

INPLASY

INPLASY202670045

doi: 10.37766/inplasy2026.7.0045

Received: 15 July 2026

Published: 15 July 2026

Corresponding author:

Raluca Madalina Burlui

raluca.burlui@ugal.ro

Author Affiliation:

Faculty of Physical Education and Sports, "Dunărea de Jos" University of Galați, Romania.

Integrative Decision-Making for Pediatric Postural Asymmetries: A Neurosensory-Based Clinical Protocol from School Screening to Surgical Thresholds - A Narrative Review

Mereuta, C; Dragomir, M; Burlui, RM.

ADMINISTRATIVE INFORMATION

Support - This review received no external financial support. The study is being conducted within the, "Dunărea de Jos" University of Galați, Romania.

Review Stage at time of this submission - Preliminary searches.

Conflicts of interest - None declared.

INPLASY registration number: INPLASY202670045

Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 15 July 2026 and was last updated on 15 July 2026.

INTRODUCTION

Review question / Objective This review aims to determine the clinical circumstances in which school-based physical activity and postural rehabilitation are sufficient for the management of pediatric postural asymmetries and to identify the situations in which orthopedic referral, bracing, or surgical intervention becomes necessary. The review will synthesize current evidence regarding school screening, neurosensory postural control, scoliosis-specific exercise therapy, conservative management, progression risk, Cobb angle evolution, skeletal maturity, and quality of life. Based on the available evidence, an integrative clinical decision-making framework will be proposed to support individualized management of children and adolescents presenting with postural imbalance or adolescent idiopathic scoliosis.

Rationale Postural asymmetries are common during childhood and adolescence and may represent either transient functional adaptations or

the earliest manifestations of progressive structural spinal deformities. Although school screening programs facilitate early identification of postural deviations, distinguishing between reversible postural imbalance and conditions requiring specialized orthopedic management remains a clinical challenge. School-based physical activity promotes musculoskeletal development, motor competence, and general health; however, its preventive and therapeutic role in structural scoliosis is limited. At the same time, increasing evidence supports the use of scoliosis-specific exercises, neurosensory rehabilitation, proprioceptive training, and bracing in selected patients, while severe progressive deformities require timely surgical evaluation. Current recommendations are dispersed across clinical guidelines and research studies, making clinical decision-making difficult for professionals involved in pediatric rehabilitation and school health. Therefore, this review aims to integrate the available evidence into a structured clinical framework that facilitates early risk identification, supports individualized therapeutic decisions, and

clarifies the transition from conservative management to surgical referral.

Condition being studied The review focuses on pediatric postural imbalance, postural asymmetries, and adolescent idiopathic scoliosis, with particular emphasis on the continuum from functional compensation to structural spinal deformity. The review will examine the contribution of school-based screening, neurosensory postural control, proprioceptive function, scoliosis-specific rehabilitation, conservative orthopedic management, bracing, and surgical indications according to Cobb angle progression, skeletal maturity, and clinical risk factors.

METHODS

Search strategy A structured literature search will be conducted to identify relevant evidence addressing the continuum from pediatric postural imbalance to structural spinal deformity, with emphasis on clinical decision-making, conservative rehabilitation, and surgical referral. Electronic searches will be performed in PubMed/MEDLINE, Scopus, Web of Science Core Collection, PEDro, and the Cochrane Library. The reference lists of all eligible articles and relevant clinical guidelines will also be manually screened to identify additional studies.

The search will include publications from January 2016 to December 2026 in order to reflect current concepts in pediatric postural assessment and scoliosis management. Controlled vocabulary (Medical Subject Headings—MeSH) and free-text terms will be combined using Boolean operators (AND, OR). Representative search terms will include: "postural imbalance", "postural asymmetry", "postural control", "school screening", "school-based physical activity", "adolescent idiopathic scoliosis", "Cobb angle", "postural rehabilitation", "physiotherapy", "physical therapy", "scoliosis-specific exercises", "Schroth", "SEAS", "proprioception", "neurosensory", "sensorimotor control", "brace", "orthotic treatment", "skeletal maturity", "spinal deformity", and "spinal surgery".

Database-specific search strategies will be adapted according to indexing systems and search interfaces. Duplicate records will be removed prior to screening. Where appropriate, additional publications identified through citation tracking will be considered for inclusion.

Participant or population The review will include studies involving children and adolescents (approximately 5–18 years of age) presenting with postural imbalance, postural asymmetries,

functional spinal deviations, or adolescent idiopathic scoliosis. Studies evaluating school-aged populations participating in screening programs, preventive physical activity, postural rehabilitation, scoliosis-specific exercise programs, neurosensory interventions, bracing, or surgical management will be considered eligible. Studies exclusively involving adults or patients with scoliosis secondary to congenital, neuromuscular, syndromic, infectious, traumatic, or neoplastic conditions will be excluded unless they provide information directly applicable to pediatric clinical decision-making.

Intervention The interventions of interest include school-based physical activity programs, postural education, physiotherapy, scoliosis-specific exercise approaches (including Schroth, SEAS, BSPTS, and comparable evidence-based methods), neurosensory and proprioceptive rehabilitation, sensorimotor training, balance training, conservative orthopedic treatment with bracing, and multidisciplinary management strategies. Surgical intervention will also be considered when evaluating clinical decision-making thresholds for progressive structural deformities.

Comparator Comparators may include standard school physical education, observation, usual care, alternative rehabilitation approaches, different exercise protocols, bracing versus exercise therapy, conservative management versus surgical treatment, or no intervention, depending on the objectives and design of each included study. In studies without a comparator group, the reported outcomes will be interpreted descriptively within the context of the available evidence.

Study designs to be included Clinical practice guidelines, systematic reviews, meta-analyses, randomized controlled trials, non-randomized controlled studies, prospective and retrospective cohort studies, case-control studies, cross-sectional studies, and observational clinical research evaluating pediatric postural asymmetries, scoliosis, rehabilitation, or surgical management will be eligible. High-quality narrative reviews may be consulted to support background interpretation but will not constitute the primary evidence base.

Eligibility criteria Studies will be included if they: involve children or adolescents with postural imbalance, postural asymmetry, or adolescent idiopathic scoliosis; investigate school screening, physical activity, postural rehabilitation, scoliosis-specific exercises, neurosensory interventions,

bracing, or surgical management; report clinically relevant outcomes related to postural correction, curve progression, neuromuscular control, quality of life, or treatment decision-making; and are published from January 2016 to December 2026. Studies will be excluded if they focus exclusively on adult populations, congenital or neuromuscular scoliosis, isolated surgical techniques without discussion of treatment indications, conference abstracts, editorials, letters, expert opinions lacking supporting evidence, duplicate publications, or articles without accessible full text.

Information sources Information will be obtained through electronic database searches in PubMed/MEDLINE, Scopus, Web of Science Core Collection, PEDro, and the Cochrane Library. Additional studies will be identified by manually screening the reference lists of included publications, relevant systematic reviews, and international clinical practice guidelines. Where appropriate, official recommendations from recognized professional organizations in pediatric orthopedics, rehabilitation, and scoliosis management will also be consulted to ensure comprehensive evidence coverage.

Main outcome(s) The primary outcomes will include evidence supporting clinical decision-making regarding the management of pediatric postural asymmetries and adolescent idiopathic scoliosis. Particular attention will be given to postural improvement, progression of spinal curvature (Cobb angle), neurosensory postural control, effectiveness of scoliosis-specific rehabilitation, indications for bracing, criteria for surgical referral, skeletal maturity, and prevention of progression toward irreversible structural deformity.

Additional outcome(s) Secondary outcomes will include quality of life, functional performance, balance and proprioceptive function, adherence to rehabilitation programs, psychosocial impact, participation in school activities, and reported adverse effects associated with conservative or surgical management.

Data management All records retrieved from the electronic databases will be exported to a reference management software (e.g., Zotero, EndNote, or Mendeley) for organization and duplicate removal. Titles and abstracts will be screened according to the predefined eligibility criteria, followed by full-text assessment of potentially relevant studies. Data extracted from the included publications will be recorded using standardized extraction tables developed for this

review. Information collected will include study characteristics, participant demographics, study design, intervention characteristics, comparator (where applicable), outcome measures, main findings, and conclusions relevant to pediatric postural assessment, rehabilitation, and clinical decision-making. The extracted data will be reviewed for consistency before narrative synthesis.

Quality assessment / Risk of bias analysis

Considering the narrative design of this review, a formal quantitative risk-of-bias assessment will not be performed. Instead, the methodological quality of the included studies will be critically appraised according to study design, level of evidence, methodological rigor, sample characteristics, relevance to the review objectives, and consistency of findings across the literature. Clinical practice guidelines, systematic reviews, and meta-analyses will be prioritized because of their higher level of evidence. Potential sources of bias, methodological limitations, and inconsistencies among studies will be considered during evidence synthesis and interpretation of the results.

Strategy of data synthesis A structured narrative synthesis will be conducted to integrate evidence from studies with different methodological designs. The findings will be organized according to the progression of clinical decision-making, beginning with school-based screening and early detection of postural imbalance, followed by neurosensory assessment, conservative rehabilitation strategies, scoliosis-specific exercise therapy, brace treatment, and surgical referral criteria. Evidence will be synthesized thematically to identify areas of agreement, discrepancies, and current gaps in knowledge. Particular emphasis will be placed on factors influencing progression risk, Cobb angle evolution, skeletal maturity, proprioceptive function, neurosensory postural control, and individualized treatment selection. Based on the integrated evidence, an evidence-informed clinical framework will be proposed to facilitate decision-making in pediatric postural disorders.

Subgroup analysis Where sufficient evidence is available, findings will be discussed according to age group, skeletal maturity, severity of spinal deformity, Cobb angle categories, intervention type (school physical activity, scoliosis-specific exercises, neurosensory rehabilitation, bracing, or surgery), and risk of progression. These subgroup considerations will be descriptive and intended to support clinical interpretation rather than quantitative comparison.

Sensitivity analysis A formal statistical sensitivity analysis is not applicable due to the narrative design of this review. However, the robustness of the proposed clinical framework will be supported through comparison of findings across different study designs, levels of evidence, and international clinical guidelines. Particular attention will be paid to the consistency of recommendations regarding conservative management, bracing, and surgical indications.

Language restriction No language restrictions will be applied, provided that a reliable translation is available.

Country(ies) involved Romania.

Other relevant information This review seeks to bridge the gap between preventive school-based postural programs and individualized orthopedic management by integrating current evidence into a clinically applicable decision-making framework. The proposed protocol emphasizes early identification of progression risk and supports interdisciplinary collaboration among pediatricians, physiotherapists, rehabilitation specialists, orthopedic surgeons, and school health professionals.

Keywords adolescent idiopathic scoliosis; pediatric postural asymmetry; neurosensory postural control; postural rehabilitation; school screening; bracing; spinal surgery pediatric postural imbalance; adolescent idiopathic.

Dissemination plans The completed review will be submitted for publication in an international peer-reviewed journal and presented at scientific meetings related to pediatric rehabilitation, physiotherapy, orthopedics, and posturology. The findings are intended to support evidence-informed clinical practice and may contribute to the development of standardized decision-making protocols for pediatric postural disorders.

Contributions of each author

Author 1 - Claudiu Mereuta - Conceptualization, supervision, critical revision of the manuscript, and methodological guidance.

Email: claudiu.mereuta@ugal.ro

Author 2 - Maricela Dragomir - Literature analysis, methodological review, manuscript editing, and critical intellectual input.

Email: maricela.dragomir@ugal.ro

Author 3 - Raluca Madalina Burlui - Conceptualization, literature review, methodology development, manuscript drafting, data

interpretation, and corresponding author responsibilities.

Email: raluca.burlui@ugal.ro