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Impact of Occupational Therapy in Improving the Executive Functions for the Children with Specific Learning Disorder – A Case Study

Tabitha Solomon Tamilselvan - B.O.T, Raghuram P - M.O.T (Paed), Loganathan S - M.O.T (Neuro), T. Sundaresan - M.O.T (Rehab)

Sri Ramachandra Faculty of Occupational Therapy, Sri Ramachandra Institute of Higher Education and Research (DU)

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KEYWORDS

Executive Functions (EF), Executive Skills Questionnaire (ESQ), Occupational Therapy for Executive Functions, Specific Learning Disorder (SLD).

ABSTRACT:

Introduction: Executive Functions (EFs; also called executive control or cognitive control) refer to a family of top-down mental processes needed when you have to concentrate and pay attention when going on automatic or relying on instinct or intuition would be ill-advised, insufficient, or impossible. Central executive functioning, particularly working memory, is observed to be a deficit in Children with Specific Learning Disorders. Executive functioning skills are considered to be essential in order to achieve academic success. In India, the prevalence of Specific Learning Disorder ranges from 5%-15%.

Objectives: To determine the areas of difficulties in Executive Functions and to provide Occupational Therapy intervention to improve Executive Functions in Specific Learning Disorder

Methods: A Single Case Study was conducted in the Outpatient Department, Occupational Therapy unit at Sri Ramachandra Hospital. Children who met the selection criteria were allotted to intervention by Purposive sampling. One subject was recruited, and the baseline assessments were done. The child participated in a 4 weeks Occupational Therapy Intervention for Executive Functions. The Pre-test and the Post-test scores of the Executive Skills Questionnaire (ESQ) were analyzed.

Results: There was a significant improvement in the Executive Functions after 4 weeks of Occupational Therapy Intervention based on the scores in the Executive Skills Questionnaire (ESQ).

Conclusions: Occupational Therapy Intervention for Executive Functions has been effective in improving the Executive Functions of the child following 4 weeks of Occupational Therapy Intervention.

1. Introduction

Executive Functions

Executive Functions (EFs; also called executive control or cognitive control) refer to a family of top-down mental processes needed when you have to concentrate and pay attention when going on automatic or relying on instinct or intuition would be ill-advised, insufficient, or impossible. It is considered to be effortful in order to use executive functions because it is easier to do things in “automatic pilot” than to resist or to consider what to do next. (1)

Inhibition, Working Memory and Cognitive Flexibility is considered to be the three core executive functions. Higher-order executive functions like reasoning, problem-solving and planning are considered to be built from the three core executive functions. Executive functioning skills are considered to be essential for physical and mental health, to be successful in school and life and for cognitive, social and psychological

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development. (1)(2)(3)(4)(5)

Executive Functions Neuroanatomy

The terminology Executive Function was coined in relation to abnormalities seen in patients with frontal lobe lesions. With the development of functional neuroimaging, it has become obvious that executive function is dependent on distributed neural networks that include the prefrontal cortex as well as the parietal cortex, basal ganglia, thalamus, and cerebellum. (6)

According to the World Health Organization (2007) and The Occupational Therapy Practice Framework Domain and Process, Executive Functions are higher-level cognitive functions deeply related to complex goal-directed behaviors across all life domains. The Executive Functions enable children and adolescents to learn, remember, plan, and make decisions in order to gain knowledge and participate in learning, playing, and social activities. Executive Functions are thought to be the fundamental mechanism of all instrumental daily tasks. (2)

Specific Learning Disorder

Specific Learning Disorder is characterized by problems in academic skills, such as reading, writing, or arithmetic, which provide the foundations for other, more advanced academic learning (6). Central executive functioning, particularly working memory, is observed to be a deficit in Children with Specific Learning Disorders (2)(3). Executive functioning skills are considered to be essential in order to achieve academic success. (5)(7)(8)(9)(10)

Prevalence Of Specific Learning Disorder

In India, the prevalence of Specific Learning Disorder ranges from 5%-15%. There has been a gender predilection with boys being more affected than girls. (6)(11)

Executive Functions And Learning

From preschool to high school, EF may have an impact on reading development. Prereading skills, in particular, are linked to inhibition and cognitive flexibility; word-reading competency is linked to working memory, inhibition, shifting, updating, and attentional control; and reading comprehension is linked to planning, working memory, and inhibition, at the very least. These findings are encouraging because they highlight the importance of EF in reading acquisition. (5)(12)

Skilled writing is a self-directed activity that is guided by the objectives that authors (children) set for themselves. To achieve these objectives, the child must utilize and organize a variety of resources, including strategic procedures, knowledge, and abilities, flexibly and skillfully. The success of this business is dependent on critical analysis, decision-making, and planning. (5)(13)

Intervention For Specific Learning Disorder

Interprofessional care is essential for the identification and treatment of Specific Learning Disorders. Educators, educational remediation specialists, special services, physicians, speech and occupational therapists, physical therapists, clinical psychologists, and educational therapists comprise the Interprofessional care team for Specific Learning Disorders. (15)

Occupational Therapy intervention for Specific Learning Disorders includes Handwriting training, providing Assistive Technologies for learning, Parental Education, Environmental Modification, prescribing adaptive devices, enhancing play and socialization, and intervention to remediate or accommodate Perceptual Impairments through various work handling techniques. (16) (17)(18)(19)

Intervention For Executive Functions

Possible interventions to improve executive functions are computerized training, games, aerobics, resistance training, martial arts, yoga, mindfulness, theatre, and certain school curriculum activities; certain cognitive training strategies (skill-based) and physical activity are the evidence-based intervention programs to improve Executive Functions. (15)

Interventions are categorized within specific areas of deficit. However, many have a remedial effect on a number of problems simultaneously. These skills are typically best taught in the context of everyday executive routines as opposed to teaching the specific skill out of context. (10)(20)(21)

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2. Objectives

The objective of the study was to determine the areas of difficulty in Executive Functions and to provide Occupational Therapy intervention to improve Executive Functions in Specific Learning Disorder

3. Methods

This Single Case Study was approved by the Ethics Committee for Students Proposals, Sri Ramachandra Institute of Higher Education and Research [Deemed to be University]. The subjects were recruited from the Outpatient Department, Occupational Therapy unit, Sri Ramachandra Hospital, Porur. Based on the DSM–5 CRITERIA, out of 30 subjects who were screened.

Among them, one client was selected through Purposive sampling, obtained their written informed consent and participated in the study. Before the commencement of the intervention, the client was assessed using the Outcome measure as pre-test scores. The outcome measure was the Executive Skills Questionnaire (ESQ). The client underwent Occupational Therapy Intervention for 12 sessions in 4 weeks of each one hour. After completing the 4 weeks of Occupational Therapy Intervention, the participant was assessed using the outcome measure. The Pre-test and Post-test scores of the Outcome measures were analysed.

Inclusion Criteria: Learning Disorder. Should undergo only Occupational Therapy during the study period. Language preference should be English (based on their curriculum). Parent should be able to read, write and understand English (based on the intervention plan)

Exclusion Criteria: Participant who has an IQ range lesser than 70. Other orthopaedic, neurological, paediatric and psychiatric conditions.

4. Results

The result of this study indicates that in the Executive Skill Questionnaire (ESQ), The pre-intervention score of Response Inhibition was 9, which increased to 11 in the post-intervention score. In Working Memory, the pre-intervention score was **3**, which significantly increased to **8** in the post-intervention score. In Emotional Control, the pre-intervention score was **4**, which then became **8** in the post-intervention score. Sustained Attention had a pre-intervention score of 6, which became 10 in the post-intervention. The pre-intervention score of Task Initiation was 3, and that increased to 7 in the post-intervention score. Planning/Prioritization was **12** in the pre and post-intervention score. Organization was **6** in the pre-intervention score, which was 10 in the post-intervention score. **3** was the pre-intervention score of Time Management, which drastically increased to 8 in the post-intervention score. The pre-intervention score of Goal-Directed Persistence was 5, which changed to 10 in the post-intervention score. The pre-intervention score of Flexibility was 6, which increased to 8 in the post-intervention score. Metacognition was **3** during the initial pre-intervention evaluation, which significantly improved to 8 in the post-intervention score.

EXECUTIVE SKILLS	PRE-TEST SCORE	POST-TEST SCORE
Response Inhibition	9	11
Working Memory	3	8
Emotional Control	4	8
Sustained Attention	6	10
Task Initiation	3	7
Planning/Prioritization	12	12
Organization	6	10
Time Management	3	8
Goal-Directed Persistence	5	10
Flexibility	6	8
Metacognition	3	8

(Table 5: Comparison of Pre and Post-test scores of Executive Skills Questionnaire)

These results support that the patient improved in Executive Skills such as Response Inhibition, Working Memory, Emotional Control, Sustained Attention, Task Initiation, Planning/Prioritization, Organization, Time Management, Goal-Directed Persistence, Flexibility, and Metacognition.

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5. Discussion

This single-case study investigated the use of Occupational Therapy Intervention in Executive Functions for Children with Specific Learning Disorders to improve Executive Functions. We found significant improvement in using Occupational Therapy Intervention for treating a Child with a Specific Learning Disorder. Specifically, the results indicate that it is successful in applying the Occupational Therapy intervention and that the child had significant improvement in Executive Skills such as Response Inhibition, Working Memory, Emotional Control, Sustained Attention, Task Initiation, Planning/Prioritization, Organization, Time Management, Goal-Directed Persistence, Flexibility, Metacognition.

Based on the prevalence rate of Specific Learning Disorders, participants who were under 6-18 years old were included in the study. The child should undergo only Occupational Therapy during the intervention period for an unbiased result. Considering the school curriculum, English should be preferred by the child and the child's parent. Having IQ range below 70 can be a comorbid condition. More precisely, it could influence the assessment and development of Executive Functions. exclusion of other Orthopedic, Neurological, Paediatrics and Psychiatric conditions is necessary as they can be comorbid conditions and have an impact in the Executive Functions and Intervention,

In previous studies(4)(21), they were giving general intervention, which makes this study unique with various client-centred strategies based on the interest of the child. The strongest executive skill was incorporated to develop the weakest executive skill. The weakest skill, which requires special considerations, was individually focused(client-centred). Through observation and analysis, the child had significant improvement in Task Initiation and Organization, which was very helpful in focusing the Inhibitory control and Working Memory. In emotional control, the child exhibited difficulty in Anger Management.

It is said that the tailor-made, structured and need-oriented training program for individuals can be effective in Neuropsychological (Executive Functions) intervention/training. (7) (15)

This study saw significant improvement in the result, which supports the Hypothesis, as it used Tailor-made client-centred strategies.

Executive Functions are important in various dimensions of a child's life as there should be Recognition of one's stronger and weaker abilities and decision-making about how easy or difficult it will be to accomplish the goal (Self-Awareness of Strengths and Weaknesses), which has an impact on the ORGANIZATION and PLANNING/PRIORITIZATION. An organized plan needs to be developed, including consideration of what materials are necessary, what steps need to be completed and in what order, and how long it will take to complete the task.

During the task, the student is encouraged to assess the accuracy and rate of progress. At the completion of the task, there is a review of the goal, the plan, and what was accomplished. An assessment is made of what did or did not work and why. There is also consideration as to how the approach to the task may be modified in the future to complete similar tasks most effectively and efficiently. This was a very successful strategy to use, as the child was Initiative (Task Initiation) and had developed Goal-Directed Persistence. (7)(21)(20)

The study's significance is that there was improvement due to the effective Occupational Therapy protocol, which was based on the child's interest and analysis of focus.

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