

Article

Postural Education Program for Indigenous Children in School: Case Study

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Received: 20 May 2025; Accepted: 21 October 2025; Available online: 30 October 2025

ABSTRACT: To investigate whether a Postural Education Program (PEP) is capable of promoting changes in body knowledge and self-perception of posture among indigenous school-aged children. The study included 9 indigenous children with a mean age of 8 years, of whom 7 completed both the initial and final evaluations. The PEP consisted of four sessions, each lasting approximately two hours, which included an initial assessment, theoretical-practical classes on postural education, and a final assessment. Responses to the Self-bodpos questionnaire, collected at the beginning and end of the sessions, were tabulated using SPSS 22.0 and analyzed through descriptive statistics and the Wilcoxon test, with the significance level set at $\alpha \leq 0.05$. Verbal information collected from the focus group was analyzed using content analysis techniques. Among the 7 participants who completed both evaluations, 4 showed statistically significant differences in four of the seven items assessed by the Self-bodpos. In addition, positive outcomes were observed in the theoretical knowledge questionnaire and in the focus group discussions. The PEP was effective in promoting changes in body knowledge and self-perception of posture among indigenous school-aged children.

Keywords: Health education; Posture; School children; Indigenous



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1. Introduction

Body posture is shaped by biological, cultural, social, and psycho-emotional factors, and is continuously modified by the variations in stimuli and perceptions experienced in daily life [1,2]. Postural changes may result from lifelong habits, health conditions, and the sociocultural context in which the individual is immersed [3]. The literature shows that proper posture is associated not only with the prevention of musculoskeletal overload but also with the promotion of physical and psychological well-being [4–6].

Postural problems and musculoskeletal pain have been observed among schoolchildren in different countries, with prevalence ranging from 10% to 38%, depending on age, sex, and daily habits [1,3,5,7–9]. However, there are no robust data documenting these conditions specifically in Brazilian indigenous children; therefore, any such association must be interpreted with caution as an extrapolation of general findings to the indigenous context. Among the risk factors already identified in urban schoolchildren are excessive sitting time, improper backpack carrying, and lack of postural guidance [6–8] elements referred to in the literature as “poor postural habits”, which in the present study refer to general data rather than to specific observations of the indigenous community studied.

Postural perception, the ability to recognize one’s own body position and alignment, and knowledge about correct posture are central variables for the adoption of long-term healthy habits [9]. School-based postural education programs, such as the Postural Education Program (PEP), have proven effective in improving these variables, positively impacting musculoskeletal health and the quality of life of children and adolescents [7–12].

In the case of the Kaingang Fag Nhin community, located in Porto Alegre (RS), children live in a bilingual context (Kaingang and Portuguese) and engage in activities that combine formal schooling with traditional games and play, often outdoors. The indigenous school environment offers ample physical space and opportunities for diverse motor experiences,

respecting cultural elements such as the appreciation of collective work, oral traditions, and activities in close contact with nature [13,14]. This reality may directly influence how children perceive and care for their posture.

From an anthropological perspective, the body is not only a biological entity but also a cultural construct that reflects the values, practices, and symbolic systems of a community. In indigenous groups such as the Kaingang, the body is deeply intertwined with collective identity, oral traditions, and daily practices in nature, shaping specific ways of perceiving health and movement. Classic anthropological contributions have emphasized that health behaviors and bodily practices cannot be separated from cultural meanings and historical contexts [15,16]. Thus, understanding posture in this community requires not only a biomechanical lens but also recognition of the cultural codes through which indigenous children learn, embody, and reproduce notions of balance, strength, and well-being.

Despite advances in incorporating health practices into indigenous school education, no published studies have evaluated the effects of a culturally adapted PEP for this population. Thus, the present study investigated whether a Postural Education Program adapted to the reality of the Kaingang Fag Nhin indigenous school is capable of promoting changes in body knowledge and self-perception of posture among indigenous school-aged children.

2. Materials and Methods

Mixed-methods study, cross-sectional analysis, with a case study design conducted in a Kaingang indigenous school (Porto Alegre/RS). The leaders of the Kaingang Fag Nhin village authorized the implementation of the Postural Education Program (PEP) in the school. It is relevant to emphasize that the intervention was proposed by a member of the Kaingang community herself, who was also the first indigenous woman to graduate in Physiotherapy from a public university in southern Brazil. Her dual role as researcher and Kaingang community member provided not only linguistic and cultural mediation but also legitimacy and trust for the development of the program. This unique position ensured that the Postural Education Program emerged from the community’s own demands, reinforcing the integration between traditional indigenous knowledge and academic health practices. The study was approved by the Research Ethics Committee of UFRGS and by the National Research Ethics Committee (CONEP) (protocol no. 5.706.258).

Initially, 12 children of both sexes, enrolled at the Kaingang Fag Nhin Indigenous School in Porto Alegre (RS), participated in the study. The number of children corresponds to the union of the 2nd to 4th-grade elementary school classes existing at this school. All children participated voluntarily after expressing their agreement by signing the Free and Informed Assent Form, along with parental consent documented through the signature of the Free and Informed Consent Form. Children who did not attend any stage of the study were excluded. Exclusion criteria: absence at any stage of the study. The sample was intentionally limited by the school’s size, which justifies classifying it as a case study and restricts the generalization of the findings (discussed in the Limitations section).

The school has classrooms with individual desks and a large outdoor courtyard. The pedagogical routine alternates between classroom activities (seated tasks) and outdoor activities with traditional games. During the PEP sessions, seated periods were interspersed with physical practices and playful activities to foster attention and participation.

The PEP consisted of four meetings (~120 min each), conducted in the school environment. The structure of this Postural Education Program (PEP) involved four sessions, each lasting approximately two hours, during which an initial assessment, postural education classes, and a final assessment were conducted, as described in Table 1.

Table 1. Schedule of the Postural Education Program.

Session	Intervention
1	Start of the Postural Education Program.
	Presentation of the PEP and its objectives; welcoming through a talking circle.
	Signing of the Informed Consent Form (parents/guardians) and delivery/explanation of the Assent Form to the children.
	Application of the Self-Perception of Body Posture Questionnaire (Self-bodpos)—baseline assessment.
	Observation of habitual postures during school activities (field notes).
2	PEP Class 1: “Getting to Know the Spine”
	Theoretical-practical class: basic notions of spinal anatomy and functionality (in accessible language).
	Metaphor of the “plumb line” for body alignment.
	Handcrafted modeling of the spine (egg cartons, sponges, wire) for tactile-visual learning.
3	Homework 1: bilingual (Kaingang/Portuguese) leaflet with pictograms reinforcing concepts.
	PEP Class 2: “Different Ways of Sitting”
	Review of contents and feedback on homework.

4	Theoretical-practical class: adjustment of sitting postures in ADLs (school desk, bench, floor), exploration of variations, and guided self-corrections.
	Playful activity in the schoolyard to integrate content into motor experience.
	Homework 2: simple checklist of postural habits (bilingual), to be completed with the support of an adult.
	Conclusion of the Postural Education Program.
4	Reapplication of the Self-bodpos (post-intervention).
	Theoretical questionnaire (knowledge assessment).
	Focus group (discussion circle) to capture children's perceptions of the PEP.
	Closure with a playful activity.

Source: Prepared by the author (2023).

For the cultural and linguistic adaptations of the PEP, bilingual language (Portuguese and Kaingang) was integrated into verbal instructions and teaching materials; metaphors and culturally familiar examples were used; outdoor activities and collective work were prioritized; and low-cost, accessible materials were employed.

2.1. Measurement Instruments

The Body Posture Self-Perception Questionnaire (Self-bodpos) [17] consists of seven items illustrated with figures and descriptions representing different body alignments. Static positions are presented in the posterior frontal, anterior frontal, and sagittal planes. The questions are distributed across assessments of body segments, with only one referring to the overall body. In addition to the illustrations, each item provides two descriptive response options for students who could not identify their posture in the drawings or who perceived themselves differently from the alternatives presented.

The theoretical knowledge questionnaire was specifically developed for this study with a pedagogical focus. It included items related to the parts of the spine, their functions, the concept of the “plumb line”, and appropriate sitting postures, according to the contents taught during the Postural Education Program (PEP). The instrument consisted of 10 single-choice questions, each worth one point, yielding a minimum score of 0 and a maximum of 10.

The scoring classification followed the grading system adopted by the participating school: A (9.0–10.0), B (8.0–8.9), and C (7.0–7.9). The validity of the instrument was verified only in terms of content and face validity through review by the school's teachers, ensuring that the questions were appropriate for the students' educational and cultural level.

The focus group, conducted in the format of a talking circle, aimed to explore children's perceptions of their own body, the “plumb line” concept, sitting posture, and the relevance of the PEP. The activity lasted approximately 25–35 min and followed a semi-structured script. Interactions were recorded in a field notebook and by audio recording, with an immediate synthesis at the end. The sessions were conducted bilingually (Kaingang and Portuguese) to ensure full comprehension by participants.

2.2. Linguistic Procedures and Research Team Competence

The lead researcher is a Kaingang Indigenous and bilingual, responsible for explanations and cultural/linguistic mediation. The questionnaires were administered in Portuguese, with oral explanations provided in Kaingang and supported by visual examples to ensure comprehension. A pre-presentation of the items (guided rehearsal) was carried out for familiarization, and any doubts were clarified before responses were recorded. This procedure does not replace formal cross-cultural adaptation/validation processes and is acknowledged as a limitation.

Homework assignments were delivered in bilingual format with pictograms and short phrases. Teachers reinforced the instructions in class, and an explanatory note for parents/guardians guided how to support the children (joint reading and practical demonstration). Questions could be directed to the lead researcher between sessions.

2.3. Data Analysis

Responses from the Self-bodpos (pre- and post-intervention) were tabulated in SPSS 22.0 and described by frequencies/medians. Intra-individual comparisons were performed using the Wilcoxon signed-rank test ($\alpha \leq 0.05$).

The qualitative analysis followed the classic steps of Content Analysis proposed by Bardin (2011), structured into three phases: (1) pre-analysis; (2) exploration of the material, categorization or coding; and (3) treatment of results, inference, and interpretation. The entire process adhered to rigorous standards of accuracy and integrity. The predefined categories of analysis were: (a) the “plumb line” as a tool for spinal care; (b) the importance of adopting proper sitting posture; and (c) the relevance of a postural education program in the context of Indigenous schools.

3. Results

On the first day, during the baseline assessment, 12 students completed the Self-bodpos questionnaire. Of these, 3 did not participate in the final assessment, resulting in a total of 9 students included in the study. The mean age of the students included was 8 ± 1 years. Among the 9 participants, 66.66% were male and 33.33% were female.

The comparison of responses from the Body Posture Self-Perception Questionnaire (Self-bodpos) between the baseline and final assessments is presented in Table 2. A statistically significant difference was observed in four questions of the Self-bodpos questionnaire.

Table 2. Comparison of the median responses from the Postural Self-Perception Questionnaire (Self-bodpos) obtained in the initial and final evaluations.

Self-Bodpos	Pre ^a	Post ^b	Z	p *
Q1: I perceive the position of my body as in the figure	1.000	3.00	−2.449	0.014
Q2: I perceive the position of my head as in the figure	1.000	2.00	−2.236	0.025
Q3: I perceive the position of my body as in the figure	1.000	1.00	−2.000	0.046
Q4: I perceive the position of my back as in the figure	2.000	2.00	−1.732	−1.732
Q5: I perceive the position of my shoulders as in the figure	2.000	2.00	−1.732	−1.732
Q6: I perceive the position of my knees as in the figure (sagittal view)	1.000	2.00	−1.633	0.102
Q7: I perceive the position of my knees as in the figure (frontal view)	2.000	2.00	−2.236	0.025

a: Initial evaluation; b: Final evaluation; Z: Wilcoxon test; *: Significance. Source: Prepared by the author (2023).

In Table 3, which presents the results of the theoretical questionnaire applied during the final evaluation, it is observed that the majority (67%) of the students achieved an “A” grade.

Table 3. Grades obtained by the students in the theoretical questionnaire applied at the end of the intervention.

Grade	Frequency *	Percentage
C (between 7.9 and 7)	1	11
B (between 8.9 and 8)	2	22
A (between 10 and 9)	6	67
TOTAL	9	100

* Absolute frequency. Source: Prepared by the author (2023).

Regarding the focus group results, after analyzing the collected information, the qualitative data were divided into three categories of analysis: (a) the plumb line as a resource for taking care of the spine; (b) theoretical/practical knowledge about the spine and adequate ways of sitting posture; and (c) the importance of the PEP.

In the indigenous students’ reports concerning category (a), “the plumb line as a resource for taking care of the spine”, the following stand out:

Indigenous child 2: It’s a little imaginary string that we pull to stay in the right position.

Researcher: So it exists and is important?

Indigenous child 2: So we can stay in the right position.

Indigenous child 1: To understand our body.

Indigenous child 2: So we do not have back pain.

Indigenous child 3: To understand our body and not have pain in the back, leg, and neck.

Regarding category (b) theoretical/practical knowledge about the spine and proper sitting posture, the following comments stood out:

Indigenous child 4: Bone.

Indigenous child 2: It has a cushion—I know that.

Indigenous child 6: Muscles.

Indigenous children: Cervical.

Indigenous child 2: Lumbar.

Indigenous children: Thoracic.

Indigenous child 6: Sacrum, coccyx.

Researcher: What is the most appropriate way to sit?

Indigenous child 6: Like this (demonstrates).

Indigenous child 7: On the little feet of the butt.

Indigenous child 2: On the little feet of the butt and pull the plumb line.

Finally, the statements that stood out regarding the importance of the PEP were the following:

Researcher: Okay. Do you think a Postural Education Program is important?

Indigenous children: Yes.

Researcher: Do you think all indigenous children should participate in a Postural Education Program?

Indigenous children: Yes.

Indigenous child 7: To learn about the body.

Indigenous child 2: To learn the right way, so we don't have back pain.

4. Discussion

The results showed a significant difference in four of the seven items assessed by the Self-bodpos questionnaire, suggesting that the Postural Education Program (PEP) was able to promote changes in body knowledge and postural self-perception among indigenous schoolchildren. In addition to these findings, positive results were observed in the theoretical knowledge questionnaire and the children's statements during the focus group, evidencing their understanding of the concepts addressed and their perception of their importance.

The literature has already documented that PEPs have positive effects on the postural habits of non-indigenous children, immediately after their conclusion [11,12]. Although there is no standardized model for implementing a PEP, studies point to convergences in the topics covered [11,12]. In this study, the choice of culturally adapted, playful theoretical-practical interventions aimed to increase adherence among indigenous children.

The small sample size, characteristic of indigenous schools and the exploratory/pilot nature of the research, should be considered when interpreting the results. The limited number of students in the school justifies this scope and highlights the need for multicenter studies in the future. Research with non-indigenous schoolchildren has also documented advances in body perception and postural habits [18], aligned with what we observed here. Recent evidence also highlights that, in addition to advances in postural habits, misconceptions about daily activities related to spinal health are frequent among schoolchildren, reinforcing the importance of culturally adapted educational programs [19]. On the other hand, cultural and motor differences, such as more spontaneous physical activities and postural patterns influenced by traditional customs, may affect the way these contents are internalized.

Although many interventions in the literature adopt pre- and post-intervention assessments [20], this study applied only a post-intervention assessment. This choice respected the indigenous school standard, in which formal evaluations occur after content is taught [10], and considered cultural aspects that discourage prior diagnostic testing. While this approach limits direct measurement of individual progress, it represents a necessary adaptation to the studied reality.

The relevance of postural perception for spinal health is supported by recent systematic reviews that associate early body awareness with the prevention of low back pain and the adoption of better postural habits throughout life [21,22]. School-based educational programs combined with exercises are effective in promoting lasting changes in postural habits [7]. The fact that three Self-bodpos items did not show significant change may be related to the absence of a direct approach to those body segments or to the limited intervention time.

The qualitative analysis reinforced that the children not only understood the theoretical content but were also able to associate it with concrete bodily experiences. Many verbalized concepts, such as "keeping the back straight" or "sitting without hunching the shoulders", are in line with the PEP objectives. This pattern of internalization, combined with the use of playful methodologies, is similar to what has been observed in other qualitative studies [23]. Furthermore, the phenomenon of knowledge multiplication was noted, in which children shared the content with peers and family members [19].

The implementation of PEP in an indigenous context requires attention to cultural and motor specificities. Postural patterns acquired in traditional activities (such as the use of different furniture or specific ways of carrying loads) may affect both postural perception and the validity of instruments designed for urban populations. Adapting educational programs to cultural references and involving community members in their implementation are highly recommended strategies [21,24].

It is also important to recognize the barriers that persist in meeting the health needs of Indigenous peoples. Outsiders often fail to grasp the community's real demands, and language may become a significant barrier to communication and access to health care. In this sense, the popular knowledge and practices developed within the

Kaingang community should be acknowledged and respected as legitimate foundations for interventions. Many Indigenous groups have increasingly encouraged their youth to pursue higher education in urban universities, fostering the creation of bridges between traditional knowledge and academic sciences. In this way, initiatives like the present study, although technically scoped and focused on specific health issues, also reflect and incorporate the broader social and cultural context in which Indigenous children live.

5. Conclusions

Based on the results obtained, it can be stated that the Postural Education Program (PEP) effectively promoted changes in body knowledge and postural self-perception among indigenous schoolchildren of the Kaingang Fag Nhin community. A positive acceptance of the “something new” was also observed, evidenced by the children’s statements about the importance of including PEP in indigenous schools and expanding its application to other children in the community.

Despite the promising results, it is necessary to acknowledge the methodological limitations of the study, such as the small number of participants, the short intervention period, and the absence of previously validated instruments for the indigenous school population.

Therefore, it is recommended that future research be conducted with larger samples and longitudinal follow-up to assess the maintenance of PEP effects in the long term. Cultural and linguistic validation of the assessment instruments, as well as comparisons across different sociocultural contexts, are also suggested to broaden the applicability and effectiveness of the program. Additional investigations could explore pedagogical and methodological adaptations that strengthen the link between postural education and the cultural reality of indigenous communities, ensuring more contextualized, participatory, and sustainable interventions.

Statement of the Use of Generative AI and AI-Assisted Technologies in the Writing Process

During the preparation of this manuscript, the authors used ChatGPT for translating the article from Portuguese to English and for managing references. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the published article.

Author Contributions

Conceptualization, M.G. and S.L. and C.T.C.; Methodology, S.L. and C.T.C.; Formal Analysis, M.G.; Writing Original Draft Preparation, M.G. and S.L.; Writing Review & Editing, M.G. and C.T.C.; Supervision, C.T.C.

Ethics Statement

The study was conducted according to the guidelines of the Declaration of Helsinki, and approved by the Ethics Committee of Federal University of Rio Grande do Sul (protocol code 5.706.258; date of approval 20 October 2022).

Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

Data Availability Statement

The authors declare that the data is available for consultation through direct contact with the corresponding author.

Funding

This research received no external funding.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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