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Play therapy in improving executive functions in children with cerebral palsy: A systematic review

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Abstract
Background: Due to brain damage impacting motor and cognitive areas, children with cerebral palsy frequently struggle with executive functioning. Impaired planning, organizing, problem-solving, and memory abilities limit their capacity to complete activities effectively. There is much evidence that supports the use of Play intervention to enhance Executive functions (EF). Therefore, a systemic review and evaluation of existing evidence is being done to explore and investigate the needs and limitations of Indian Occupational Therapy research.
Objectives: The purpose of this review is to analyze the effectiveness of play therapy in improving executive functions in children with Cerebral Palsy (CP).
Methods: A systematic review was conducted according to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. The search was done on the databases (PubMed, Scopus, Open Access, Web of Science, Research Gate & Google Scholar) to identify studies that include Randomized control trials (RCT), CP, EF in children, executive dysfunctions in CP, and how play therapy has an important role in improving EF. Studies with no access to full text, a language other than the English language, and studies with no such proper explanation were excluded using a combination of keywords of CP, EF, and Play therapy. The search was restricted to published studies that are relevant to the systemic review and was published between the year 2008 - 2022. The search keyword string was – "Cerebral Palsy and Executive functions" OR "Cerebral Palsy and Play therapy" OR "Play therapy and Executive functions". We independently finished the screening, and read each screened study's entire text.
Results: The initial search yielded 300 potentially relevant articles from databases and other additional sources out of which 133 studies were excluded as duplicates, 92 studies were excluded as they didn't meet inclusion and exclusion criteria, 65 were excluded as they didn't mention intervention protocol and 10 studies were included for review. All the review articles were identified as (RCT) with total participants of 558 in total.
Conclusion: After going through all the reviews included in this literature, the literature supports the effectiveness of Play therapy in improving EF in children with CP. By synthesizing the available evidence, this study will offer valuable information for practitioners, educators, and researchers working to improve the cognitive outcomes and overall quality of life for children with cerebral palsy So, it is concluded that a proper study will give positive outcomes and will help identify the gaps in the literature and suggest avenues for future research in this field.

Keywords: Cerebral palsy, executive function, play therapy, randomized control trial

Introduction

Cerebral palsy (CP) is a group of disorders that result from nonprogressive damage to the developing fetal or infant brain, leading to movement and posture impairments and causing activity limitations [1]. CP is typically characterized as a motor development disorder, but it encompasses a wide range of impairments beyond movement disorders. Individuals with CP often experience challenges related to sensory perception and cognitive, communicative, and behavioral problems [2].

Incidence of CP: The incidence of cerebral palsy varies by an order of magnitude; according to recent data from the Centers for Disease Control (CDC), there are 3.6 cases of CP for every thousand live births [3].

Prevalence of CP: CP is a prevalent issue, with a frequency of 2 to 2.5 per 1000 live births worldwide [4].

Executive Functions: The phrase "Executive function" (EF) refers to a broad category of abilities required for novel, sophisticated, goal-directed activities. Executive function is essential for daily functioning, and EF impairments can lead to poor planning and organization, difficulty focusing, carelessness while reacting to tasks, loss of self-control, and increased task completion times. Executive functioning (EF) refers to the skills required for goal-directed behavior to complete tasks. To function in everyday life, EF must organize, plan, focus, attend to tasks, exercise self-control, and self-monitor. The four distinct domains are as follows: (i) attentional control, which includes the ability to selectively attend to specific stimuli; (ii) information processing, which refers to the fluency, efficiency, and speed with which information is processed; (iii) cognitive flexibility, which refers to the ability to shift between response sets, learn from mistakes, and divide attention; and (iv) goal setting, which includes the ability to develop new initiative and concepts [5].

Play Therapy: Since Virginia Axline's seminal work in the 1940s, play therapy has been recognized as a developmentally appropriate solution for children with a wide range of issues. Play therapy has, however, long been challenged for lacking sufficient evidence to support its effectiveness. To be accepted as a practical and developmentally appropriate solution for children, play therapy must be shown to the legal community, third-party payers, mental health specialists, school administrators, parents, and play therapy skeptics to demonstrate its efficacy. According to the Association of Play Therapy, licensed play therapists assist clients achieve optimal growth and development by preventing or resolving psychosocial disorders via the therapeutic capabilities of play [6]. After reviewing the various articles related to play therapy and its effects on executive functions in children with cerebral palsy, it was concluded that play therapy positively influences the improvement of executive functions in children with cerebral palsy.

Objectives: The primary objective of this study is to investigate the effectiveness of play therapy as an intervention to enhance executive functions in children diagnosed with cerebral palsy.

Methods

Eligibility criteria

Inclusion criteria

- Randomized control trials
- Cerebral Palsy
- EF in children,
- Executive dysfunctions in CP,
- Role of play therapy in improving EF

Exclusion criteria

- Studies with no access to full-text
- Language other than the English language
- Studies with no such proper explanation

Information Source: The database searched: PubMed, Open Access, Google Scholar, Research Gate, Web of Science, Scopus

Search Strategy: We searched the following databases: PubMed, Scopus, Web of Science, Google Scholar, Open Access, Research Gate, and Online journals from (2008) to (2022) were comprehensively searched. The following search terms or keywords were used: Cerebral Palsy, Executive Functions, Play Therapy, and Randomized control trials. In addition, the reference lists of all papers chosen in the first phase were manually searched. It is made sure that any articles with a chance of being included in this evaluation are considered. The only available results were in English. We worked independently to accomplish the entire process. Studies were assessed to determine whether they satisfied the selection criteria listed above after being identified by title and abstract. To make sure that all pertinent publications were found, additional references were looked up in the reference lists of pertinent systematic reviews using the snowballing method.

Selection Process: The search results were downloaded with all titles and abstracts from electronic databases in Microsoft Excel software. We ran the search in electronic databases, and other resources and screened the titles and abstracts. Any irrelevant reports and duplicates during the initial screening were removed. Full text of the records identified for inclusion in the screening was retrieved, and the full-text screening was completed. The results of the full-text screening were reviewed for eligibility assessment and final inclusion. Any disagreement was resolved between us at all the stages of the review.

Data Extraction: Title, abstract, and full-text screening of resulting articles were undertaken independently by us to confirm eligibility criteria were met. Then we extracted the data from full-text articles separately, and the data were reviewed. Disagreements were resolved via discussion and expert consultation. The following information was extracted from each article: first author, year of publication, study design, participants diagnosed, sample size, age range, study aims, and conclusion. The relevant data were extracted and tabulated from the studies, and any queries were clarified.

Result: We identified 10 articles that we have reviewed. The characteristics of the included studies are provided in Table 1.

Study Selection: 300 references were reviewed, 228 of which came from database searches and 72 from other searches. The total number of references for screening was 167 after duplicates were eliminated. 92 records were excluded for reasons. Then the total number of full-text articles assessed for eligibility was 75. Out of which we disqualified 65 studies because they didn't meet the requirements for the study's participants, intervention, outcomes evaluation, and study design. As a result, 10 studies were included in the evaluation. The details of the search are provided in a PRISMA flowchart as shown in Figure 1.

Study Characteristics: The 10 studies included in the systematic review and meta-analysis were published between 2008 and 2022, with nearly 70% of the studies concentrated from 2014 to 2022. The sample sizes of the included studies ranged from 12 to 115, with a total of 558 people. The included studies were randomized control trials with the participants diagnosed with either ASD or CP children.

Limitation: The sample sizes of many of the included studies were quite small, which would reduce the statistical power to identify play therapy's substantial effects on executive functioning in the particular subgroup of cerebral palsy children. Due to this restriction, it may be more difficult to make conclusive judgments regarding how well play therapy works for this demographic. Although the studies on Play therapy in improving Ef focus on short-term outcomes, the effectiveness of play therapy in enhancing executive functioning in children with cerebral palsy may be seen over a longer length of time. This constraint can make it difficult to understand long-term implications. Play therapy includes a variety of approaches and tactics, and the success varies depending on the method utilized. Because of this variation, determining the most successful strategy might be difficult. Executive functions are frequently evaluated using subjective assessments, such as parent or

caregiver reports, which are susceptible to bias. There might be a publication bias in favor of research that produces favorable outcomes, which may result in the underreporting of studies that do not produce substantial benefits. This bias may have an impact on the overall evaluation of play therapy's success.

Conclusion: After studying the various articles allied to problems in executive functions in Cerebral palsy children, we have found that play therapy has greater self-transformation and is capable of influencing executive functions in preschool children [7]. It is also seen that play therapy has a significant effect in improving manual dexterity and independence in life with Cerebral palsy Children [8]. For the achievement of academics, social, behavioral, and adaptive day-to-day functions executive skills are very much necessary [5]. The above review suggested different kinds of therapy that can improve executive functions and the quality of life of children with cerebral palsy. But improving a child can be easier in a playful manner and fewer researches are there regarding this context. So, it is very important to focus on this area to enhance executive functions and quality of life in children with cerebral palsy.

Conflict of Interest: The authors declare no conflicts of interest.

Characteristics of the included studies

Table 1

Author (year)	Study Design	Participant Diagnosis	Sample	Age	Aim	Conclusion
Susan Faja *et al* (2022)	RCT	Autism Spectrum Disorder	70	7-11 years	The aim is to examine the initial efficacy of an executive function (EF) training program for children with autism spectrum disorder (ASD)	However, after training, the training group showed fewer signs of repetitive behavior. No negative incidents or attrition from the training group occurred. Findings imply that a short, focused computer-based training program combined with coaching is possible and may enhance repeated behaviors and neural responses in school-aged children with ASD.
Samia A. Abdel Rahman et.al (2019)	RCT	Spastic hemiparetic Cerebral palsy	30	3-7 year	The purpose of this study was to investigate the effectiveness of play therapy along with conventional physical therapy on gross manual dexterity in children with spastic hemiparetic cerebral palsy	When paired with traditional physical treatment, play therapy can significantly improve children with spastic hemiparetic cerebral palsy's gross hand dexterity.
Orkun Tahir Aran *et al* (2019)	RCT	Hemiplegic cerebral palsy	90	7-12 year	This study aims to evaluate the effectiveness of virtual reality-based rehabilitation program for children with hemiplegic cerebral palsy on cognitive functions.	Children with HCP demonstrated better progress after 10 weeks of VR-based therapy compared to TOT intervention in their visuomotor development, spatial perception, and executive functioning. The usage of various VR systems is advised in cognitive rehabilitation processes and cognitive research since VR offers good support to Traditional occupational therapy intervention.
Amir Azizi *et al* (2018)	RCT	Specific learning disorder	35	7-9 years	The aim is to assess the effect of cognitive-behavioral play therapy on working memory, short-term memory and sustained attention among school-aged children with specific learning disorder: a preliminary randomized controlled clinical trial	In this study, it was discovered that Cognitive Behavioral play therapy is beneficial in improving sustained attention in children with Specific learning disorder, but that it had no impact on working memory and short-term memory. This study suggests further RCTs with sizable sample sizes, more one-on-one therapy sessions, longer follow-up periods, and various methods.
Catherine Mak *et al* (2018)	RCT	CP	42	6-16 year	The aim is to evaluate the effect of mindfulness-based yoga program MiYoga on attention, executive function, behavior, and physical outcomes in cerebral palsy	The RCT found that MiYoga improved children's attention and lowered parent-reported mindfulness when compared to a waiting control immediately after the intervention.
AM Piovesena *et al* (2017)	RCT	Unilateral Cerebral Palsy	102	11 years	This study aims to ascertain whether the multi-modal web-based programme Move-it-to-improve-it (MitiiTM) is effective in enhancing executive function (EF) in kids with unilateral cerebral palsy (UCP).	In a sizable RCT, Mitii TM did not result in appreciably better EF measurements or parent assessments of EF performance in kids with UCP. Improvements in motor and processing abilities, daily living tasks, and physical capacity have been seen with Mitii TM, indicating that it may be a successful web-based multimodal therapy for these activities. The EF of kids with mild to moderate UCP does not appear to be improved by MitiiTM in its current form. It is advised that modules targeted exclusively towards EF be created and evaluated to increase the potential for practise specificity.

Amruta Charuchandra Nerurkar *et al* (2016)	RCT	CP	12	Less than 7 years	To aim is to Study the Effects of Play Therapy on Motor Function and Social Maturity in Children with Cerebral Palsy	When compared to traditional physical therapy, the administration of play therapy had a significant impact on the social maturity of children with cerebral palsy, but had no additional impact on motor function. Play therapy also improves the ability of children with cerebral palsy to integrate newly learned skills and apply them as an ensemble in activities that are embedded in the social context.
Gro CC Løhaugen *et al* (2014)	RCT	CP	115	7-15 year	The main aim of this study is to evaluate if cognitive training may improve working memory in children with CP.	Regarding cognitive function and the results of intervention techniques in this patient population, there is a paucity of evidence-based knowledge. The planning of therapy and rehabilitation will also benefit from examining a thorough cognitive profile in children with cerebral palsy. More scientific research is required to prevent the needless and expensive treatment of patients. A reduction in the requirement for special schooling, an improvement in social and daily-life functioning, and favorable effects on the individual and family levels may all result from improving working memory. Using the proposed study, recommendations can be made about how cognitive training affects CP youngsters.
Karina K. Chung *et al* (2013)	RCT	Preschool children	32		The study examines whether self-transformation through pretend play can influence executive functioning in pre-schoolers.	The finding of this investigation demonstrated that even in preschool-aged children, self-transformation through pretend play can actively contribute to the inhibition of prepotent responses
Nidhi Pitroda *et al* (2008)	RCT	Spastic diplegic CP	30	3-7 years	The study aims to examine the effectiveness of play therapy together with conventional therapy to improve hand function ability in children with spastic diplegic cerebral palsy.	Children with spastic diplegic cerebral palsy have shown improved hand function after receiving play therapy in addition to traditional physiotherapy. The functional outcomes of play therapy for children with cerebral palsy may be used and assessed by physiotherapists with the help of this study.

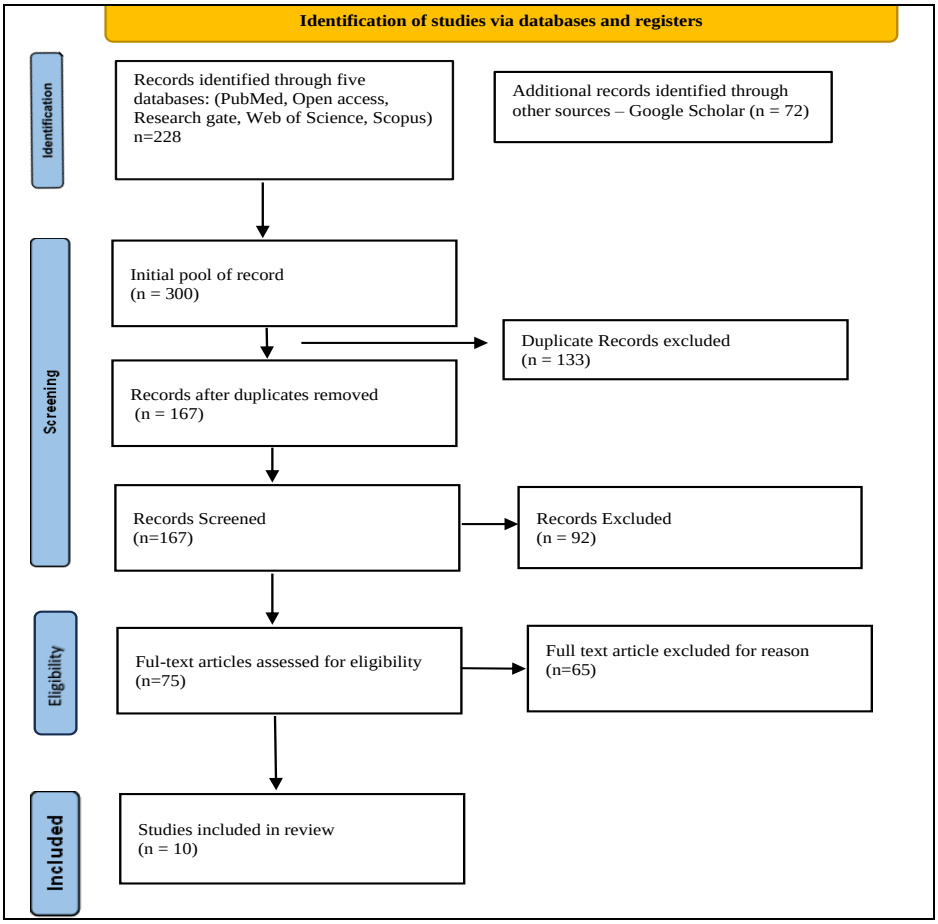

Fig 1: PRISMA Flowchart of the Search Process

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