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Original Article

Paediatrics Section

Effectiveness of Art Therapy and Physical Activity in Improving Quality of Sleep in Children with Hemiplegic Cerebral Palsy: A Quasi-experimental Pilot Study

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ABSTRACT

Introduction: Hemiplegic Cerebral Palsy (CP) is characterised by abnormalities in movement and posture, along with sensory and tone abnormalities. It also represents significant impairments in cognition and sleep quality. Art activity involves playfulness, creativity, improvisation, and brings benefits to cognition and the alleviation of mental suffering. Physical activity shows considerable improvement in sleep quality as it concentrates on cardiorespiratory fitness and increases total energy expenditure.

Aim: To evaluate the effect of art therapy and physical activity on sleep quality in children with hemiplegic CP.

Materials and Methods: This quasi-experimental pilot study was performed among six ambulant children with hemiplegic CP in December 2022 at MGM School of Physiotherapy, Aurangabad, Maharashtra, India. Both male and female children aged between 4 to 12 years were included in the study. Pretest scores were recorded using the Paediatric Sleep Questionnaire (PSQ). The participants then underwent a physiotherapy protocol lasting one hour, which included art therapy along with upper limb physical activities for four weeks. Art therapy included colouring pictures, drawing geometrical shapes, line-drawing connections, thumbprints, and vegetable prints. The protocol was given for one month, which included three sessions of art therapy and physical activity each week. Parents and children were encouraged to follow the protocol before sleep. At the end of one month, postscoring of all outcome measures was calculated, and statistical analysis was done using the paired t-test.

Results: From the results, the median pretest and post-test PSQ scores were 0.68 and 0.49, respectively. Interquartile Range (IQR) value for the outcome measure was 0.0675 and 0.0775, which was significant.

Conclusion: Art therapy, along with physical activity, improved sleep quality in children with hemiplegic CP.

Keywords: Art intervention, Physiotherapy, Posture, Sleep quality, Tone abnormality

INTRODUCTION

The CP is a permanent movement and posture disorder that causes limitations in activities due to abnormalities in the foetal or newborn brain. With an incidence of 2.1 per 1000 live births, it is a significant contributor to impairments and disabilities, children with hemiplegic CP make up 39% of the overall CP population [1]. In children with CP, movement deficiencies frequently include poor coordination, muscular weakness, tremors, sensory deficits, poor vision, and difficulties with attention [1]. Spastic-type CP accounts for 85-91% of all CP cases, making it the most prevalent kind. Hemiplegia (38% of all spastic CP cases), diplegia (37%), and quadriplegia (24% of cases) are further subclassified into spastic CP. The causes of hemiplegic CP include stroke, vascular abnormalities, unilateral intraventricular haemorrhage, and periventricular leukomalacia [2]. Despite this, children with hemiplegic CP may have trouble adapting to and carrying out daily tasks. Movement and muscle tone are often affected on one side of the body in hemiplegic CP [3].

Around 23-46% of kids with CP experience sleep problems, and sleep disruption is thought to be highly frequent in this population. This prevalence is significantly higher than the 20-30% range observed in children with normal development [4]. Recent studies have found that poor sleep relates to increased pain sensitivity and disruption of the Hypothalamus-Pituitary-Adrenal Axis (HPA) [4-6]. In up to 50% of children with CP, studies have shown aberrant patterns on the Electroencephalogram (EEG) during sleep, including the lack of rapid eye movement and irregularities in the formation of sleep spindles [5]. Sleep difficulties may be correlated with a number of CP-related co-morbidities, including spasticity, dystonia, pain, seizures, behavioural problems, and visual impairments [6].

Numerous researches have been conducted on how children with CP use their motor skills. Nevertheless, the parents claim that learning challenges are more difficult, and that cognition is more important for communication, academic performance, involvement, and social functioning. Children with CP are more prone than typically developing kids to experiencing sleep issues, which can include trouble falling asleep, frequent night awakenings, pain or discomfort in bed, and early waking. Emphasising physical activity in children with CP has shown greater results in improving sleep quality [7,8]. Physical training combined with action observation has emerged as a new rehabilitation strategy. This type of training was developed to effectively induce neuroplasticity by doubling the effects of task-oriented training. It is strongly connected to observational learning and imitation [9].

Playfulness, creativity, symbolism, and improvisation are all key components of art therapy, which has advantages including promoting spiritual development and alleviating mental pain. Consequently, implementing artistic activities may enhance quality of life. For disabled children with suffering, resentment, and unmet needs, the goal of art therapy is to maximise their potential in the sensory, psychological, and social development domains. In physical activity, repeated joint movements increase motivation and enhance upper extremity strength, as well as fine and gross motor function. Additionally, art therapy helps persons with impairments in improving cognitive skills [10]. As no other studies have been conducted on improving sleep quality in children with hemiplegic CP so far, this study aimed to study the effect of art intervention and physical activity on sleep impairments in these children.

MATERIALS AND METHODS

The quasi-experimental pilot study was performed in MGM School of Physiotherapy in Aurangabad, Maharashtra, India for four weeks, Study started in 1st week of December 2022 and ended on last week of December 2022. The study was commenced after taking ethical committee (IEC no. MGM/SOP/2023/192).

Inclusion criteria: Both male and female ambulant children, aged between 4 to 12 years, with hemiplegic CP, normal speech, and right-hand dominance were included in the study.

Exclusion criteria: Severely mentally retarded children, children with other types like quadriplegic, ataxic, mixed, and dystonic, were excluded from the study. Also, children with cardiorespiratory disorders, visual impairments, recent fractures, and other musculoskeletal disorders were also excluded from the study.

Sample size: Fourteen participants were initially selected for the study, of which five participants discontinued the protocol at the end of 3rd and 4th weeks. Three participants failed to carry out the protocol due to lack of cooperation from their parents. Therefore, the study was carried out among six ambulant children with hemiplegic CP.

Data collection: Informed consent was taken from the parents prior to study. Before starting the intervention, pretest scores were recorded PSQ [5] as the outcome measure.

University of Michigan PSQ: It contains total of 22 questions divided into three domains, about snoring, difficulty breathing during sleep, daytime sleepiness, inattentive or hyperactive behaviour, and other features of paediatric Obstructive Sleep Apnoea (OSA). Participants respond to items with 'yes,' 'no,' or 'don't know.' More than eight positive responses may indicate a problem with sleep-related breathing disorders [5].

A total of six children received art activity along with upper limb physical activity. Colouring pictures, drawing geometrical shapes, line joining drawings, thumbprints, and vegetable prints. The upper limb physical activities included various exercises, like clapping hands, moving the upper body, and rotating the neck and head in various directions. Each session of physical activity and art therapy lasted for one hour. The protocol spanned one month and included three sessions of art therapy and physical activity each week. The difficulty level of the art therapy was gradually increased gradually [Table/Fig-1]. Parents and children were encouraged to follow art activity and physical activity protocol before sleep.

STATISTICAL ANALYSIS

Statistical analysis was done using MS Excel for Windows and Statistical Package for Social Sciences (SPSS) version 23.0. A paired t-test was used to compare pretest and post-test results.

RESULTS

There were three males and three females participants who followed the protocol. Age distribution is shown in [Table/Fig-2].

In the present study, the median for pre and post-test PSQ scores was 0.68 and 0.49, respectively. Therefore, based on the median, IQR was calculated for the outcome measures, which was 0.0675 and 0.0775, respectively, which was significance [Table/Fig-3].

DISCUSSION

The process of art therapy promotes changes in sentiments and thoughts, which then lead to improvements in self-confidence. Participants have a means of expressing emotions and translating their ideal perspectives into tangible experiences through activities like doodle art. Doodle art therapy aims to aid counselees in developing self-awareness and resolving emotional issues. This therapy includes cognitive components, such as mental concentration and stimulation, concept organisation, and creative stimulation. Present study also observed that art therapy had a positive impact on behavioural symptoms, ultimately showed positive changes in mood. Drawing on the spot can give client as secure approach to communicate concerns, fears, desires, and challenges. People can express and explore unconscious emotions through the symbolic

[Table/Fig-1]: Week wise pictures of activity worksheets done by children (The sequence of activity per week is as 1st week- colouring, 2nd week- Tracing, 3rd week, drawing different shapes and 4th week- finger painting).

Parameters	n (%)
Gender	
Male	3 (50)
Female	3 (50)
Age (years)	
4-8	2 (20)
>8-12	4 (80)
Age (years), M±SD	9.83±3.12

[Table/Fig-2]: Demographic data of participants according to gender and age group.

Name	Pretest PSQ	Post-test PSQ
A	0.77	0.55
B	0.55	0.42
C	0.68	0.5
D	0.68	0.46
E	0.73	0.5
F	0.64	0.41
Mean	0.675	0.492
p-value	0.000027865	
Q1	0.65	0.471
Q2	0.71	0.503
IQR	0.0675	0.0775
Median	0.68	0.49

[Table/Fig-3]: Comparison of pre and post scores of PSQ scales.

and verbal use of doodle art, individuals can express and explore unconscious emotions [11,12].

The correlation between sleep spindles and cognitive performance was identified in a two-year longitudinal study that evaluated early adolescent performance on executive function and response inhibition tests while assessing sleep EEG coherence and waking performance on these tasks. Sleep spindles are produced by long-range thalamocortical loops; therefore, this activity may include significant data about the health and function of the cortical circuits that support cognitive function [11].

Being creative involves the capacity to develop unique and valuable concepts or actions. Creativity in the arts and sciences has greatly contributed to the advancement of human civilisation. The regional grey matter volume of the left Middle Frontal Gyrus (MFG) and left Inferior Occipital Gyrus (IOG) were significantly associated with creativity. Because it draws upon various cognitive skills, including sustained attention, the ability to filter out irrelevant ideas, working memory, and cognitive flexibility, artistic creativity may be considered a fundamental cognitive process [12,13].

The majority of art therapies have emphasised neuropsychiatric outcomes like anxiety and depression, art therapy can also be utilised to improve cognitive performance. In instance, art therapy trains on a number of cognitive processes through its art creation and evaluation components. It is not rare for there to be a strong correlation between changes in the cortical thickness of the MFG and increase in immediate memory. Functional MRI studies have linked the use of different encoding and retrieval strategies during learning and memory which has been linked to greater activation in the MFG [13].

Furthermore, another study revealed a substantial correlation between the grey matter volume of the MFG and the employment of elaborate encoding techniques during a memory test [14]. The ability of art to express cultural norms, history, ideas, emotions, aesthetics, and other elements of human civilisations through its many forms (visual art, music, literature, dance, theatre, etc.) makes it a vital component of human society. The most likely conditions for creativity in the arts and other fields are sound knowledge and semantic conceptual systems, which are expressed through several pathways in the cortex. Thus, from the referenced articles, present study proves that the correlation of art therapy has a positive impact on children's behaviour [15].

Children with CP are at a significant risk of experiencing pain, which requires special consideration when addressing sleep problems. In children with CP, conditions including skin breakdown and pressure ulcers, spasticity, altered muscle tone, involuntary movements, and aberrant postures might make it more difficult for them to adjust their body positions at night and make them more sensitive to pain. These elements work as risk factors for sleep issues when combined. Improvement in behavioural functions has indirectly shown improvement in sleep functions [13-15].

Limitation(s)

Since this study was conducted solely among six hemiplegic CP participants, a larger sample size could be considered to implement this protocol.

CONCLUSION(S)

From the analysed data and results, this study concludes that art therapy, along with physical activity, improved sleep quality in children with hemiplegic CP. The clinical implications of this study suggest that art therapy can be integrated into physiotherapy interventions and incorporated into daily activities to improve sleep quality in children with hemiplegic CP.

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