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Development and Reliability of Children's Posture Assessment: Parental Questionnaire

Renuka Krishnan 0009-0001-7045-8100
PhD Candidate, GlobalNxt University

*Corresponding author. Email: Krishray@gmail.com

Abstract

This study investigates key factors influencing postural quality among children aged 9-14 years, focussing specifically on Flexibility, Strength, and Posture Awareness. Guided by Vygotsky's Social Constructivist Theory, emphasising social interactions in learning, and Bandura's Social Learning Theory, highlighting observational learning, this research uniquely incorporates parental assessments to address gaps in existing quantitative literature. A validated 24 item Likert-scale questionnaire was administered to parents following institutional ethical clearance. Reliability testing showed excellent internal consistency (Cronbach's Alpha = 0.957). Pearson correlation analysis revealed strong positive relationships, notably between Posture Awareness and Quality of Posture (r = 0.731). Regression analysis indicated that Flexibility (B = 0.170, p = 0.020, 95% CI [0.028, 0.312]), Strength (B = 0.262, p = 0.03, 95% CI [0.094, 0.430]), and particularly Posture Awareness (B = 0.609, p < 0.001, 95% CI [0.456, 0.762]) significantly predicted Posture Quality, explaining 67.8% of the variance (R2 = 0.678). These findings highlight the vital role of posture awareness and support the implementation of educational and behavioural interventions to enhance musculoskeletal health and overall well-being in children.

Keywords: Flexibility, Posture Awareness, Parental Assessment, Posture Quality, Questionnaire Validation, Strength,

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1. Introduction

Sedentary lifestyles among school-aged children have become increasingly prevalent, driven primarily by prolonged screen time and reduced physical activity. This shift has led to rising concerns about posture-related health issues, including musculoskeletal disorders and poor physical development. Recent studies underscore the link between extended sedentary behaviour and compromised posture in children (Afzal et al., 2024). Extended sedentary time is associated with an increased risk of postural disorders, including scoliosis, kyphosis, and lordosis (Dop et al., 2024). Additionally, prolonged mobile phone use and screen time are linked to a higher risk of neck pain in children and adolescents (Mahdavi et al., 2022). Sedentary behaviour is also negatively associated with motor competence in elementary school children, potentially

affecting their physical development (Santos et al., 2021). Screen-based sedentary behaviour (SSB) is linked to poorer physical fitness, cardiovascular health, and increased obesity risk in young people (You & Cui, 2024).

Previous interventions, such as school-based exercise programs and ergonomic classroom adaptations, have aimed to address these issues, demonstrating varying degrees of effectiveness in improving posture and reducing musculoskeletal problems (Afshari et al., 2025). Although previous research has explored postural education interventions among elementary school children, a systematic review of randomised clinical trials indicated mixed outcomes. While some interventions showed improvements in posture knowledge and habits, the reliability of these findings is limited due to a high risk of bias in existing studies (Valenciano et al., 2021). Furthermore, a scoping review identified inconsistent results in follow-up studies of postural educational programs, emphasising a critical need for more rigorous research focussed specifically on young children's posture education (Araújo et al., 2023).

Factors such as flexibility, muscular strength, balance and posture awareness are often considered essential for maintaining good posture and overall well-being (Chen, 2024). However, there is limited research quantitatively evaluating these factors collectively, particularly from parental perspectives. Parental modelling and co-participation markedly enhance children's activity levels and motivational climate, reinforcing the importance of parental input in monitoring posture-related behaviours (Vega-Díaz et al., 2023). Parents, especially mothers, significantly shape children's sedentary behaviours through modelling, reinforcement, and rules, suggesting that effective interventions require a whole-family approach (Knowles et al., 2015).

Children aged 7-15 years, particularly between 7-10 years, experience rapid musculoskeletal growth and lifestyle shifts from extensive movement to prolonged sitting (Baranowska et al., 2023). This shift leads to common postural abnormalities such as forward head posture, rounded shoulders, hyperlordosis, and pelvic anteversion. Early adolescence presents unique opportunities for effective intervention, as musculoskeletal health established during these years profoundly influences lifelong physical well-being. Despite the recognised value of parental observations in capturing daily habits influencing posture, quantitative research from parental perspectives remains underrepresented. Hence, this study specially addresses this gap by leveraging parental evaluations, ensuring practical applicability of findings. Furthermore, guided by Vygotsky's Zone of Proximal Development and Bandura's Social Learning Theory, this study emphasises posture awareness as not merely physical but also a cognitive-behavioural factor, integral for effective behaviour modification. Bandura's Social Learning Theory posits that children acquire behaviour patterns through observation and modelling, even when exposure is incidental, which supports using parental observation in posture development assessments (Bandura & Huston, 1961).

In light of these developmental and behavioural complexities, posture improvement strategies must move beyond isolated physical corrections. Emerging evidence supports the effectiveness of holistically designed interventions that integrate physical, cognitive, affective, and social dimensions (Grauduszus et al., 2023; Jerebine et al., 2024). Such approaches have shown success in enhancing physical literacy, body awareness, and movement confidence among children, making them particularly suited for addressing posture-related challenges. By embedding these multidimensional insights into a parent-led, theory-

informed framework, the present study aligns with current best practices in child-centred health promotion.

Given the long-term implications of childhood posture issues on overall health and well-being, there is an urgent need to identify effective, scalable methods for early detection and intervention. Addressing these issues promptly can significantly mitigate health complications later in life and enhance children's quality of life and academic performance. To address this gap, this study employs a validated parental-report questionnaire to assess flexibility, strength, posture awareness, and posture quality in children. The results provide evidence-based insights into critical factors influencing posture quality. This approach facilitates targeted interventions aimed at enhancing children's musculoskeletal health and early posture evaluation.

Ethical clearance was obtained prior to data collection, and all procedures adhered to institutional research ethics standards. The study seeks to fill a methodological and practical gap in posture research by integrating psychological theory, parental insight, and empirical assessment into a child-centred screening tool. The study's innovative contribution is its robust quantitative validation and reliability testing of the assessment tool using Cronbach's alpha, Pearson correlation, and regression analyses.

2. Research Method

This research utilised a quantitative, descriptive cross-sectional design to systematically evaluate the influence of flexibility, strength, and posture awareness on posture quality among children aged 9-14 years. This design enabled precise measurement of relationships among variables, ensuring robust statistical analysis and reliable conclusions.

A comprehensive structured questionnaire was developed comprising 24 items, divided equally across four key constructs: Flexibility, Strength, Posture Awareness, and Quality of Posture, each containing six items. The items were specifically crafted to capture detailed parental assessments of their children's posture-related attributes.

2.1 Questionnaire Constructs

Flexibility: Items in this construct assessed the ease with which children could perform movements involving various muscle groups and joints. It specifically measured the child's ability to bend, stretch, and move joints smoothly without discomfort or restriction.

Strength: This construct evaluated children's muscular strength, particularly focussing on the core muscles. Questions targeted the child's capacity to engage in activities requiring stability and sustained muscular effort.

Posture Awareness: Items were designed to evaluate the child's awareness and conscious effort in maintaining correct posture. This included assessing how frequently and effectively the child consciously corrected their posture during various activities.

Quality of Posture: This construct measures the overall effectiveness and alignment of children's posture during daily activities. It incorporated parental observations of their children sitting, standing,

and movement patterns.

Convenience sampling which enabled rapid data collection and ensured diverse participant representation, was initially employed for pilot testing with 28 participants, after which the questionnaire was refined for clarity and reliability. The final validated questionnaire was administered online via Google Forms to 106 respondents with children in the specified age range. Institutional ethical clearance was obtained prior to data collection. Ethical standards, including participant confidentiality and voluntary participation, were strictly adhered to throughout the research process.

Reliability was assessed through Cronbach's Alpha using SPSS version 30.0, revealing high internal consistency across all constructs: Flexibility (α = 0.944), Strength (α =0.926), Posture Awareness (α = 0.880), and Quality of Posture (α = 0.932). The overall questionnaire reliability was excellent (α = 0.957), confirming the tool's effectiveness and suitability for broader use.

Pearson's correlation tests assessed relationships among variables, followed by linear regression analysis to explore the predictive power of flexibility, strength, and posture awareness on the quality of posture. Before conducting regression analyses, key assumptions were rigorously tested and satisfied including continuity of the dependent variable, normal distribution of variables (verified by skewness and kurtosis), linearity, absence of correlation (Durbin-Watson statistic = 2.024), absence of multicollinearity (VIF <10), normal distribution of residuals, and homoscedasticity.

3. Results and Discussion

Reliability Analysis was performed to measure the internal consistency and reliability of the questionnaire used in this study. The results are detailed in Table 1. Cronbach's alpha values indicated excellent internal consistency for all measured constructs. The overall internal consistency of the questionnaire was also very high (α = 0.957), demonstrating the questionnaire's reliability as a robust assessment tool for evaluating these posture-related factors among school-aged children.

Table 1 - Summary of the Cronbach Alpha results

Constructs	No. of Items	Mean	Std. Deviation	Cronbach Alpha
Flexibility	6	21.98	6.547	0.944
Strength	6	20.11	6.053	0.926
Posture Awareness	6	15.79	4.945	0.880
Quality of Posture	6	18.00	5.778	0.932
Overall Questionnaire	24	75.89	19.528	0.957

Pearson Correlation Analysis identified strong positive relationships among the studied variables. Posture awareness showed the strongest positive correlation with quality of posture (r = 0.731), followed by strength (r = 0.697) and flexibility (r = 0.685). These strong associations suggest that improvements in any of these attributes, particularly posture awareness, may lead to substantial enhancements in children's overall posture quality.

Table 2 - Correlation between the independent variables and the dependent variable

Independent Variables	Quality of Posture
Flexibility Score	0.576*
Strength Score	0.681*
Posture Awareness Score	0.731**

*. Correlation is significant at the 0.05 level (2-tailed)
**. Correlation is significant at the 0.01 level (2-tailed)

This study aimed to investigate the effects of Flexibility (F), Strength (S), and Posture Awareness (PA) on the Quality of Posture (QP) in children. The following hypotheses were formulated and tested:

H1: Flexibility significantly impacts Quality of Posture.

H2: Strength significantly impacts Quality of Posture.

H3: Posture Awareness significantly impacts Quality of Posture.

Several assumptions were confirmed prior to regression analysis, including continuity of the dependent variable, normal distribution of variables, absence of outliers, linearity, absence of autocorrelation (Durbin-Watson = 2.024), absence of multicollinearity (VIF < 10), normality of residuals, and homoscedasticity.

Regression Analysis indicated a significant overall predictive relationship ($F(3,101) = 71.020$, $p < 0.001$), explaining 67.8% of the variance in Quality of Posture ($R2 = 0.678$).

Table 3 - Hypotheses Results

Hypotheses	Regression Weights	B	t	95% CI	p-value	Results
H1	F → QP	0.170	2.369	(0.028, 0.312)	0.020*	Significant
H2	S → QP	0.262	3.091	(0.094, 0.430)	0.03*	Significant
H3	PA → QP	0.609	7.909	(0.456, 0.762)	< 0.001**	Highly significant
R^2	0.678					
F(3,101)	71.020					

Note: * → p value significant at the 0.05 level
** → p value significant at the 0.001 level
F: Flexibility, S: Strength, PA: Posture Awareness and QP: Quality of Posture

This study robustly demonstrates the influential role of posture awareness in determining children's posture quality. Among the three predictors, posture awareness emerged as the most consistent and powerful factor, aligning with findings that highlight its influence on spinal alignment, postural habits, and injury prevention in children (Chen, 2024; Dop et al., 2024). Regression results confirmed that improvements in awareness were strongly associated with better posture outcomes, aligning with Bandura's Social Learning Theory, which asserts that behavioural change occurs through modelled observation and reinforcement, particularly in early developmental stages (Bandura, 1977; Schunk & Usher, 2012). These findings align with the broader relevance of Social Cognitive Theory, which emphasises observational learning, self-efficacy, and environmental influences as key drivers of health-

related behaviours (Egele et al., 2025). Posture awareness not only encompasses the ability to recognise correct posture but also involves consistent, conscious efforts to maintain and correct postural alignment throughout various daily activities. Flexibility and Strength also made meaningful contributions, supporting the need for integrated physical training approaches. Strength, by enhancing muscular support for spinal alignment, directly contributes to improved posture stability and reduces vulnerability to postural deviations. Similarly, flexibility facilitates ease of movement and alignment maintenance, promoting adaptability to various physical demands throughout the day. These findings reinforce the relevance of both cognitive and physical strategies in promoting postural health and behavioural modification. Additionally, by engaging parents in observational assessment, the study operationalises Vygotsky's Zone of Proximal Development, where guided correction from adults can bridge the gap between awareness and action. This is supported by research showing that parental modelling and feedback are vital in shaping postural and motor behaviours in children (Knowles et al., 2015; Vega-Díaz et al., 2023). This operationalises Vygotsky's ZPD framework in the domain of motor and posture development, where guided feedback from parents serves as a scaffold (Zoglowek & Aleksandrovich, 2017).

These insights align with previous literature advocating comprehensive approaches combining structured physical activity, ergonomic adjustments and posture awareness as shown in recent interventions that integrate cognitive, physical, and behavioural components to enhance children's physical literacy (Grauduszus et al., 2023; Jerebine et al., 2024). Schools, educators, and health practitioners could leverage these findings to implement targeted interventions, specifically enhancing awareness through educational workshops, structured physical education programs, and consistent home-based exercises tailored to improving children's strength and flexibility. By validating a reliable, parent-centred assessment tool grounded in theory and practice, this study provides a scalable model for early posture intervention applicable across educational, clinical, and home environments.

While this study provides robust quantitative evidence and clear recommendations for practice, future research could explore longitudinal outcomes and further validate intervention effectiveness over extended periods. Additionally, exploring broader demographic factors and different settings could enhance the generalisability of these results, ultimately guiding more tailored, culturally sensitive intervention strategies.

4. Strengths and Limitations

The strength of this study is the use of a rigorously validated questionnaire with exceptionally high internal consistency (overall Cronbach's alpha = 0.957), ensuring high quality, dependable results. The clear and detailed methodological approach, including thorough testing of regression assumptions, ensures the statistical validity and generalisability of findings. Quantitative design provides robust empirical evidence, significantly contributing to the existing literature on posture management, particularly in highlighting posture awareness as a crucial predictor. Inclusion of parental insights provides valuable real-world context, enhancing the practical relevance and applicability of findings to everyday settings and interventions. Comprehensive statistical analyses (correlation, regression) clearly demonstrate

relationships among key constructs, providing actionable insights for targeted intervention programs.

As a cross-sectional study, causal interpretations cannot be established. Longitudinal research is needed to confirm long-term impacts of flexibility, strength, and posture awareness on posture quality. Use of convenience sampling and reliance on parental reporting introduces potential selection bias and subjectivity, possibly influencing generalisability. Future studies could include objective assessments alongside parental reporting to enhance data validity. The relatively small sample size (N=106), though sufficient for statistical analyses, may limit generalisability to broader populations. The study does not directly assess children's self-perception or objective measures of posture, potentially limiting comprehensive understanding of all influencing factors. Potential external factors such as socioeconomic status, detailed physical activity patterns, or ergonomic environments at home and school, which may have influenced posture outcomes in ways not fully captured by this design.

Conclusion

This study identified posture awareness, strength, and flexibility as significant predictors of posture quality among children aged 9-14 years, with posture awareness emerging as the most influential factor. Grounded in Vygotsky's Zone of Proximal Development and Bandura's Social Learning Theory, the findings affirm the importance of guided behavioural correction and observational learning in promoting postural health. The validated parental-report questionnaire demonstrated excellent reliability and practical applicability, offering a scalable, theory-informed tool for early posture screening. These findings support the development of holistic intervention programs that integrate educational (posture awareness), behavioural (ergonomic adjustments), and physical components (structured exercises) both at school and at home. Future research should incorporate longitudinal designs and broader demographic variables to strengthen generalizability and practical applicability, ultimately contributing to improved posture, physical health, and quality of life in children.

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Declaration

The author declares no part of this manuscript involves plagiarism or fabrication of data, and all ethical guidelines for educational research have been strictly adhered to during the conduct of the study. AI tools, if used, were solely

for language refinement, grammatical clarity and formatting assistance. No AI tool was used for generating the core ideas, analysis, interpretations, or findings of the research.

About the Author

Renuka Krishnan is a posture educator and fitness coach with a passion for preventive wellness and child development. She is the creator of the RENEW Kaizen framework (Resilient Educational Navigation for Enhanced Wellness), which integrates behavioural science, physical literacy, and parental engagement to promote musculoskeletal health from an early age. Through validated assessment tools and the RENEW Kaizen method, Renuka has also developed a suite of posture-focussed digital tools, including cue cards, posture story book, activity book and self-assessment tracker, to translate research into engaging, accessible resources for families and educators.

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