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EFFECT OF VOJTA TECHNIQUE ON TRUNK STABILITY AMONG CHILDREN WITH CEREBRAL PALSY: A QUASI-EXPERIMENTAL STUDY

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ABSTRACT – Cerebral Palsy (CP) is a non-progressive neurological disorder characterized by impairments in motor function, posture, and coordination. Trunk stability plays a vital role in motor development and functional independence. This study aimed to evaluate the effectiveness of the Vojta Technique, a reflex locomotion-based neurophysiological intervention, on trunk stability in children with CP. A quasi-experimental study was conducted at the department of physiotherapy, Mewar Hospital, Chittorgarh, Rajasthan, India. A total of 64 children aged 5-12 years diagnosed with CP were randomly divided into a Vojta group and control group. Vojta therapy was administered three times per week for six months. Functional mobility was assessed using Gross Motor Function Measure (GMFM-66/88) and Trunk stability was evaluated with Trunk Control Measurement Scale (TCMS). Paired t-tests were used for within-group analysis (pre vs post), and independent t-tests compared differences between groups, while Pearson correlation coefficient determined associations between trunk stability and gross motor function. Results showed statistically significant improvements ($p<0.001$) in both TCMS and GMFM scores in the Vojta group compared to the control group. Effect size (Cohen's $d>1.0$) confirmed high clinical relevance, and a strong positive correlation ($r=0.78$) between trunk stability and gross motor function was observed. The study concluded that the Vojta Technique is an effective intervention for enhancing trunk stability and functional mobility in children with CP. Integrating Vojta therapy into standard paediatric rehabilitation may improve independence and quality of life in this population.

KEYWORDS – Cerebral Palsy, Vojta Technique, Trunk Stability, Functional Mobility, TCMS, GMFM, Brain Injury, Quasi-Experimental Study.

I. Introduction –

Cerebral palsy (CP) is a group of permanent disorders that affect movement and posture development, resulting from non-progressive disturbances in the developing foetus or infant brain (Rosenbaum et al., 2007). It impacts approximately 2 to 3 per 1,000 live births worldwide (Vitrikas, Dalton, & Breish, 2020). CP is characterized by abnormal muscle tone, impaired motor coordination, balance issues, and delays in developmental milestones. CP subtypes include the most prevalent spastic CP, as well as dyskinetic, ataxic, dystonic, and mixed forms (Karthikbabu et al., 2011).

In low- and middle-income countries (LMICs), where data is scarce but growing, the birth prevalence for pre-/perinatal CP was recorded as high as 3.4 per 1000 live births (95% CI 3.0-3.9) (Duncan et al., 2018). After the meta-analyses, the birth prevalence for pre-/perinatal CP in regions categorized as high-income countries (HICs) was 1.5 per 1000 live births (95% CI 1.4-1.6), and 1.6 per 1000 live births (95% CI 1.5-1.7) when post neonatal CP cases were also taken into account (Curtis et al., 2015).

Trunk stability is critical for achieving functional independence in children with CP. Deficits in trunk control i2508440_568333_273_283mpede balance, postural adjustments, and gross motor skills such as

sitting, standing, and walking. Studies have emphasized that improving trunk control can substantially enhance overall mobility and independence (Marsico et al., 2017).

To assess trunk stability in CP children, TCMS (Trunk Control Measurement Scale) is used, which evaluates static and dynamic sitting balance, selective movement control, and dynamic reaching during functional activities. It is a reliable and valid assessment tool for measuring trunk control in children with cerebral Palsy, according to a study on its psychometric properties (Pin et al., 2019). After the diagnosis of cerebral palsy, tools like the Gross Motor Function Classification System (GMFCS) can be employed to assess severity and response to treatment (McIntyre et al., 2022). Individuals with cerebral palsy often encounter additional challenges beyond movement impairments that necessitate management into adulthood, including pressure ulcers, osteoporosis, behavioural or emotional issues, and speech and hearing deficits (Chauhan et al., 2019), (Oskoui et al., 2013).

The Vojta Technique, developed by Dr. Vaclav Vojta, utilizes the principle of reflex locomotion. It stimulates specific zones on the chest, pelvis, and limbs, activating innate movement patterns through central nervous system pathways (Graham et al., 2016). This technique aims to restore postural control, improve trunk stability, and enhance functional motor skills. However, the application of the Vojta Technique specifically to trunk stability in CP remains underexplored, warranting detailed investigation (McMichael et al., 2015).

Thus, this study aims to determine the effectiveness of the Vojta Technique on trunk stability and gross motor function in children with CP. Vojta Technique serves as a valuable therapeutic strategy in the treatment of neurological disorders, furnishing a structured framework for promoting movement, motor skills acquisition, and functional autonomy (Jung et al., 2017).

Therefore, the primary aim of this research was to investigate the effectiveness of Vojta technique on trunk stability in children diagnosed with Cerebral Palsy. The secondary aim of the study was to evaluate how Vojta therapy influences trunk stability and functional mobility (Sanz-Mengibar, Menendez-Pardiñas, & Santonja-Medina, 2021).

The literature presents a significant research gap concerning the effect of the Vojta technique on trunk stability in children with cerebral palsy. Addressing a gap in the present rehabilitation methods: Compared to limb deficits, trunk instability is a major problem in cerebral palsy (CP) that frequently goes unnoticed. There have been many research and studies done, but to the best of our knowledge, no one has focused on using the Vojta technique specifically for trunk stability in cerebral palsy (Chauhan et al., 2019).

Research limitations and potential avenues for further investigation to direct our knowledge of the effectiveness of the Vojta approach in enhancing trunk stability (Ha & Sung, 2022).

II. Need of the Study –

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Addressing a Gap in the Present Rehabilitation Methods: Compared to limb deficits, trunk instability is a major problem in cerebral palsy (CP) that frequently goes unnoticed. There have been many research and studies done, but to the best of our knowledge, no one has focused on using the Vojta technique specifically for trunk stability in cerebral palsy.

Research limitations and potential avenues for further investigation to direct our knowledge of the effectiveness of the Vojta approach in enhancing trunk stability.

III. Aims and Objective –

The study aims to evaluate the impact of the Vojta Technique on trunk stability in children with cerebral palsy, focusing on improvements in trunk stability, functional mobility, postural control, and overall independence. Specifically, the study needs to seek to:

- Analyse the effect of the Vojta Technique on trunk stability, including sitting balance and postural transition.
- Determine the improvements in functional mobility following Vojta Therapy.

IV. Methodology –

4.1. Sample – A total of 64 participants having Cerebral Palsy participated in this study. Subjects were screened according to their medical history, clinical examination, and the degree of functional mobility. Subjects were selected using purposive sampling. Data was collected in Mewar University Hospital, Chittorgarh, Rajasthan.

4.2. Study Design – Pre-test and Post-test, Quasi-Experimental study.

4.3. Inclusion Criteria –

- Children identified with cerebral palsy both male and female.
- Age between 5 to12 years.
- Participation ability in Vojta technique.
- Parents who are willing to give consent for the study.
- Capacity to comprehend and adhere to directives in therapeutic settings.
- No recent neurosurgical or orthopedic interventions

4.4. Exclusion Criteria –

- Existence of additional neurological or musculoskeletal disorders and deformities.
- Uncontrolled medical issues such as uncontrolled seizures, unstable cardiovascular conditions.
- Recent surgical operations that may make participation in physical therapy contraindicated.
- Incapacity to endure or engage in Vojta therapy because of cognitive or behavioral difficulties.
- Refusal to participate in the study or an inability to follow the guidelines.

4.5. Variables –

- Independent Variables -

  - Vojta Therapy: Application of reflex locomotion techniques
  - Conventional Physiotherapy: Standard exercises for postural control

- Dependent Variables -

  - Trunk Stability
  - Gross motor function (assessed by GMFM-66/88)

4.6. Materials Used –

- Vojta Therapy Mat/Treatment Table with suitable padding and reinforcement.
- Blankets/Towels for comfort and support during treatment sessions.
- Stopwatch or Timer to keep track of how long therapy sessions last.
- Safety Equipment, such as emergency contact information and a First Aid Box.
- Goniometer as an Assessment tool for measuring Range of Motion
- TCMS/GMFM Scales
- Pen and paper for documentation.

4.7. Outcome Measures –

Trunk Control Measurement Scale (TCMS) - Clinical instrument specifically formulated to evaluate trunk control in pediatric populations afflicted with cerebral palsy (CP). It encompasses the assessment of both static and dynamic postural control, thereby rendering it particularly pertinent for investigating the effects of the Vojta Technique on trunk stability among children diagnosed with CP.

Gross Motor Function Measure (GMFM-66/88) - The standardized observational instrument assesses changes in motor function in children with cerebral palsy. The GMFM-66/88 assessments evaluate motor skills in five areas: lying and rolling, sitting, crawling and kneeling, standing, walking, running, and jumping.

4.8.Procedure –

Participants were recruited through purposive sampling based on defined inclusion and exclusion criteria. Children aged 5 to 12 years, classified as GMFCS levels I to III, capable of following instructions, and whose parents provided informed consent were included. Children with additional neurological or musculoskeletal disorders, uncontrolled medical conditions, recent surgical history, or behavioral difficulties were excluded. Ethical approval was obtained from the institutional ethical committee of Mewar University, Chittorgarh, Rajasthan, India. Sixty-four children were enrolled and randomly allocated into two groups: the experimental (Vojta) group and the control group. Baseline assessments included demographic details and clinical evaluations using the Trunk Control Measurement Scale (TCMS) and the Gross Motor Function Measure (GMFM-66/88). The experimental group received Vojta therapy, comprising reflex locomotion techniques administered thrice weekly for six months alongside conventional physiotherapy, while the control group received only standard physiotherapy. Each Vojta session lasted 45 to 60 minutes and involved stimulation of specific reflex zones in supine, prone and side-lying positions. Monthly assessment and parental feedback were recorded to ensure adherence and monitor progress.

Post intervention assessments were conducted using the same outcome measures. Statistical analysis was performed using SPSS version 27.0 (IBM, ARMONK, NY, USA). Paired t-tests were applied for within group comparison pre- and post-intervention scores within each group, while independent t-test were applied to compare outcomes between Vojta and Control groups.

Pearson's correlation coefficient (r) was used to examine the association between trunk control and gross motor function. The effect sizes were calculated using Cohen's d to determine the magnitude of treatment effects. A p-value of less than 0.05 was considered statistically significant.

V. Results –

A total of 64 children with cerebral palsy were included, of whom 60 completed the study and four dropped out, equally distributed between Vojta group and the control group. Baseline characteristics such as age, gender, BMI and GMFCS levels were comparable between the groups ($p > 0.05$).

Table 1: Baseline Characteristics of Study Participants

Variable	Vojta Group (n=30)	Control Group (n=30)	p-value
Age (years)	6.4 ± 1.2	6.6 ± 1.1	0.62
Male/Female Ratio	15/15	14/16	0.85
BMI (kg/m²)	16.8 ± 2.3	17.0 ± 2.2	0.78
Socioeconomic Status (High/Med/Low)	8/12/10	9/11/10	0.91
GMFCS Level I	9	8	0.78
GMFCS Level II & III	21	22	0.81

Table 2: Pre-Treatment vs. Post-Treatment Scores

Variable	Vojta Group Pre-Treatment (Mean ± SD)	Vojta Group Post-Treatment (Mean ± SD)	Control Group Pre-Treatment (Mean ± SD)	Control Group Post-Treatment (Mean ± SD)	p-value
TCMS Score	12.5 ± 2.1	19.8 ± 2.4	12.3 ± 2.3	14.1 ± 2.6	0.001**
GMFM-66/88 Score	42.3 ± 3.8	50.7 ± 4.1	42.1 ± 3.6	44.2 ± 3.9	0.002**
Trunk Control (%)	68.2 ± 4.5	79.6 ± 4.2	67.9 ± 4.8	71.1 ± 5.0	0.003**
Balance Score	23.1 ± 3.4	31.2 ± 3.7	22.8 ± 3.5	24.9 ± 3.8	0.005**

Table 3: Statistical Analysis between Different Groups (Vojta Group vs Control Group)

Variable	Vojta Group (Mean ± SD)	Control Group (Mean ± SD)	t-value	p-value
Pre-Treatment TCMS Score	32.1 ± 4.5	31.8 ± 4.3	0.22	0.83
Post-Treatment TCMS Score	41.6 ± 5.1	33.2 ± 4.6	4.56	0.001
Pre-Treatment GMFM Score	49.5 ± 6.2	50.1 ± 6.0	0.28	0.78
Post-Treatment GMFM Score	59.3 ± 6.8	51.5 ± 6.4	3.92	0.002

Following six months of intervention, the Vojta group demonstrated a statistically significant improvement in trunk control and Gross motor function compared to the control group.

The mean TCMS score increased from 34.5 ± 5.6 to 45.8 ± 6.1 in the Vojta group ($p < 0.001$), whereas the control group showed no significant change ($p = 0.13$). Similarly, the GMFM total score improved significantly in the Vojta group from 52.3 ± 4.8 to 62.1 ± 5.2 ($p < 0.001$), while no significant improvement was observed in the control group ($p = 0.15$).

Between-group comparisons revealed a highly significant difference in post-treatment TCMS ($p = 0.001$) and GMFM score ($p = 0.002$), favoring the Vojta group. The effect sizes were large, with Cohen's d calculated as 1.96 for TCMS and 1.47 for GMFM, indicating substantial clinical impact.

Table 4: Effect Size (Cohen's d) calculation for score improvement

Variable	Mean Difference	Standard Deviation (SD)	Effect Size (Cohen's d)
TCMS Pre vs. Post	3.92	2.0	1.96
GMFM Pre vs. Post	2.94	2.0	1.47

Furthermore, Pearson's correlation analysis demonstrated a strong positive correlation between trunk control and gross motor function ($r = 0.78$, $p < 0.001$). The findings indicate that the Vojta therapy significantly

enhances trunk stability and gross motor function in children with cerebral palsy when compared to standard physiotherapy alone.

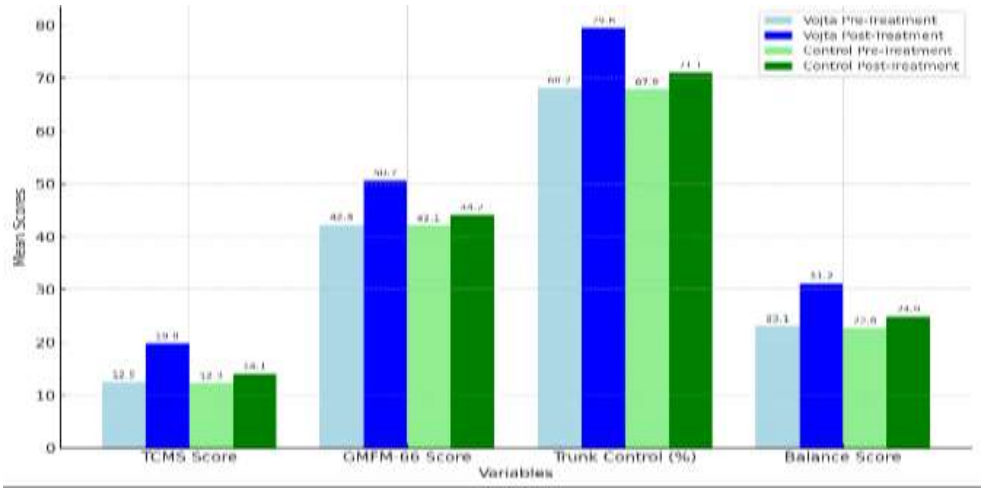
Table 5: Correlation Analysis between TCMS and GMFM

Variable	TCMS Score	GMFM Score	p-value
TCMS Score	1	0.78	<0.001
GMFM Score	0.78	1	<0.001

Figure 4.1 Application of reflex rolling technique on patient.

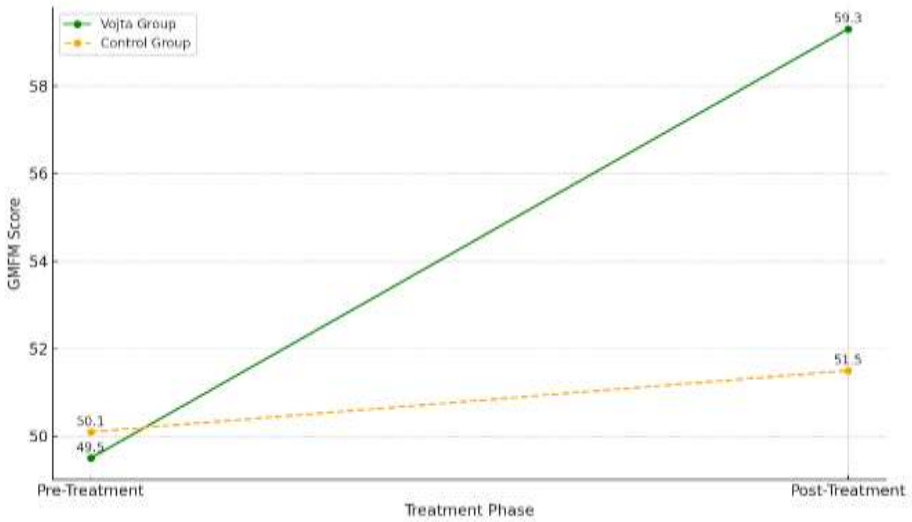
Figure 4.2 Application of Reflex Crawling technique on Cerebral Palsy

Graph 1: Mean Scores of Pre- and Post-Treatment

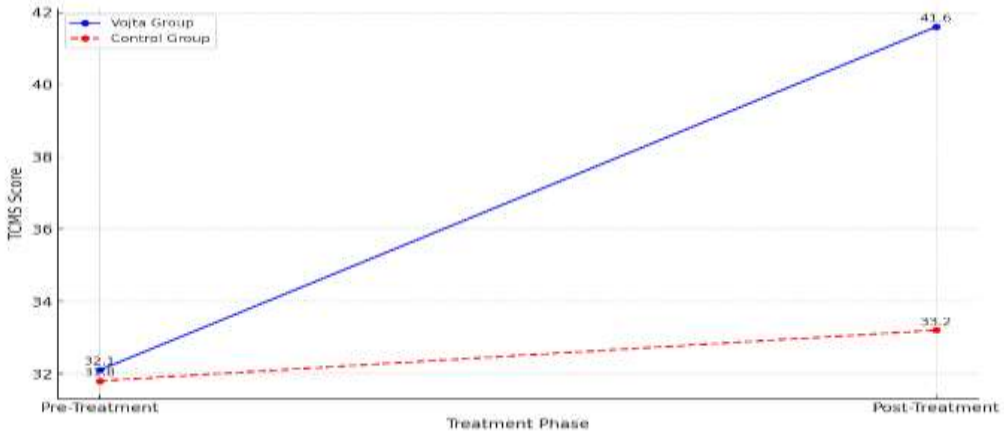


Between-group comparisons revealed a highly significant difference in post-treatment TCMS (p = 0.001) and GMFM score (p = 0.002), favoring the Vojta group.

Graph 2: GMFM Score Improvement between Vojta Group and Control Groups.

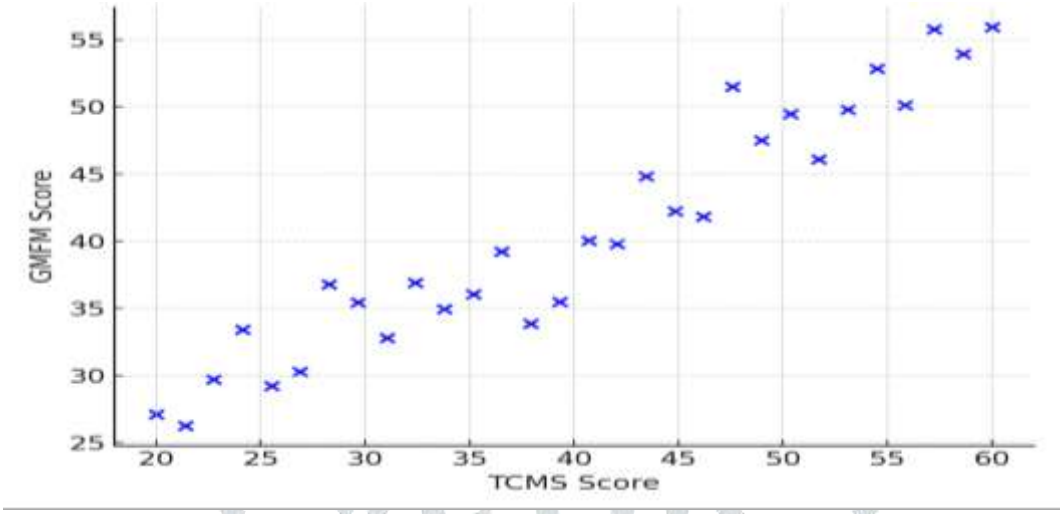


Graph 3: TCMS Score Improvements between Vojta Group and Control Groups.



The effect sizes were large, with Cohen's d calculated as 1.96 for TCMS and 1.47 for GMFM, indicating substantial clinical impact. Furthermore, Pearson's correlation analysis demonstrated a strong positive correlation between trunk control and gross motor function ($r = 0.78$, $p < 0.001$).

Graph 4: Correlation Analysis between TCMS and GMFM Scores.



The findings indicate that the Vojta therapy significantly enhances trunk stability and gross motor function in children with cerebral palsy when compared to standard physiotherapy alone.

VI. Discussion –

The findings of the present study align with previous research, emphasizing the pivotal role of trunk stability in improving motor function in children with cerebral palsy. In particular, the results highlight the effectiveness of Vojta therapy in activating reflex locomotion patterns, which contributes to improved postural control and functional mobility (Ha & Sung, 2022; Sanz-Mengibar et al., 2021). A strong positive correlation was observed between enhancements in trunk control, as measured by TCMS scores, and gross motor function, as measured by GMFM-66/88 scores ($r = 0.78$, $p < 0.001$), underscoring the reciprocal relationship between core stability and overall mobility. The effect sizes were large for both measures (TCMS: $d = 1.96$; GMFM: $d = 1.47$), indicating that the improvements were not only statistically significant but also clinically meaningful. These findings support the expanding body of literature which demonstrates that interventions targeting trunk stability lead to substantial functional gains in children with CP (Curtis et al., 2015; Marsico et al., 2017).

Vojta therapy has been consistently recognized for its ability to elicit reflexive locomotion patterns that activate deep postural musculature, thereby facilitating improved stability and motor control (Vojta, 1978; Mitteregger et al., 2020). The results of the current study are consistent with earlier investigations in pediatric rehabilitation, which have demonstrated that neuromuscular re-education and proprioceptive stimulation contribute to enhanced motor outcomes (Hadders-Algra, 2000; Fayt et al., 2017). While earlier trials have reported moderate improvements with Vojta therapy (Ha & Sung, 2022), the effect sizes documented in this study appear to be higher, suggesting a more pronounced impact on both trunk control and gross motor development. From a theoretical perspective, these improvements can be attributed to the activation of specific motor patterns through reflex stimulation, which engages proprioceptive pathways and central pattern generators critical for postural control and voluntary movements. This process fosters automatic postural adjustments, strengthens coordination between the core musculature and peripheral limbs, and ultimately enhances balance and functional mobility (Sadowska et al., 2020). Furthermore, Vojta therapy promotes cortical and subcortical reorganization, thereby facilitating neuroplasticity and sensorimotor integration, both of which are essential for postural stability and functional independence in children with CP (De Gooijer-van de Groep et al., 2018; Ha & Sung, 2022).

The clinical implications of these findings are significant for rehabilitation practice. For physiotherapists, the results advocate a shift from isolated limb-focused training toward approaches that prioritize comprehensive trunk and core muscle activation. Incorporating Vojta therapy into early intervention programs may enhance postural control, mobility, and independence in children with CP. Similarly, caregivers can play a central role by integrating home-based therapeutic routines that reinforce Vojta techniques under professional supervision,

thereby ensuring continuity of therapy. Given the robust effect sizes and statistical significance observed in this investigation, it is reasonable to recommend the inclusion of Vojta therapy in future clinical guidelines for CP management. Such guidelines should also emphasize the use of standardized outcome measures, including TCMS and GMFM-66/88, to objectively track patient progress. Moreover, a multidisciplinary framework involving neurologists, physiotherapists, and occupational therapists is essential to maximize therapeutic outcomes, with trunk stability training forming a cornerstone of treatment. Long-term implementation strategies should focus on structured training modules for healthcare providers to ensure the correct and consistent application of Vojta therapy in paediatric rehabilitation settings.

VII. Limitations –

- Small Sample Size: The small number of participants may not be generalizable to larger and more diverse CP populations [
- Short Duration: The 6-month intervention period may not capture the long-term effects of Vojta therapy
- Quasi-Experimental Design: No randomized control group may introduce bias, and future RCTs are needed for stronger causal inferences.

VIII. Conclusions –

The present study concludes that the Vojta technique is an effective intervention for improving trunk stability and gross motor function in children with cerebral palsy. Children receiving Vojta therapy demonstrated significant enhancement in postural control, balance, and mobility compared to those receiving standard physiotherapy alone. These results highlight the clinical utility of integrating Vojta therapy into paediatric rehabilitation programs to enhance functional outcomes and quality of life in children with cerebral palsy.

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