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POSTURAL DEVELOPMENT AND MUSCULOSKELETAL STRENGTHENING IN PRIMARY SCHOOL CHILDREN

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Annotation. This article examines postural development and musculoskeletal strengthening in primary school children aged 7–10, a period marked by rapid anatomical and physiological growth. At this stage, the spine and musculoskeletal structures are still developing, which makes children particularly vulnerable to postural deviations such as kyphosis, lordosis, and scoliosis. Factors including prolonged sitting, improper desk ergonomics, heavy schoolbags, and extended screen time significantly contribute to the onset of these conditions. Epidemiological studies indicate that approximately 25–40% of children in this age group display early signs of postural abnormalities.

The article highlights the importance of early preventive strategies—such as targeted physical exercises to strengthen core and back muscles, ensuring ergonomic classroom environments, and educating children about correct posture and movement habits. These interventions have been shown to reduce the risk of later spinal deformities and promote healthier physical development.

In conclusion, the study emphasizes the need for coordinated efforts among teachers, parents, and healthcare professionals to monitor posture, encourage regular physical activity, and create supportive conditions that foster optimal musculoskeletal growth during the primary school years.

I.Introduction

Children aged 7–10 years experience one of the most intensive stages of anatomical and physiological development. During this period, the spine and musculoskeletal system are not yet fully formed, making them highly susceptible to postural deviations such as kyphosis, scoliosis, and lordosis. Sedentary lifestyle, incorrect sitting posture, heavy schoolbags, and prolonged screen time significantly increase this risk.

Recent epidemiological reports indicate that 25–40% of primary school children show early signs of postural abnormalities. Preventive interventions implemented during the early school years have been shown to reduce later spinal deformities and improve overall physical development.

Purpose of the study:

To experimentally evaluate the effectiveness of a 6-week posture-correction exercise program for improving postural alignment and musculoskeletal development in primary school children.

1. Assess the baseline postural condition of the participants.
2. Implement a structured posture-correction exercise program.
3. Evaluate postural and physical changes after the intervention..
4. Provide pedagogical recommendations for primary education settings.

II. Methods

2.1 Participants

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The study involved 48 primary school students aged 7–10. The children were randomly divided into two equal groups:

-Experimental Group (n = 24)

-Control Group (n = 24)

Both groups demonstrated comparable baseline physical characteristics.

2.2 Diagnostic Tools

Validated postural and physical assessment tools were used:

1. Visual postural assessment (frontal & sagittal planes)
2. Wall-alignment test (spinal alignment assessment)
3. Sit-and-reach flexibility test
4. Ruffier Index (cardiovascular fitness)
5. Back and abdominal muscle strength test (repetitions in 30 seconds)

2.3 Intervention (Exercise Program)

The experimental group followed a 6-week posture-correction program, consisting of:

-Frequency: 3 sessions per week

-Duration: 20–25 minutes each

Exercise components

-Back-strengthening: “Boat”, “Bridge”

-Abdominal strengthening: basic abdominal repetitions

-Spinal stretching: forward bends, cat–camel

-Posture alignment: wall-support posture exercises

-Balance training: single-leg stance, line walking

The control group continued standard physical education classes.

2.4 Statistical Analysis

Data were analyzed using Student’s t-test**.**

Differences were considered statistically significant at $p < 0.05$.

III. Results

3.1 Postural Changes

Baseline Postural Deviations:

-Kyphotic tendencies — 14 children

-Mild scoliotic curves — 9 children

-Increased lumbar lordosis — 7 children

Post-intervention outcomes (Experimental Group):

Postural condition	**Baseline (%)**	**Final (%)**	**Improvement**
Kyphosis signs	29%	11%	–61%
Scoliosis signs	19%	10%	–47%
Lordosis signs	15%	12%	–23%
Total postural deviations	63%	33%	–48%

Control group changes were statistically insignificant ($p > 0.05$).

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3.2 Flexibility Test
-Experimental group: +74% improvement (5.6 cm → 9.8 cm)
-Control group: +9%
3.3 Back Muscle Strength
-Experimental group: +32% improvement
-Control group: +7%
3.4 Ruffier Index
Percentage of children in the "healthy" zone:
-Experimental group: +26%
-Control group: +5%
Statistical results:
Most improvements in the experimental group were significant ($p < 0.05$).

IV. Discussion

This study confirmed that a structured posture-correction exercise program can significantly improve spinal alignment and musculoskeletal strength in primary school children. The 48% reduction in postural abnormality rates demonstrates the high responsiveness of the developing spine to corrective physical interventions.

The findings align with previous research by Matveev, Kulyagin, and others, who emphasize that muscle imbalance and weak postural muscles are the main contributors to postural disorders in children. Strengthening the back, abdominal, and stabilizing muscles proved critical in restoring natural spinal curves.

Additionally:

-Children displayed improved sitting behavior in class.
-Physical fatigue decreased noticeably.
-Participation in physical activities became more active.

These behavioral changes indicate that postural interventions can influence both physical and motivational aspects of learning.

V. Conclusion

The 6-week exercise program demonstrated clear and statistically significant improvements in:

-postural alignment,
-spinal muscle strength,
-flexibility,
-overall physical fitness.

Key conclusion:

Posture-correction and musculoskeletal-strengthening exercises are highly effective and should be systematically included in primary school physical education curricula.

Recommendations:

1. Integrate posture-correction modules into weekly PE lessons.
2. Collaborate with parents to monitor daily sitting posture and home exercises.
3. Reduce schoolbag weight to below 10–12% of body mass.
4. Introduce posture-breaks every 15–20 minutes during lessons.

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