



INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Panchakarma-Based Interventions in Children with Developmental Delay: Therapeutic Rationale, Clinical Evidence, and Future Perspectives

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Abstract

Background: Developmental delay in children is characterized by delayed acquisition of age-appropriate developmental skills and may involve motor, language, cognitive, social, or adaptive domains. Management requires early identification, etiological evaluation, and multidisciplinary intervention. *Panchakarma*-based therapies are used in *Ayurvedic* paediatric practice as supportive interventions in children with developmental and neuromotor impairments; however, their clinical effectiveness and mechanisms require critical scientific evaluation.

Objective: To critically review the therapeutic rationale, potential mechanisms, and available clinical evidence regarding *Panchakarma*-based interventions in children with developmental delay and to identify priorities for future research.

Methods: Classical *Ayurvedic* principles relevant to developmental impairment and paediatric *Panchakarma* were integrated with contemporary literature on developmental delay and available clinical studies of *Panchakarma*-based interventions. Particular attention was given to procedures such as *Abhyanga*, *Swedana*, *Shashtika Shali Pinda Sweda*, and *Basti*, with evaluation of developmental, motor, functional, and safety outcomes.

Results: Available studies suggest potential supportive effects of multimodal *Ayurvedic* interventions on selected developmental and motor outcomes, particularly in children with cerebral palsy and associated developmental impairment. Proposed benefits may involve sensory stimulation, modulation of muscle tone, facilitation of motor function, and supportive rehabilitative effects. However, the current evidence is limited by small sample sizes, heterogeneous patient populations, combined therapeutic protocols, variable outcome measures, and inadequate controls, making it difficult to determine the independent effect of individual *Panchakarma* procedures.

Conclusion: *Panchakarma*-based interventions represent an emerging area of supportive research in paediatric developmental rehabilitation. Current evidence is insufficient to establish definitive efficacy, and these interventions should be investigated within multidisciplinary developmental care rather than as substitutes for established rehabilitation. Future research requires adequately powered controlled trials, standardized age-appropriate protocols, validated developmental and functional outcome measures, systematic safety assessment, and long-term follow-up.

Keywords: *Panchakarma*; developmental delay; neurodevelopment; paediatric rehabilitation.

1. Introduction

Developmental delay is an important paediatric concern characterized by failure to attain age-appropriate developmental skills within the expected period. It may involve gross motor, fine motor, language, cognitive, social, or adaptive functions. Global developmental delay (GDD) is specifically defined in children below five years as a significant delay, generally ≥ 2 standard deviations below the mean on standardized developmental assessment, in at least two developmental domains.[1] Early recognition is essential because timely developmental intervention can improve functional outcomes and should be initiated as soon as delay is identified, even while etiological evaluation is ongoing.[1]

The etiology of developmental delay is heterogeneous and may include genetic, metabolic, neurological, prenatal, perinatal, and environmental factors. Consequently, contemporary management emphasizes etiological evaluation together with individualized multidisciplinary intervention involving developmental paediatrics, physiotherapy, occupational therapy, speech and language therapy, and other supportive services according to the affected developmental domains.[1]

Ayurveda does not describe developmental delay as a single disease entity directly corresponding to the contemporary diagnosis. However, classical paediatric concepts related to delayed acquisition of developmental functions, *Bala*, *Vridhhi*, *Dhatu Poshana*, and neurological or motor impairment provide a framework for individualized management. *Panchakarma*-based interventions are used clinically as part of multimodal *Ayurvedic* management, particularly where motor dysfunction, altered muscle tone, weakness, or delayed motor development predominates.

Procedures such as *Abhyanga*, *Swedana*, *Shashtika Shali Pinda Sweda*, and various forms of *Basti* have been investigated in children with cerebral palsy and associated developmental impairment. Clinical studies have reported improvements in selected outcomes including gross motor function, fine motor function, activities of daily living, muscle tone, and developmental milestones. [2,3] However, these studies generally evaluated combinations of *Panchakarma* procedures, internal *Ayurvedic* medicines, and sometimes physiotherapy, making it difficult to determine the independent contribution of individual interventions. A recent systematic review and meta-analysis of *Ayurvedic* interventions in children with cerebral palsy similarly identified potential improvement in spasticity but emphasized substantial heterogeneity and the need for more robust evidence.[4]

Therefore, *Panchakarma* in developmental delay requires evaluation as a **potential adjunct to established multidisciplinary developmental rehabilitation**, rather than as an isolated or replacement therapy. The present review examines the *Ayurvedic* therapeutic rationale, potential mechanisms, available clinical evidence, methodological limitations, and future research priorities for *Panchakarma*-based interventions in children with developmental delay.

2. *Ayurvedic* Therapeutic Rationale

Developmental delay does not have a single direct disease equivalent in classical *Ayurveda*. Its clinical presentation may involve delayed motor functions, impaired speech or cognition, weakness, abnormal muscle tone, or limitations in functional activity. Therefore, *Ayurvedic* interpretation should be individualized according to the predominant clinical features rather than assigning developmental delay to a single classical diagnosis. Similar caution has been emphasized in *Ayurvedic* literature on cerebral palsy, where no exact classical equivalent has been identified.[2]

2.1 Role of *Vata* and *Dhatu Poshana*

From an *Ayurvedic* perspective, *Vata* has an important role in *Cheshta* (motor activity), sensory-motor functions, and coordinated bodily activities. Consequently, developmental conditions presenting predominantly with impaired movement, weakness, spasticity, or delayed motor acquisition are commonly approached through *Vatahara*, *Brimhana*, and *Balya* therapeutic principles.[2]

In children with poor growth, muscular weakness, or reduced physical capacity, inadequate *Dhatu Poshana* may additionally influence the selection of nourishing therapies. Thus, the therapeutic objective is not merely *Vata Shamana* but also improvement of *Bala*, nourishment of tissues, and support of functional development.

2.2 Rationale for *Panchakarma*-Based Interventions

Panchakarma procedures in children are modified according to age, *Bala*, disease severity, and tolerance. Among the interventions investigated in children with developmental and neuromotor impairment, *Abhyanga*, *Swedana*, *Shashtika Shali Pinda Sweda*, and *Basti* are the most frequently reported. [2,5,6]

Abhyanga with medicated oils provides repeated tactile and proprioceptive stimulation and is traditionally used for *Vata Shamana* and *Bala* promotion. *Shashtika Shali Pinda Sweda* combines warmth, massage, and a nourishing preparation of *Shashtika Shali*, milk, and medicinal drugs and is primarily employed as a *Brimhana* procedure in children with muscular weakness and motor impairment.[5]

Basti occupies an important position in the management of *Vata*-predominant disorders. *Yapana Basti* and other appropriately modified *Basti* protocols have been clinically investigated in children with cerebral palsy, with reported improvements in selected gross motor, fine motor, and activities-of-daily-living outcomes. [2,6] These findings provide a clinical basis for further investigation but should not be interpreted as definitive evidence of efficacy.

Accordingly, the therapeutic framework may be represented as:

Predominant developmental impairment → Assessment of *Vata* involvement and *Dhatu* status → Age-appropriate *Panchakarma* intervention → *Brimhana*/*Balya* support → Functional and developmental rehabilitation

Importantly, these interventions should be considered **adjunctive to developmental rehabilitation**, with treatment outcomes assessed using standardized developmental and functional measures.

3. Major *Panchakarma*-Based Interventions

Panchakarma protocols used in children with developmental delay are generally modified according to age, physical strength, nutritional status, predominant neurological manifestations, and tolerance. Available clinical literature primarily involves children with cerebral palsy and associated developmental impairment; therefore, evidence should not be generalized to all causes of developmental delay. [2,4]

3.1 *Abhyanga*

Abhyanga is frequently incorporated into paediatric *Panchakarma* protocols, particularly in children presenting with motor impairment and *Vata*-predominant manifestations. Medicated oils such as *Bala Taila* and related formulations are used with the therapeutic objectives of *Vata Shamana*, improvement of *Bala*, and support of neuromuscular function. [5,6] From a rehabilitative perspective, repeated massage also provides tactile and proprioceptive sensory input, although the specific contribution of medicated *Abhyanga* to developmental outcomes remains inadequately established.

3.2 *Shashtika Shali Pinda Sweda*

Shashtika Shali Pinda Sweda is a *Snigdha* and *Brimhana* form of *Swedana* commonly employed where developmental impairment is accompanied by muscular weakness, poor physical development, or motor dysfunction. The procedure combines massage, controlled thermal stimulation, and a nourishing

preparation of *Shashtika Shali* cooked with milk and medicinal decoction. Clinical studies incorporating this procedure have reported improvement in selected motor and functional parameters in children with cerebral palsy. [5,6]

3.3 Basti

Basti is therapeutically important in *Vata*-predominant disorders and has been investigated in paediatric neuromotor conditions using carefully modified protocols. *Rajayapana Basti*, for example, was evaluated along with *Baladi Yoga* in children with cerebral palsy and was associated with improvement in gross motor, fine motor, and activities-of-daily-living measures. [2] Because these studies generally used multimodal treatment, the independent effect of *Basti* remains uncertain.

3.4 Shirodhara and Other External Procedures

Procedures such as *Shirodhara*, *Shiro-Pichu*, and *Talapodichil* are occasionally incorporated into *Ayurvedic* management of children with neurological and developmental disorders. Their proposed applications relate mainly to behavioural regulation, sleep, sensory modulation, and neurological support. However, high-quality paediatric evidence specifically demonstrating improvement in developmental milestones is currently insufficient. Therefore, these interventions require substantially greater clinical and mechanistic investigation before specific developmental benefits can be established.

Overall, available evidence supports studying *Panchakarma* as a **multimodal supportive rehabilitation strategy**, while highlighting the need to distinguish the effects of individual procedures through appropriately controlled clinical research.

4. Potential Mechanisms of Action

The potential effects of *Panchakarma*-based interventions in children with developmental delay may involve a combination of sensory, neuromuscular, circulatory, and rehabilitative mechanisms. However, direct mechanistic evidence in paediatric developmental disorders remains limited; therefore, these mechanisms should be considered biologically plausible rather than established.

4.1 Sensory and Proprioceptive Stimulation

Procedures such as *Abhyanga* and *Shashtika Shali Pinda Sweda* provide repetitive tactile, pressure, thermal, and proprioceptive inputs. Somatosensory information contributes to motor control and motor learning, while rehabilitation strategies that provide structured sensory input may facilitate motor performance through experience-dependent neuroplasticity. [7,8] This provides a possible contemporary rationale for studying externally applied *Panchakarma* procedures as adjuncts to conventional motor rehabilitation.

4.2 Modulation of Muscle Tone and Motor Function

Massage, passive movement, and controlled thermal stimulation incorporated into *Abhyanga* and *Swedana* may temporarily influence muscle stiffness, joint mobility, relaxation, and ease of movement. In children with cerebral palsy, massage-based interventions have demonstrated potential benefits for muscle tone and motor function, although the overall evidence remains heterogeneous.[9] These effects may partly explain improvements in motor parameters reported in multimodal *Ayurvedic* studies. [2,5,6]

4.3 Neuroplasticity and Rehabilitation

Neuroplasticity the capacity of the nervous system to modify neural connections in response to experience is fundamental to paediatric rehabilitation. Repetitive, task-specific, and intensive motor activity is particularly important for promoting functional motor learning in children with neurological impairment.[8] *Panchakarma* procedures themselves should not be assumed to induce neuroplasticity directly; rather, improvement in relaxation, flexibility, sensory input, or movement tolerance may theoretically create more favourable conditions for active physiotherapy and developmental training.

4.4 Nutritional and *Brimhana* Support

Procedures such as *Shashtika Shali Pinda Sweda* and *Yapana Basti* are traditionally conceptualized as *Brimhana* and *Balya* interventions. Their classical therapeutic objective is particularly relevant in children presenting with poor muscular development, weakness, or inadequate nourishment. Clinical studies combining such interventions have reported improvements in selected motor and functional outcomes. [2,5] However, the extent to which these effects represent systemic nutritional action, sensory stimulation, concomitant medication, rehabilitation, or their combined influence remains uncertain.

Thus, the possible therapeutic effects of *Panchakarma* may be viewed through an integrated framework of **sensory stimulation, modulation of neuromuscular function, facilitation of active rehabilitation, and traditional *Brimhana-Balya* support**. Dedicated mechanistic studies are required before causal pathways can be established.

5. Clinical Evidence and Critical Appraisal

The clinical evidence for *Panchakarma*-based interventions in children with developmental impairment is limited and predominantly derived from studies involving cerebral palsy. Available studies have assessed gross and fine motor function, muscle tone, activities of daily living, and acquisition of developmental milestones. [2-6] Therefore, these findings cannot be generalized to all forms of developmental delay.

Table 1. Clinical Evidence for *Panchakarma*-Based Interventions in Children with Developmental Impairment

Intervention	Study/Population	Major outcomes	Key limitation
<i>Rajayapana Basti</i> + <i>Baladi Yoga</i> [2]	Children with cerebral palsy and motor disability	Improvement reported in gross motor, fine motor and activities of daily living	Combined therapy; independent effect of <i>Basti</i> unclear
<i>Panchakarma</i> + oral <i>Ayurvedic</i> formulation [3]	Children with delayed milestones, particularly associated with cerebral palsy	Improvement reported in selected developmental parameters	Limited methodological detail and multimodal intervention
<i>Ayurvedic</i> interventions included in systematic review/meta-analysis [4]	Children with cerebral palsy	Potential benefit reported for selected outcomes, including spasticity	Considerable heterogeneity across studies
<i>Shashtika Shali Pinda Sweda</i> + <i>Samvardhana Ghrita</i> [5]	Children with cerebral palsy	Improvement in selected motor and developmental parameters	Small sample and combined intervention
Multimodal <i>Panchakarma</i> protocol [6]	Children with spastic cerebral palsy	Improvements reported in spasticity and functional parameters	Multiple simultaneous therapies prevent attribution to a single procedure

Overall, the evidence indicates a **possible supportive role** for *Panchakarma*-based interventions, particularly in children with motor-dominant developmental impairment. However, most studies employ combinations of *Abhyanga*, *Swedana*, *Basti*, internal medications, and other therapies. [2,3,5,6] Consequently, improvements cannot reliably be attributed to *Panchakarma* alone.

Methodological limitations include small sample sizes, heterogeneous patient populations, short intervention periods, inconsistent diagnostic criteria, limited blinding, variable control groups, and differences in developmental outcome measures. The systematic review evidence similarly highlights heterogeneity and limitations in the available trials. [4]

Another important issue is that developmental improvement should not be assessed solely through attainment of individual milestones. Future trials should employ validated instruments appropriate to the child's condition and age, such as standardized developmental assessment tools and, for children with cerebral palsy, measures including the Gross Motor Function Measure (GMFM). [10] This would allow clinically meaningful changes to be distinguished from maturation occurring naturally with increasing age.

Thus, current evidence should be considered **preliminary and hypothesis-generating rather than confirmatory**. *Panchakarma*-based interventions warrant further investigation as adjuncts to established multidisciplinary rehabilitation, particularly through trials capable of separating their effects from those of concurrent physiotherapy and pharmacological or *Ayurvedic* treatments.

6. Safety and Paediatric Considerations

Panchakarma procedures in children require greater caution than in adults because treatment tolerance, fluid balance, thermoregulation, skin sensitivity, and physiological reserve vary substantially with age and nutritional status. Paediatric protocols should therefore be individualized according to age, *Bala*, nutritional condition, neurological status, and the child's ability to cooperate with the procedure.

External therapies such as *Abhyanga* and *Shashtika Shali Pinda Sweda* are generally less invasive, but attention is still required to oil temperature, duration of therapy, skin reactions, hydration, fatigue, and thermal exposure. In children with motor impairment, special precautions are needed in the presence of contractures, reduced sensation, epilepsy, orthopedic deformity, feeding difficulties, or respiratory compromise.

Basti requires particular clinical supervision because inappropriate selection, excessive volume, unsuitable formulation, or poor procedural technique may result in discomfort, dehydration, altered bowel pattern, or poor tolerance. Procedures should therefore be performed only by practitioners experienced in paediatric *Panchakarma* and should not delay indicated medical, nutritional, neurological, or rehabilitative care.

Another important consideration is the safety and quality of medicated oils, decoctions, herbal formulations, and other substances used during *Panchakarma*. Standardization, botanical authentication, manufacturing quality, contamination testing, dose documentation, and adverse-event reporting are essential for reproducible paediatric research. [11] Paediatric clinical trials should also prospectively record treatment-related adverse events and reasons for withdrawal rather than reporting only therapeutic outcomes. [12]

For children with developmental delay, *Panchakarma* should therefore be viewed as an **adjunctive intervention within a multidisciplinary care plan**, with clear treatment indications, age-appropriate dosing and procedural modifications, systematic monitoring, and documented safety outcomes.

7. Research Gaps and Future Perspectives

The current evidence base for *Panchakarma*-based interventions in children with developmental delay remains insufficient for firm clinical conclusions. Most available studies involve cerebral palsy rather than heterogeneous developmental delay, use multimodal *Ayurvedic* protocols, and include relatively small samples. This limits the ability to determine which specific procedures are beneficial, for which developmental domains, and in which paediatric subgroups. [2-6]

Future studies should clearly define the developmental diagnosis and affected domains before intervention. Children with global developmental delay, isolated motor delay, cerebral palsy, language delay, or genetic and metabolic disorders should not be grouped together without appropriate stratification.

Standardized developmental and functional assessment tools should be used at baseline and follow-up so that observed changes can be distinguished from age-related maturation.

Research should also separate individual *Panchakarma* components wherever feasible. Trials comparing *Abhyanga*, *Shashtika Shali Pinda Sweda*, *Basti*, combined *Panchakarma*, and standard rehabilitation would help identify procedure-specific effects. Where combination therapy is evaluated, the protocol should be clearly standardized with respect to formulation, dose, treatment duration, frequency, age-related modification, and concurrent rehabilitation.

Mechanistic studies are another important priority. Potential effects on sensory processing, muscle tone, range of motion, sleep, autonomic regulation, motor learning, and participation in rehabilitation may provide more realistic and measurable pathways than broad claims of direct neurodevelopmental recovery. Objective measures such as GMFM scores, validated developmental scales, spasticity assessment, gait parameters, caregiver-reported functional outcomes, and quality-of-life measures should be incorporated wherever appropriate. [8,10]

Longer follow-up is also essential because short-term improvement in relaxation, flexibility, or cooperation does not necessarily indicate sustained developmental gain. Future trials should therefore evaluate persistence of benefit after treatment completion and include systematic adverse-event monitoring.

Overall, the next phase of research should move toward **diagnostically precise, adequately powered, controlled, and standardized paediatric trials** that evaluate *Panchakarma* as an adjunct to established developmental rehabilitation rather than as a replacement for multidisciplinary care.

8. Conclusion

Panchakarma-based interventions may have a supportive role in children with developmental delay, particularly when motor dysfunction, altered muscle tone, weakness, or poor functional performance are prominent. Procedures such as *Abhyanga*, *Shashtika Shali Pinda Sweda*, and *Basti* have been explored mainly in children with cerebral palsy and related developmental impairment, with preliminary reports of improvement in selected motor, functional, and developmental outcomes. [2-6]

However, the present evidence remains limited by small sample sizes, heterogeneous diagnoses, multimodal treatment protocols, short follow-up, and inconsistent outcome assessment. Therefore, *Panchakarma* should currently be considered an **adjunctive rehabilitative approach** rather than an independently established treatment for developmental delay.

Future research should focus on clearly defined paediatric populations, standardized age-appropriate *Panchakarma* protocols, validated developmental and functional outcome measures, adequate control groups, long-term follow-up, and systematic safety monitoring. Such methodologically robust studies are essential to determine whether *Panchakarma* can provide reproducible and clinically meaningful benefit within multidisciplinary developmental rehabilitation.

9. References

1. Juneja M, Gupta A, Sairam S, Jain R, Sharma M, Thadani A, et al. Diagnosis and management of global development delay: consensus guidelines of Growth, Development and Behavioral Paediatrics Chapter, Neurology Chapter and Neurodevelopment Paediatrics Chapter of the Indian Academy of Paediatrics. *Indian Pediatr*. 2022;59(5):401-415. ([PubMed](#))
2. Shailaja U, Rao PN, Girish KJ, Arun Raj GR. Clinical study on the efficacy of Rajayapana Basti and Baladi Yoga in motor disabilities of cerebral palsy in children. *Ayu*. 2014;35(3):294-299. doi:10.4103/0974-8520.153748. ([PubMed](#))
3. Pandey VB, Kumar A. Clinical evaluation of oral *Ayurvedic* formulation and *Panchakarma* procedures in delayed milestone disorders in children w.s.r. to cerebral palsy. *Anc Sci Life*. 2012;32(Suppl 1):S39. doi:10.4103/0257-7941.112010. ([PMC](#))

4. Rocha AMO, Len CA, Santos FH, Iglesias SBO, Bissoto JR. A systematic review and meta-analysis focusing on the use of *Ayurvedic* medicine in cerebral palsy. *J Ayurveda Integr Med*. 2024;15(5):101035. doi:10.1016/j.jaim.2024.101035. ([PubMed](#))
5. Vyas AG, Kori VK, Rajagopala S, Patel KS. Etiopathological study on cerebral palsy and its management by Shashtika Shali Pinda Sweda and Samvardhana Ghrita. *Ayu*. 2013;34(1):56-62. doi:10.4103/0974-8520.115450. ([PubMed](#))
6. Bhinde SM, Patel KS, Kori VK, Rajagopala S. Management of spastic cerebral palsy through multiple *Ayurveda* treatment modalities. *Ayu*. 2014;35(4):462-466. doi:10.4103/0974-8520.159044. ([PubMed](#))
7. Proske U, Gandevia SC. The proprioceptive senses: their roles in signaling body shape, body position and movement, and muscle force. *Physiol Rev*. 2012;92(4):1651-1697. doi:10.1152/physrev.00048.2011. ([PubMed](#))
8. Novak I, Morgan C, Fahey M, Finch-Edmondson M, Galea C, Hines A, et al. State of the evidence traffic lights 2019: systematic review of interventions for preventing and treating children with cerebral palsy. *Curr Neurol Neurosci Rep*. 2020;20(2):3. doi:10.1007/s11910-020-1022-z. ([PubMed](#))
9. Alizad V, Sajedi F, Vameghi R. Muscle tonicity of children with spastic cerebral palsy: how effective is Swedish massage? *Iran J Child Neurol*. 2009;3(2):25-29. ([Pedro](#))
10. Russell DJ, Rosenbaum PL, Wright M, Avery LM. *Gross Motor Function Measure (GMFM-66 & GMFM-88) user's manual*. 2nd ed. London: Mac Keith Press; 2013.
11. World Health Organization. *Quality control methods for herbal materials*. Geneva: World Health Organization; 2011. ([World Health Organization](#))
12. World Health Organization. *Promoting safety of medicines for children*. Geneva: World Health Organization; 2007. ([World Health Organization](#))