Summary of ERIC Project

Adaptation of Indian Folk Games to Enhance Physical Activity and Academic Performance in School-going Children with Cerebral Palsy (Aged 5–18 Years)

Mansoor Rahman A.* and Kavitha Raja**

Background

The World Health Organization (WHO) reports that physical inactivity accounts for approximately 6 per cent of global deaths, making it the fourth leading risk factor for mortality worldwide. Engaging children and young adults in regular participation in physical activity is crucial not only for improving health but also for promoting social development. Physically active children tend to demonstrate higher academic achievement, enhanced self-confidence, better social interactions, and an improved quality of life (Zayed et al., 2024).

Children with disabilities, including Cerebral Palsy (CP), face unique challenges in maintaining physical activity. The Rights of Persons with Disabilities Act, 2016, recognises multiple disability categories ranging from visual impairments and mobility issues, to neurological and genetic conditions; covering 7 to 21 types of disabilities. Children with CP, with an estimated incidence of approximately 1.5 to 2.5 per 1,000 live births, often encounter additional hurdles, such as sensory, perceptual, cognitive, communication, and behavioral challenges. Despite many children with CP being academically capable and attending mainstream schools, their participation in physical activity is limited due to factors like lack of interest, time constraints, inadequate professional support, infrastructural deficits, and societal attitudes.

**Assistant Professor,* JSS College of Physiotherapy, Mysore, Karnataka (e-mail: Rahman.paediatry@gmail.com)

***Professor*, JSS College of Physiotherapy, Mysore, Karnataka (e-mail: kavitharaja_jsscpt@jssonline.org)

To address these barriers, adapted physical education emerges as a promising intervention. This individualised approach tailors physical and motor activities to meet each child's specific needs, promoting motor skills, physical fitness, and overall well-being. Research indicates that adapted sports and recreational activities for children with CP can foster inclusion, reduce physical deconditioning, improve physical functioning, and enhance quality of life. Such programmes encourage social integration and help children develop confidence and independence.

While there is extensive literature on adapted physical education and game modifications in western contexts, applying similar strategies in India, particularly in rural areas, requires culturally relevant and resource-efficient solutions. Western sports, especially those showcased in the Paralympics, often demand significant infrastructure and professional expertise, which may be lacking in Indian settings. Consequently, adapting traditional folk games presents a feasible alternative. These games, deeply rooted in Indian culture, are simple, low-cost, require minimal equipment have been passed down informally through generations. They can be easily modified to accommodate children with CP, providing opportunities for physical activity and social participation. Incorporating folk games into physical education curricula not only promotes health and inclusion but also helps preserve traditional Indian cultural practices.

Hence, this study was carried out with adaptations designed to serve as effective, culturally appropriate tools to combat sedentary lifestyles, improve health outcomes, and enhance academic performance among children with CP aged 5–18 years.

Objectives of the Study

The study was carried out with the following objectives:

1. To identify, list, and document folk games adaptable to children with CP in the Indian context.
2. To translate and adapt the outcome measures into Kannada and Tamil languages.
3. To develop an adapted physical education programme using traditional folk games.
4. To perform a baseline evaluation of children with CP using the specified outcome measures.

Methodology

In phase one of the study, a systematic five-step procedure was followed. Initially, folk games suitable for adaptation to children with CP within the Indian context were identified, documented through video recordings, and compiled into a comprehensive list. The second step involved reviewing existing game classification systems to understand how games are categorised based on their perceived health benefits, focusing on the health domains relevant to children with CP. In the third step, each game underwent a functional and biomechanical analysis to assess its suitability and potential benefits for children with CP, considering their specific physical capabilities and limitations. The fourth step involved developing a structured framework for adapted physical education (APE), integrating traditional games, tailored to meet the needs of children with CP, and promoting their participation in physical activity. Finally, the outcome measures were translated into Kannada to ensure accessibility and applicability within the local context. This structured approach aimed to create culturally relevant, feasible, and effective strategies for promoting physical activity among children with CP through the adaptation of traditional folk games.

The process of listing traditional Indian games was carried out using an ethnographic qualitative research method. To obtain information about the traditional Indian games, the authors decided to use several strategies. These strategies consisted of extracting information about games from books, websites, journals, and experts through in-depth interviews. Using these resources, a list of 32 traditional Indian games was prepared. These listed games were then video-recorded using skilled players from the respective cultural zone (Kongunadu zone of South India). The video documentation process adhered to established guidelines from previous literature, ensuring standardisation in player instructions, court selection, and camera placement.

Following this, the listed games were examined for their functional contributions using an operationalised conceptual model that covered key health domains like communication, cognition, gross motor and fine motor skills. The movement required for gameplay were determined through a movement analysis of each game, with an emphasis on the joint movements and muscle contractions in each phase of the game.

Then, the narrative synthesis was carried out to identify the appropriate adapted physical education framework for the concept 'adaptation of traditional Indian games for children with cerebral palsy (CP)'. This guided us to adapt each game ensuring inclusivity and effectiveness in enhancing physical activity and academic performance for children with CP. Finally, the outcome measures were translated into native language (Kannada and Tamil) using a cross-cultural adaptation methodology for self-report measures (Beaton et al., 2000).

The second phase of this project involved the compilation of a screening battery for children with CP based on expert opinion. Participants were recruited through multistage cluster sampling from data provided by the Deputy Director of Public Instructions (DDPI) in the Mysore zone, which comprises seven areas: Periyapattna, Hunsur, HD Kote, T. Narsipura, Nanjangud, Mysore North, and Mysore South. Screening camps were organised in each area, and lists of children were obtained from Block Resource Teachers (BRTs). Prior to the camps, parents or guardians received information regarding the date, time, and location of the screening sessions. Using the developed screening battery, all children from the lists were screened, and those identified as having CP and those who met the inclusion and exclusion criteria were recruited. A total of 236 children attended the screening camps across the seven areas; out of these, 106 children qualified for participation, although six children declined to participate.

This recruitment process was conducted after obtaining approval from the BRTs overseeing each zone. The methodology and purpose of the study were explained to both the resource teachers and special education teachers, who assisted in implementing the adapted physical education protocol. Informed consent was obtained from the parents and guardians, who were also briefed about the intervention protocol and its potential benefits. Demographic information, including age, gender, and functional classification based on the Gross Motor Function Classification System (GMFCS), was recorded to facilitate analysis and ensure appropriate tailoring of interventions. Then, the outcome measures {Brockport Physical Fitness Test (BPFT), SEABRS, and Academic Performance Rating Scale (APRS)} were administered for all the recruited participants.

Based on the pre-test results from the outcome measures, an individualised problem list was developed for each child. Traditional

Indian games were then mapped to these problem areas, targeting specific physical and academic skills that needed improvement. For every child, 2–3 games were selected for each skill area, resulting in a total of 8 to 10 games per child. A list of these selected games was shared with the children and their parents or caregivers as part of the adapted physical education protocol.

From this list, each child or their parent or caregiver chose 5–6 games that collectively addressed components such as strength, flexibility, aerobic fitness, and academic engagement. These games were then tailored to suit the child's functional abilities using the APE framework for traditional games. Children who selected the same or similar games were grouped together for the intervention. The adapted physical education sessions were conducted for 45 minutes to one hour per day, three times a week, over the course of one academic year. Following the intervention, post-test assessments were carried out to evaluate the outcomes.

The researchers checked the assumption of normality for these dependent variables. All variables were not normally distributed, necessitating the use of non-parametric statistics, therefore, the Wilcoxon signed-rank test was used. The Wilcoxon signed-rank test for paired samples such as hand grip, seated pushups, modified curl ups, APRS score, SEABRS score, and Chi-square tests for ordinal variables of BPFT such as reverse curl ups, modified Thomas test, modified Apley's test and Target Aerobic Movement test was used.

Results

A total of 236 children from seven cultural zones of Mysuru were initially contacted for participant recruitment. Out of these, 106 children met the study's inclusion and exclusion criteria. However, six children declined to participate, resulting in a final sample of 100 participants; comprising 50 children with GMFCS Level I and 50 with GMFCS Level II. The group included 46 males and 54 females.

Following the intervention, children with CP demonstrated significant improvements in physical fitness measures. Notable gains were observed in hand grip strength ($p < 0.001$), seated push-ups ($p = 0.022$), and modified curl-ups ($p < 0.001$), as assessed by the Brockport Physical Fitness Test. Additionally, academic performance and behaviour scores also showed significant improvements, with both APRS and SEABRS scores yielding p-values of less than 0.001.

Discussion

One of the significant challenges in the current physical education systems, particularly in India, is the limited capacity to accommodate children with special needs within inclusive, therapeutic playground environments. These environments often lack the necessary adaptability to address the individualised requirements of children with disabilities, particularly CP. This study represents a preliminary and novel attempt to examine the impact of adapting traditional Indian folk games as a means to enhance physical activity levels and academic performance in school-aged children (5–18 years) with CP.

The results of this study demonstrated marked improvements in several domains of physical fitness and academic performance. Specifically, statistically significant gains were noted in hand grip strength, upper body strength or endurance (seated push-ups), abdominal strength or endurance (modified curl-ups), and academic performance scores as measured by APRS and SEABRS. These findings are consistent with existing literature that emphasises the role of adapted physical activity programmes in improving strength, endurance, social engagement, and psychological well-being among children with CP. For instance, previous studies also reported that engagement in sports is associated with higher levels of motor proficiency and physical fitness among children with disabilities.

The substantial improvement observed in grip strength may be attributed to the repeated engagement of gripping functions in various traditional games. For example, games like *gilli-danda* involve cylindrical gripping of the stick, and arm wrestling involves sustained interlocking and pushing of hands. Researches also supports the idea that repetitive use of specific muscle groups enhances strength and functional capacity. The alignment of our findings with prior studies underscores the efficacy of game-based motor task repetition in strengthening hand function.

Furthermore, improvements in upper and abdominal strength can be associated with the dynamic and transitional movement patterns inherent to many of the traditional games used in this study. For example, games like hopscotch require trunk flexion and extension to place and retrieve tokens from a grid, and 'lock and key' requires children to use their upper extremities to transition from squatting to standing. These movement patterns engage multiple muscle groups in a coordinated fashion, encouraging the activation

of agonistic and antagonistic muscles to improve joint stability and muscular strength. Such findings are supported by biomechanical research highlighting the benefits of multidirectional and weight-transferring activities on muscle strength development.

While a few of the adapted games included elements aimed at improving flexibility, the study did not observe statistically significant changes in upper or lower limb flexibility. This may be due to a ceiling effect noted during baseline measurements, where most children classified under GMFCS Levels I and II already demonstrated adequate flexibility as measured by the modified Apley's and Thomas tests. Additionally, flexibility was not a primary goal for all participants, many of whom had educational and behavioural outcomes prioritised in their individualised goals.

Aerobic capacity, as measured by the Target Aerobic Movement Test (TAMT), was generally low among participants, aligning with the findings of Olaf Verschuren et al., (2021) who reported reduced aerobic capacity in children with CP (GMFCS I and II) compared to typically developing peers. Although none of the children fully met the aerobic test criteria, there were notable improvements in maintaining heart rates within target zones post-intervention, indicating a positive trend in cardiovascular endurance.

CP, being a complex neuro-developmental disorder, can impact both cognitive and motor domains of function. This study primarily focused on educational outcomes such as academic performance, social or emotional behaviour, and classroom engagement. Significant improvements were noted in all key academic domains, including writing, reading, verbal communication, attention, and classroom behaviour.

Writing skills, often impaired in children with CP due to deficits in fine motor control, motor planning, and strength, improved significantly. The selected traditional games incorporated visuomotor coordination, in-hand manipulation, and upper extremity strengthening, key components to support handwriting development. These findings are in agreement with previous research highlighting the effectiveness of motor-based interventions in improving handwriting and academic output in this population (Suggate et al., 2023).

Language and communication skills—both expressive and receptive were positively influenced by the oral and social nature of traditional games. Many of these games are inherently communicative, involving chants, rhymes, verbal interactions,

and peer feedback. The social play context provided naturalistic opportunities to practice speech, respond to social cues, and engage in structured communication, supporting both language development and reading fluency.

Attention and executive functioning—areas often impaired in children with CP due to slower information processing and reduced problem-solving abilities—were also enhanced. Many traditional games used in this study involve planning, sequencing, and attentional control across multiple levels of difficulty. For example, *goli atta* requires goal setting, motor precision, and attentional shift across phases of gameplay, while 'five stones' increases attentional demands progressively. Initial difficulties in task focus were noted in some children but improved with repeated participation and familiarity.

Social interactions, cooperation, and peer engagement were also positively influenced. Traditional Indian games often include self-governed rules for turn-taking, player elimination, and role assignments, such as the indigenous method of selection called 'saa-boo-three.' These practices promoted leadership, teamwork, and inclusive social behavior. Activities such as preparing the play area and organising gameplay fostered planning and cooperation, contributing to improved peer relationships, and social-emotional development.

Limitations and Future Directions

One of the major limitations of this study is the absence of a sedentary or non-intervention control group. Future randomised controlled trials are needed to strengthen the causal evidence supporting the efficacy of adapted traditional Indian games. Additionally, many benefits were observed such as improved self-confidence, posture, and classroom participation were reported primarily anecdotally by teachers and caregivers, but were not captured through standardised measures. Future studies should include objective assessments of posture, balance, and psychosocial outcomes. Furthermore, integrating adapted traditional games into inclusive education policies and physical education curricula could broaden access to therapeutic play-based interventions for children with CP and other disabilities.

Conclusion

This study demonstrates that adapting traditional Indian folk games into an inclusive, structured physical education framework

is not only feasible, but also significantly beneficial in enhancing both physical and academic outcomes for school-aged children with CP. By leveraging culturally relevant, cost-effective, and engaging play strategies, this approach holds promise as a scalable model for inclusive education and rehabilitation in resource-constrained settings. The findings underscore the potential of traditional games as therapeutic tools that promote physical fitness, academic success, and social inclusion in children with developmental disabilities.