



Original Article

The impact of group occupational therapy using a cueing system on executive function of preschool-aged children with brain lesions

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Abstract. [Purpose] This study investigates the effects of group occupational therapy using a cueing system on the executive function of preschool-aged children with brain lesions. [Subject and Methods] Six preschool-aged children with brain lesions participated in this study. A 24-session occupational therapy program (1 session/week, 50 minutes/session) designed based on a cueing system was administered to examine the changes in the participants' executive function. The behavior rating inventory of executive function-preschool (BRIEF-P) was used to check the magnitude of improvement of executive functions after therapy. [Result] A Wilcoxon signed rank test revealed that occupational therapy significantly improved all domains, indices, and the global executive composite in the BRIEF-P. [Conclusion] The occupational therapy intervention incorporating a type of cognitive behavioral approach known as the cueing system may assist improving executive functions in preschool-aged children with brain lesions

Key words: Executive function, Group occupational therapy, Cueing system

(This article was submitted Sep. 21, 2017, and was accepted Nov. 29, 2017)

INTRODUCTION

Executive function refers to a set of cognitive processes used to plan, organize, manage, and integrate one's own behaviors and learning related to a given task¹⁾. These functions comprise cognitive skills such as inhibition, shifting, emotional control, working memory, planning, and organization. These skills generally manifest after birth and are developed until puberty^{2, 3)}. Children with brain lesions display not only limited physical function, visual perception, and cognitive abilities but also limited executive function^{4, 5)}. In particular, damage to the executive function in the preschool period detrimentally affects self-control and learning abilities^{1, 6)}. However, because executive function develops throughout childhood⁷⁾, neurological development is still possible even in the presence of brain injuries⁸⁾. Timely intervention to improve executive function is critical because early therapeutic intervention may gravely impact the performance of daily living activities and academic, behavioral, and social achievement⁹⁻¹¹⁾. There are three primary therapeutic approaches to improving executive function: the neuropsychological, flexibility training, and cognitive behavioral approaches. The neuropsychological approach involves administering drugs at consistent time points and intervals to compare differences in effects. The flexibility training approach involves repeatedly conducting training at consistent times and intervals and comparing the pre- and post-training states to validate the effects of training. Finally, the cognitive behavioral approach involves helping participants plan and adjust their strategies toward a task while performing a task through group activities¹²⁾. A cueing system¹³⁾, which is a type of cognitive behavioral approach that encourages children to solve their problems individually and maintain the objective of the activity by phasing in information (cues) needed to successfully perform the given task according to the extent of the child's cognitive limitation, is an essential component for children with cognitive disabilities. A cueing system consists of six stages

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depending on the method of cueing, such as direct, indirect, verbal, and physical methods¹⁴⁾ (Table 1). Studies on executive function in Korean children¹⁵⁻¹⁷⁾ have primarily focused on examining the effects of cognitive behavioral therapy on the executive function of children with mental health disorders. Studies involving children with brain lesions^{11, 18)} have generally performed assessments of executive function, and few studies have investigated the efficacy of therapies in improving executive function. In particular, none of the existing studies have examined children's executive function status using a cueing system, which is a type of cognitive behavioral approach. Therefore, this study examines how a group occupational therapy program using a cueing system affects improvement in the executive function of preschool-age children with brain lesions.

SUBJECTS AND METHODS

Six preschool-aged children diagnosed with brain lesions were enrolled in this study. The inclusion criteria were: 1) children who are capable of independently sitting on a chair, 2) children who are capable of following three-step instructions and 3) children who are able to draw basic geometric figures. A 50-minute therapy session was administered once a week for 24 sessions. Each therapy session consisted of 1) explanation and tool preparation (10 minutes), 2) a task (30 minutes), and 3) clean-up (10 minutes). The tasks included drawing lines, coloring, and cutting and gluing paper, and the difficulty of the task was adjusted or additional activities were added depending on the child's performance. While the children performed the task, they were offered cues in a stepwise manner to help them successfully complete the task. This study used the Behavior Rating Inventory of Executive Function-Preschool (BRIEF-P) to assess the improvement of executive functions after therapy³⁾. The BRIEF-P is a 63-item (five domains) scale that is used to observe and assess children's behavior using a 3-point scale (never, sometimes, often). All statistical analyses were performed using SPSS version 20.0 for Windows. Descriptive statistics were used to examine the general characteristics of the participants, and a Wilcoxon signed rank test was used to measure changes in executive function after group occupational therapy. Statistical significance was set at $p < 0.05$. This study was approved by Seoul Metropolitan Children's Hospital Ethics Committee. The study procedure was explained for all patients and informed consent was obtained from them. The study was complying with the ethical standards of Declaration of Helsinki.

RESULTS

The mean age of the six participants of this study was 64.67 ± 6.59 months. Four male and two female participated in the study (Table 2). The Wilcoxon signed rank test revealed that the children showed significant improvements in all domains, indices, and the global executive composite of BRIEF-P ($p < 0.05$) (Table 3).

DISCUSSION

This study investigated how an occupational therapy intervention using a cueing system affected the executive function of preschool-age children with brain lesions. The results confirmed that all participants showed significant improvements of BRIEF-P score for executive function (inhibition flexibility, emotional control, working memory). Directly comparing these findings with existing literature is difficult due to the lack of studies examining how therapy using a cueing system affects children's executive function; however, our findings were similar to those of previous studies that confirmed cognitive therapy programs to be effective for improving executive functions and adjustment behavior in children with brain lesions: One study that investigated the effects of an online problem-solving program in 132 school-aged children (12-17 years) with traumatic brain injury for six months¹⁹⁾. Another study that examined the effects of Cognitive Orientation to daily Occupational Performance activity on adjustment behaviors and quality of performance in six children aged 6-15 years with acquired brain injuries²⁰⁾. The current study had a few limitations. Limitation is the small sample size and lack of control group, which hamper the generalization of our findings. Another limitation is not verifying the improvement of executive functions using various classic neuropsychological test methods, such as card sorting and mazes. In addition, we could not confirm whether the improvement in executive function persisted after the completion of the program or whether the therapy led to changes in the performance of various daily activities. Nevertheless, this study provided meaningful contributions by advancing on previous studies that have primarily focused on assessing executive function among children with brain lesions to attempting to employ a task-oriented occupational therapy using a type of cognitive behavioral approach known as the cueing system. Therefore, occupational therapists should pay attention to the executive function of preschool-aged children with brain lesions and apply task-centered occupational therapy programs including various cognitive behavioral approaches in order to enhance quality of life. Furthermore, researchers should continue their efforts to substantiate the efficacy of therapeutic interventions by using various cognitive behavioral approaches to improve the executive function of children with brain lesions.

Conflict of interest

None.

Table 1. Step of cueing system

Stage	Method	Content
0	No cue required	Each stage is performed independently/The task is immediately performed.
1	General verbal guidance	Ask general questions instead of giving direct instructions
2	Gesture guidance	Requires physical assistance (The therapist does not directly physically engage with the child)/Show the child the motions needed to complete the task or show body motions to re-engage the child in the task.
3	Direct verbal assistance	Give direct expressions or instructions/Tell the child what to do / Give the first-stage cue to help the child to act.
4	Physical assistance	Physically help the child to perform the task.
5	Doing for the participant	The therapist helps throughout the entire process of performing the task.

Table 2. Gender characteristics of study participants (N=6)

	Gender	Month
1	Male	72
2	Male	71
3	Female	67
4	Female	64
5	Male	58
6	Male	58
		64.6 ± 6.5

Table 3. Changes in the T-score of BRIF-P after 24 sessions

Variables	Pre-test Mean ± SD	Post-test Mean ± SD	p value
Inhibition	71.0 ± 13.7	55.8 ± 8.8	0.04*
Shifting	72.2 ± 13.6	56.5 ± 8.5	0.04*
Emotional control	70.2 ± 17.9	49.7 ± 11.0	0.02*
Working memory	86.5 ± 15.9	63.0 ± 7.9	0.02*
Planning and Organization	78.7 ± 11.6	54.3 ± 5.8	0.02*
Global Executive Composite	83.5 ± 13.2	58.8 ± 7.7	0.02*

Significance level: *p<0.05.

BRIF-P: Behavior Rating Inventory of Executive Function-Preschool.

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