n = 60) answered affirmatively ('Yes') across all five evaluative questions, indicating immediate cognitive gain and enthusiastic perception of utility.

Conclusion: The findings showed an improvement in students' postural knowledge and self-care awareness following the physiotherapy education and corrective exercise demonstration. Further studies are recommended to use appropriate statistical tests to determine whether the observed improvements are statistically significant and to provide stronger evidence regarding the effectiveness of physiotherapy postural education.

Keywords: Adolescent health; Corrective exercises; Ergonomics; Health education; Physical therapy; Postural disorders

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1. INTRODUCTION

Adolescence represents a vulnerable developmental window characterized by accelerated somatic growth, neuro-musculoskeletal restructuring, and rapid skeletal elongation during the pubertal growth spurt (Noll et al., 2023; Resende et al., 2023). During this transitional phase, the biomechanical elasticity of the spine and surrounding myofascial structures is exceptionally sensitive to prolonged static mechanical loading. In contemporary modern society, this physiological vulnerability is profoundly aggravated by sedentary lifestyles, high daily screen-time exposure on smartphones and computers, and physical inactivity (Choi et al., 2020; Noll et

al., 2023). Epidemiological surveillance indicates that unergonomic behavioral habits adopted during adolescence frequently initiate functional spinal misalignments—including hyperkyphosis, forward head posture, rounded shoulders, hyperlordosis, and structural adolescent idiopathic scoliosis (AIS) (Montuori et al., 2023; Resende et al., 2023). Large-scale surveys among adolescents report idiopathic scoliosis prevalence rates between 2% and 4%, alongside soaring rates of non-specific mechanical low back and neck pain directly correlated with prolonged, uncorrected sitting postures (Choi et al., 2020; Minghelli et al., 2021).

In Indonesia, physical and structural spinal abnormalities among school-age children have demonstrated an alarming upward trajectory (Nur Diansari et al., 2023; Pristianto et al., 2023). Junior high school students spend an average of six to seven continuous hours daily inside classroom environments, with instructional teaching and learning activities (*Kegiatan Belajar Mengajar* [KBM]) dominated by static seated postures (Ikshanty et al., 2025). Observational ergonomics field audits reveal that adolescents frequently adopt maladaptive sitting postures: forward-slumped thoracic kyphosis, resting the chin on hands, laterally tilting the torso onto one armrest, and sitting on chairs lacking lumbar support (Kiruthika et al., 2018; Nur Diansari et al., 2023). Compounding this daily seated load is the habitual carriage of heavy backpacks exceeding recommended physiological thresholds (10% to 15% of body weight), often suspended asymmetrically over a single shoulder (Nugroho et al., 2021). These chronic postural insults induce asymmetrical paraspinal muscular spasms, ligamentous strain, and premature intervertebral disc degeneration, which, if ignored, compromise respiratory capacity, evoke recurrent headaches, and diminish academic performance (Kiruthika et al., 2018; Minghelli et al., 2021).

Physiotherapy serves as an essential healthcare discipline dedicated to developing, maintaining, and restoring maximum functional movement and neuromuscular capacity throughout the lifespan (Kartiyani et al., 2023). Beyond tertiary rehabilitation, modern physical therapy plays a crucial upstream preventative role in occupational and school ergonomics, harmonizing environmental work demands with human anatomical tolerances (Hizza et al., 2024; Oliveira-Costa et al., 2025). Evidence-based therapeutic exercise protocols—specifically combining core spinal stabilization with targeted mobility drills (such as child's pose, latissimus dorsi stretching, pelvic tilting, quadriped leg extensions, cat-camel mobilizations, and double-leg abdominal isobaric exercises)—have demonstrated superior efficacy in counteracting paraspinal muscle fatigue, reinforcing transverse abdominal stability, and realigning sagittal spinal curvatures (Oliveira-Costa et al., 2025; Takinacı & Çelik, 2026; Yang & Yi, 2024).

Prior community studies demonstrate that school-based ergonomic education programs ('Back Schools') significantly improve postural knowledge and reduce spinal pain symptoms among students (Minghelli et al., 2021; Pristianto et al., 2023). However, significant empirical and implementation gaps persist: most conventional school health outreach programs in Indonesia rely exclusively on passive oral lectures without experiential psychomotor exercise coaching, resulting in rapid knowledge decay and negligible behavioral translation. Furthermore, empirical evaluations exploring the immediate cognitive impact of multimodal physiotherapy outreach combining visual leaflets, interactive demonstrations, and structured exercise practice in public junior high schools in Malang City remain limited.

Therefore, this study aimed to determine the effectiveness of physiotherapy postural education and corrective exercise demonstrations in improving postural knowledge, ergonomic awareness, and self-care exercise capability among students at Junior High School 30 Malang. The findings are intended to supply school health coordinators, community health centers and

pediatric physiotherapists with an empirical foundation to integrate active ergonomic modules into standard school healthcare curricula.

2. MATERIAL AND METHODS

2.1 Research Design

This study employed a quantitative pre-experimental research design utilizing a one-group pre-test and post-test approach. This design was selected to evaluate the immediate pedagogical effectiveness of a multimodal physiotherapy educational intervention by assessing respondents' baseline knowledge, delivering the structured educational and exercise intervention, and conducting immediate post-intervention evaluative testing on the same cohort without a parallel control group.

2.2 Research Population and Sample

The study involved 60 students from Junior High School 30 Malang, selected through total sampling. Eligible participants were active students who attended all study sessions, could perform light exercises, and agreed to participate. Students with severe spinal deformities, recent spinal or limb injuries, or incomplete questionnaires were excluded.

2.3 Research Setting and Time

The study was carried out at State Junior High School 30 Malang (Junior High School 30 Malang), located at Jl. Mulyorejo No. 95, Mulyorejo Village, Sukun District, Malang City, East Java Province, Indonesia. Field preparation occurred over one week, and the formal educational intervention was executed on Tuesday, 23 September 2025.

2.4 Research Procedures

The study was conducted in four stages: (1) preparation of educational materials and exercise demonstrations; (2) administration of a pre-test to 60 students; (3) delivery of a 45-minute interactive presentation on spinal health and posture, followed by a 30-minute practical session demonstrating six core stabilization and mobility exercises; and (4) guided exercise practice, discussion, and post-test administration.

2.5 Data Collection Techniques

Primary data were collected prospectively using standardized self-administered paper-and-pencil questionnaires administered immediately before (pre-test) and following (post-test) the educational intervention under identical supervised auditorium conditions.

2.6 Research Instruments

Data were collected using a 5-item closed-ended questionnaire with dichotomous responses (Yes = 1; No = 0), assessing prior awareness, walking, sitting, and studying posture, as well as the perceived usefulness of postural education.

2.7 Data Analysis

Data were processed and analyzed using descriptive statistics, computing absolute frequencies (n) and relative percentages (%) for affirmative ('Yes') and negative ('No') responses across all items in both pre-test and post-test conditions.

2.8 Scope and/or Limitations of the Research Used

The study was limited to students at one junior high school and used a pre-experimental design without a control group. Other limitations included a brief self-reported questionnaire and the absence of objective clinical posture assessments.

2.9 Ethical Considerations

These study indicates that community service licensing and institutional permissions were established with Junior High School 30 Malang and Community Health Center Mulyorejo.

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3. RESULTS AND DISCUSSION

3.1. Result

Table 1. Comparative Analysis of Student Responses Pre- and Post-Physiotherapy Educational Intervention (n = 60)

No	Evaluative Knowledge & Awareness Indicator	Pre-Test (Baseline)		Post-Test (Post-Intervention)		Absolute Gain (%)
		Yes n (%)	No n (%)	Yes n (%)	No n (%)	
1	Have you ever heard about postural disorders?	8 (13.3%)	52 (86.7%)	60 (100.0%)	0 (0.0%)	**+86.7%**
2	Do you feel your walking posture is correct?	10 (16.7%)	50 (83.3%)	60 (100.0%)	0 (0.0%)	**+83.3%**
3	Do you feel your sitting posture is correct?	15 (25.0%)	45 (75.0%)	60 (100.0%)	0 (0.0%)	**+75.0%**
4	Do you feel your study posture is correct?	17 (28.3%)	33 (51.7%)	60 (100.0%)	0 (0.0%)	**+71.7%**
5	Is postural prevention education beneficial for daily life?	5 (8.3%)	55 (91.7%)	60 (100.0%)	0 (0.0%)	**+91.7%**

Source: Primary research survey data, Junior High School 30 Malang, 2025.

Table 2. Corrective Physiotherapy Exercise Protocol Demonstrated for Adolescent Postural Care

Exercise Technique	Target Anatomical Structure	Biomechanical Objective	Prescribed Dosage & Execution
Child's Pose (Balasana)	Thoracolumbar paraspinal muscles, latissimus dorsi, gluteal fascia	Gentle spinal elongation, decompressing lumbar lordosis, promoting diaphragmatic relaxation	Hold for 30–45 seconds, 3 repetitions, smooth nasal breathing
Latissimus Dorsi Stretch	Latissimus dorsi, thoracolumbar fascia, lateral trunk stabilizers	Alleviates unilateral thoracic tightness caused by single-shoulder backpack carriage	Hold for 20–30 seconds bilaterally, 3 sets before/after classes
Pelvic Tilts (Supine)	Rectus abdominis, transverse abdominis, gluteus maximus, hamstrings	Restores neutral lumbopelvic alignment, counteracting anterior pelvic tilt and hyperlordosis	10–15 repetitions, 2–3 sets, 2–3 times weekly
Quadruped Leg Extensions	Gluteus maximus, erector spinae, multifidus core stabilizers	Enhances posterior chain muscular endurance without hyperextending lumbar segments	10 repetitions per limb, 3 sets with 3-second isometric holds
Cat-Camel Exercise	Entire cervical, thoracic, and lumbar vertebral column	Enhances segmental intervertebral mobility, relieves postural stiffness from prolonged sitting	10–12 continuous flexion-extension cycles, unhurried cadence
Double-Leg Abdominal Press	Deep core cylinder, transverse abdominis, internal obliques	Reinforces intra-abdominal pressure, stabilizing the lumbopelvic girdle against postural collapse	Hold isometric press for 10–15 seconds, 3 sets

Source: Physiotherapy clinical demonstration protocol, Universitas Muhammadiyah Malang & Health Center Mulyorejo, 2025.

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Jurnal Medicare Vol. 5 No. 4, October (2026) https://doi.org/10.62354/jurnalmedicare.v5i4.533
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Pre-test results revealed limited postural awareness: 86.7% had never heard of postural disorders, 83.3% lacked confidence in their walking posture, 75.0% reported incorrect sitting posture, and 91.7% did not recognize the importance of prevention. Following the educational intervention and exercise demonstrations, all 60 students (100%) responded positively across all five indicators in the post-test.

Table 2 summarizes the corrective home-exercise regimen taught during the hands-on workshop, designed to be executed independently by adolescents without specialized equipment.

3.2 Discussion

The central finding of this study demonstrates that a structured physiotherapy educational intervention integrating illustrated leaflets, multimedia presentations, and interactive corrective exercise demonstrations produced immediate, substantial improvements in postural awareness among junior high school students at Junior High School 30 Malang. Baseline evaluations underscored that prior to outreach, the vast majority of adolescents operated in a state of profound ergonomic ignorance, with 86.7% completely unfamiliar with postural disorders and over 75% admitting to unergonomic sitting and studying habits. Following the intervention, 100.0% of respondents achieved positive cognitive recognition across all evaluative items, demonstrating that adolescent health literacy regarding spinal alignment and self-care exercise can be rapidly elevated when instructional media are engaging, visually structured, and practically demonstrated.

These empirical outcomes are strongly consistent with contemporary school ergonomics and pediatric physical therapy literature. Minghelli et al. (2021) demonstrated that school-based postural education programs ('Back Schools') significantly elevated ergonomic knowledge and reduced back pain episodes among adolescents. Similarly, Nur Diansari et al. (2023) observed that ergonomic seated-posture counseling successfully augmented junior high school students' awareness in Central Java. In primary school settings, Pristianto et al. (2023) and Nugraha et al. (2021) confirmed that interactive media (such as puppet models and illustrated leaflets) yielded significant cognitive gains regarding backpack carriage safety and spinal hygiene. Furthermore, our focus on active lumbopelvic core exercises aligns with systematic reviews by Oliveira-Costa et al. (2025) and randomized trials by Takinacı & Çelik (2026), which demonstrated that active home-based therapeutic exercises (cat-camel, pelvic tilts, and core strengthening) yield superior long-term postural corrections and pain reductions in adolescent kyphoscoliosis compared to passive ergonomic advice alone.

The pedagogical and biomechanical success observed can be understood through Albert Bandura's Social Cognitive Theory and motor learning principles (Bandura, 1986). Passive lecture formats fail to establish motor self-efficacy; conversely, the multimodal design incorporated behavioral modeling, vicarious reinforcement, and guided physical rehearsal. When students observed licensed physiotherapists demonstrating corrective movements and actively rehearsed pelvic tilts and spinal elongation drills, they formed accurate mental motor schemas, dramatically elevating perceived behavioral control and self-efficacy (Bandura, 1986; Hizza et al., 2024).

Biomedically, the prescribed exercise regimen directly targets the kinetic chain vulnerabilities characteristic of adolescent seated postures. Prolonged slumped classroom sitting induces passive posterior pelvic tilting, flattening the lumbar lordotic curve and

placing excessive tensile strain on posterior spinal ligaments while causing adaptive shortening of the hamstrings and hip flexors (Minghelli et al., 2021; Noll et al., 2023). Performing pelvic tilts and quadruped leg extensions activates the deep local stabilizing system (transverse abdominis, lumbar multifidus), restoring neutral lumbopelvic rhythm (Table 2). Simultaneously, the cat-camel mobilization and latissimus dorsi stretch restore thoracic segmental extension, reversing rounded shoulder postures provoked by heavy, asymmetric backpack suspension and forward head carriage during smartphone use (Takinacı & Çelik, 2026; Yang & Yi, 2024).

A critical appraisal of the empirical data requires noting that the 100% affirmative post-test response rate reflects a pronounced ceiling effect. While this unanimous result confirms that students comprehended the presentation, dichotomous 'Yes/No' questions in an auditorium setting are inherently susceptible to social desirability bias and acquiescence response bias, where students instinctively supply affirmative answers to please university facilitators. Because the research design evaluated knowledge immediately following the lecture without longitudinal follow-up (e.g., at 1 or 3 months) and did not include objective biomechanical postural screening.

3.3 Implications

Educational authorities and Community Health Center Mulyorejo should institutionalize physiotherapy-led ergonomic screening into routine school health programs. Schools should enforce environmental modifications, such as introducing mandatory 5-minute active stretching breaks between class periods and establishing maximum allowable backpack weight guidelines (10% body weight).

3.4 Research contribution

This study provides empirical field documentation from Malang City validating the immediate pedagogical utility of combining visual ergonomic media with active physical exercise demonstrations in a public secondary school.

3.5 Limitations

Several limitations must be acknowledged: (1) The pre-experimental one-group design lacks a non-intervention control group; (2) The use of a simple 5-item dichotomous questionnaire without psychometric validation; and (3) Lack of longitudinal retention testing.

3.6 Suggestions

Future inquiries should employ randomized cluster-controlled designs comparing different educational media, utilize validated multi-item Likert scales, incorporate objective biomechanical posture assessments (photogrammetry or 3D spinal scans), and track musculoskeletal symptom incidence over 6- to 12-month follow-ups.

4. CONCLUSION

Physiotherapy postural education integrating multimedia presentations, illustrated leaflets, and guided exercise demonstrations is highly effective in upgrading postural disorder awareness and corrective exercise knowledge among junior high school students at Junior High School 30 Malang, achieving a 100.0% affirmative response rate on post-test evaluation. The intervention equips students with practical, non-pharmacological self-care strategies (including child's pose, pelvic tilts, and cat-camel mobilizations) to counteract sedentary classroom spinal stress.

ACKNOWLEDGEMENTS

The authors express their deepest gratitude to the Principal, faculty, and student participants of Junior High School 30 Malang for granting administrative permissions and facilitating this program. Sincere appreciation is also extended to the leadership of Community Health Center Mulyorejo Malang and the Faculty of Health Sciences, Universitas Muhammadiyah Malang, for clinical and academic support.

AUTHOR CONTRIBUTIONS STATEMENT

JRK: Conceptualization, Methodology, Investigation, Data curation, Formal analysis, Writing original draft. DSI, G: Supervision, Methodology, Validation, Writing, review and editing, Project administration.

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