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ASSESSING EXECUTIVE FUNCTION DEFICITS IN INDIVIDUALS WITH AUTISM SPECTRUM DISORDER AND SPECIFIC LEARNING DISORDERS

Tity Jospeh
Research Scholar
Desh Bhagat University &
Dr.Mansi Kapoor
Supervisor
Department Of Psychology
Desh Bhagat University

ABSTRACT

The executive functions are necessary cognitive processes that help in goal-oriented behavior, learning, and adaptation functions. The executive functioning deficits are generally evident in people with autism spectrum disorder (ASD) and Specific Learning Disorders (SLD), but the detail and magnitude of these deficits differ between disorders. The current research paper was set out to evaluate and compare the impairment of executive functions in people with ASD, people with SLD, and people with normal development. The descriptive and comparative research design was chosen, and a purposive sample including 150 participants, aged 1018 years, ASD, SLD, and typically developing groups was used in equal measure. A standardized executive function rating scale that involved the parents and teachers in the collection of data was used, and the data were analyzed in percentages. The finding showed that people with ASD had a greater rate of severe deficits in executive functions, especially in the case of inhibition and cognitive flexibility whereas people with SLD had more severe impairments in working memory and planning. The developmental individuals who were typically characterized showed relatively insignificant deficits in executive functions across all areas. The results reveal common and disorder-specific executive functions profiles, which is relevant as they make it essential to conduct specific assessment and intervention measures that meet the individual cognitive requirements of people with ASD and SLD.

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1. INTRODUCTION

Executive functions are defined as a group of more complex thinking processes that allow individuals to plan, organize, regulate the behavior, control impulses, and change the situation. These are functions that involve inhibition, working memory, cognitive flexibility and planning that are instrumental in the academic performance, socialization and normal functioning. Lack of executive functioning can also greatly disrupt learning, problem solving, emotional control and independent behavior, especially in the childhood period and adolescence when the aspect of executive functioning is still developing.

Autism Spectrum Disorder (ASD) and Specific Learning Disorders (SLD) are neurodevelopmental disorders, which are often linked with deficits in executive functioning. Persons with ASD tend to have problems with behavioral inhibition, cognitive flexibility, and self-regulation, which leads to the problem of social communication and adaptive behavior. On the contrary, some people with SLD often have executive functions impairments, concerning the working memory, organization, and planning, which directly influence academic performance in the domain of reading, writing, and mathematics. In spite of the fact that both groups show executive dysfunction, the nature of these deficits and the extent of the impairment differs among disorders.

The specific executive function patterns of persons with ASD and SLD should be understood to properly assess and plan interventions. The subsequent comparative analysis of the impairments in the executive functions in these groups of people can serve to pinpoint common and disorder-specific cognitive difficulties that can be employed by educators and clinicians to develop specific support plans. Thus, this study will evaluate and compare the executive functioning impairments in patients with ASD, patients with SLD, and normally developing children with the purpose of better understanding the executive functioning behaviors of such groups.

2. LITERATURE REVIEW

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Amies et al. (2020) studied the repetitive transcranial magnetic stimulation (rTMS) in managing executive function impairments in people with autism spectrum disorder in a double-blind, sham-controlled pilot study. The research was aimed at enhancing executive functioning, especially cognitive control and self-regulation which is usually impaired in ASD. The results suggested that rTMS had some possible advantages to the improvement of some domains of executive functions, which means that neurostimulation-related interventions might be an effective complement to standard behavioral and cognitive therapies among individuals with ASD. Nevertheless, the authors noted that further investigations concerning the effectiveness of this treatment form and long-term consequences are required to determine its efficacy.

Braconnier and Siper (2021) studied the importance of neuropsychological testing in autism spectrum disorder, especially in executive functioning. Their synthesis indicated that the individual with ASD always showed inability in inhibition, working memory, cognitive flexibility and planning at the various stages of development. The authors have stated that extensive tests of executive functions were essential in the proper diagnosis, personalized planning of intervention, and the tracking of the treatment outcomes. The research emphasized the diversity of executive functioning profiles in ASD and emphasized the significance of multidimensional assessment strategies, which can be both cognitive and behavioral and developmental.

Ceruti, Pecini, and Marzocchi (2025) investigated executive functional skills in children with indications of Specific Learning Disorders. Their study showed that children with SLD exhibited severe weaknesses in working memory, planning and organization skills that had a close correlation with academic weaknesses in reading, writing and mathematics. This paper has revealed that executive dysfunction was at the center of learning difficulties as opposed to secondary effects of academic failure. The authors have come to the conclusion that the early recognition of deficits in executive functions was the key to successful intervention and suggested an inclusion of the executive function training in the educational support programs of children with SLD.

3. RESEARCH METHODOLOGY

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This research used a descriptive and comparative research method and a purposive sample consisting of 150 participants (ASD, SLD, and typically developing groups), which was identified based on a standardized executive functioning rating scale administered by parents and teachers. The analysis of data was done by percentage analysis and was presented in tables and graphic forms to compare between the groups and domains of executive function deficits.

3.1 Research Design

The current research design was descriptive and comparative research design to evaluate and compare executive functions deficiency in persons with autism spectrum disorder (ASD), Specific Learning Disorders (SLD), and individuals in the general population who develop normally. This design was deemed suitable to establish the level and trend of executive function dysfunctions in various groups and to determine group-wise differences in executive functioning areas.

3.2 Sample and Participants

A participation of 150 participants aged between 10 and 18 years was used to select the sample to study the topic and a purposive sampling method was applied. The sample was separated into 3 equal groups:

- **Autism Spectrum Disorder (ASD) group:** 50 participants with an official clinical diagnosis of ASD.
- **The group with specific Learning Disorders (SLD):** 50 individuals with known learning disorders, specifically the disorder in reading, writing, or mathematics.
- **Group, typically developing:** 50 individuals with no developmental, neurological or learning-related disorder.

ASD and SLD participants were enlisted in the special schools, inclusion schools as well as in clinical centers, whereas typically developing participants were recruited in the mainstream schools. All diagnoses have been done using the available clinical or educational records.

3.3 Tools for Data Collection

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A standardized Executive Function Rating Scale was used to collect data in the shape of parent and teacher reports. The instrument evaluated several areas of executive functioning such as:

- Inhibition
- Working Memory
- Cognitive Flexibility
- Planning and Organization

The scale gave scores that were classified as mild, moderate and severe deficits in executive functions, which was used to conduct the analysis as percentages and the comparison between groups.

3.4 Procedure

Data collection was pre-empted by getting the permission of the school officials and institutional heads. All the participants were informed and provided informed consent with their parents or guardians. The rating scales of the executive functions were handed to the parents and the teachers and they were guided on how to answer the scale. Sufficient time was allocated to do the same and the responses received were thoroughly checked to see completeness and accuracy. The ethical issues like confidentiality and anonymity of the participants were highly observed in the study.

3.5 Statistical Techniques Used

The data obtained were analyzed by percentage analysis in order to find the distribution of the executive function's deficits between groups and domains. The findings were tabulated and depicted graphically to make the findings easy to understand and compare. Patterns of executive dysfunction between ASD, SLD, and typically developing people were identified through comparison in the form of percentages.

4. RESULT

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Table 1 shows the proportion of the total executive function deficiencies among patients with autism spectrum disorder (ASD), Specific Learning Disorders (SLD), and typically developing individuals. Participants in the table are divided into mild, moderate, and severe levels of deficits in executive functions and one can clearly compare the three categories. These distributions are plotted graphically in figure 1 and the way the severity of deficits varies within the groups.

Table 1: Distribution of Overall Executive Function Deficits

Group	Mild Deficit (%)	Moderate Deficit (%)	Severe Deficit (%)
ASD	18%	46%	36%
SLD	30%	44%	26%
Typically Developing	62%	30%	8%

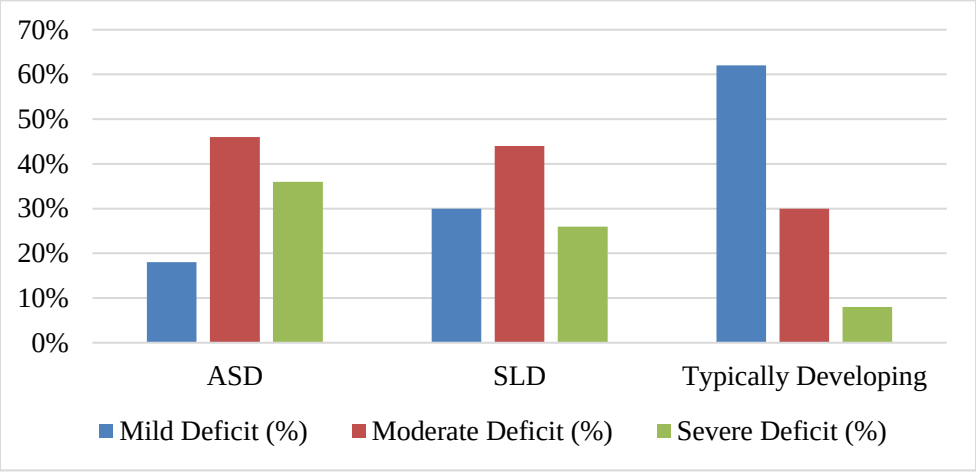

Figure 1: Graphical Representation of Distribution of Overall Executive Function Deficits

The figures reflect that people with ASD have the largest number of severe executive deficits (36%), people with SLD (26%), and people developing normally (8%) present the greatest proportion of severe deficits respectively. On the other hand, most typical (62 percent) individuals are in the mild deficit category, and their executive functioning is relatively intact. These results indicate that executive functioning impairments are more vivid and acute in the group of neurodevelopmental disorders, especially in ASD, which is why special assessment and intervention plans should be implemented.

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Table 2 represents the percent division of deficits on core executive functions domains - that is, inhibition, cognitive flexibility, working memory and planning and organization of people with autism spectrum disorder (ASD). The table indicates the degree to which each of the executive functions domain is impacted in the ASD group, whereas Figure 2 gives a graphical display to clearly compare the severity of the deficits of the various domains.

Table 2: Deficits in Core Executive Function Domains (ASD Group)

Executive Function Domain	Deficit (%)
Inhibition	72%
Cognitive Flexibility	68%
Working Memory	60%
Planning & Organization	64%

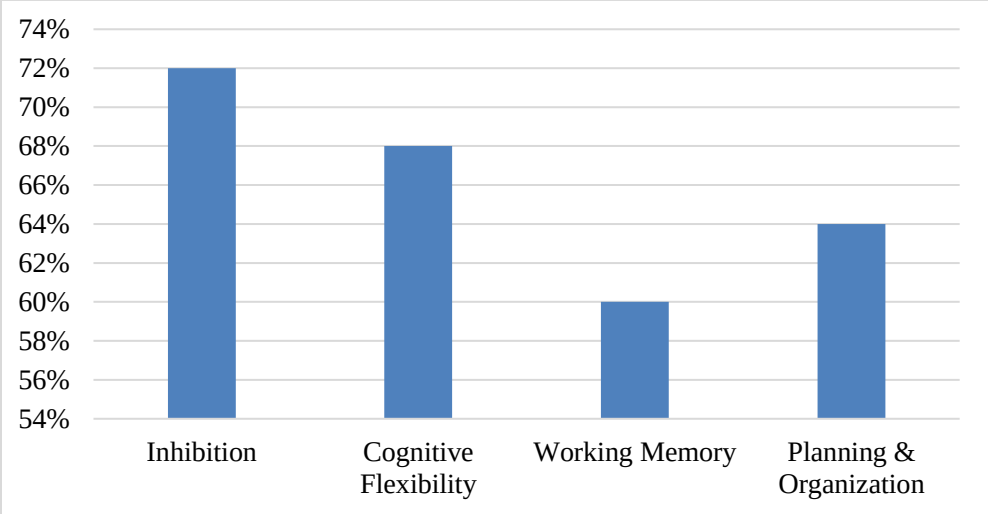

Figure 2: Graphical Representation of Deficits in Core Executive Function Domains (ASD Group)

The results show that the most affected domains of executive functions in people with ASD are inhibition (72% and cognitive flexibility (68%), which implies that they cannot control their behaviors and adapt to the changing situations without problems. Weaknesses in planning and organization (64%) and working memory (60%) are also significant and they portray problems in

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goal-oriented behavior and processing of information. All in all, the findings reveal a wide pattern of executive dysfunction in ASD with more severe areas of deficiency in self-regulation and flexibility, which can potentially be a contributive factor to the typical behavior and social problems seen in the population.

The percentage distribution of deficits in core domains of executive functioning including working memory, planning and organization, inhibition, and cognitive flexibility is provided in table 3, in relation to people with Specific Learning Disorders (SLD). The table gives a domain-by-domain analysis of the executive functioning issues in SLD group and Figure 3 charts such deficits in a graphical format so that comparison of the deficit across domains can be easily made.

Table 3: Deficits in Core Executive Function Domains (SLD Group)

Executive Function Domain	Deficit (%)
Working Memory	74%
Planning & Organization	70%
Inhibition	52%
Cognitive Flexibility	48%

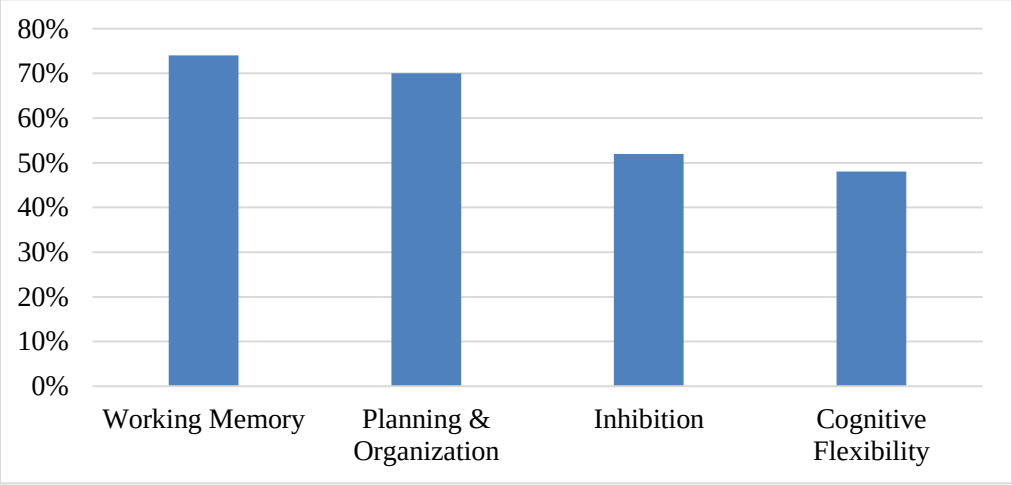

Figure 3: Graphical Representation of Deficits in Core Executive Function Domains (SLD Group)

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The findings indicate that the most affected executive functions domains among the people with SLD are working memory (74%), planning and organization (70%), which means that these people have great problems with the memory of information, organizing of tasks, and meeting the academic requirements. Inhibition (52%) and cognitive flexibility (48) deficits are also less, though significant. These results indicate that the cognitive processes which directly contribute to learning and academic success play a major role in explaining executive function impairment in SLD thus necessitating specific interventions aimed at enhancing memory and organization skills.

Table 4 provides a comparative percentage analysis of high executive function deficits of three groups: individuals with autism spectrum disorder (ASD), individuals with Specific Learning Disorders (SLD), and typical developing individuals in four core executive functioning domains: inhibition, working memory, cognitive flexibility, and planning. These comparisons are graphically represented by figure 4 in which the differences in the executive functioning profile of the groups were clearly observed.

Table 4: Comparative Percentage of High Executive Function Deficits Across Groups

Executive Function Domain	ASD (%)	SLD (%)	Typically Developing (%)
Inhibition	72%	52%	18%
Working Memory	60%	74%	22%
Cognitive Flexibility	68%	48%	20%
Planning	64%	70%	24%

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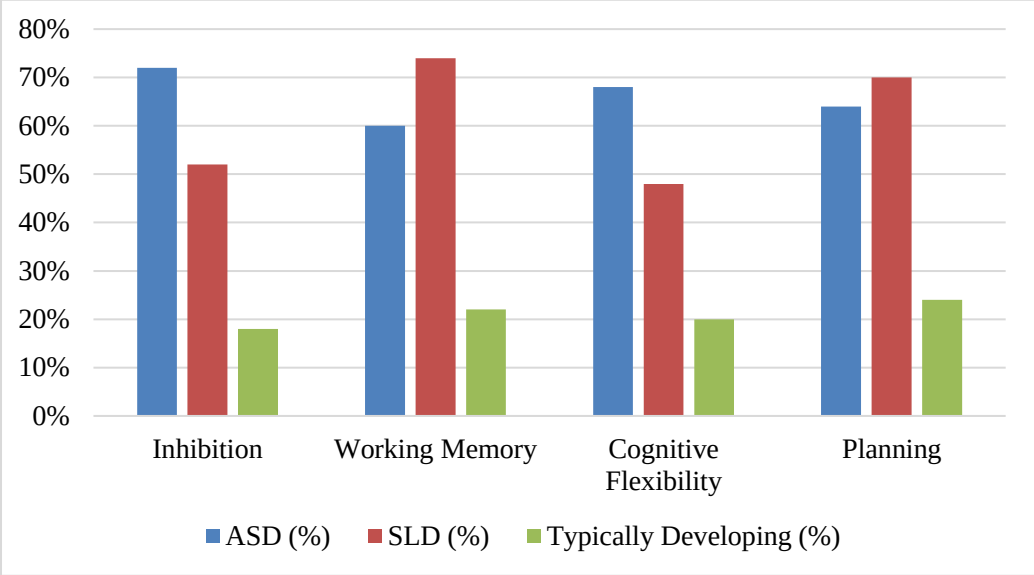

Figure 4: Graphical Representation of Comparative Percentage of High Executive Function Deficits Across Groups

The comparison depicts clear trends of executive function impairment in groups. People with ASD have the highest impairments in inhibition (72%), and cognitive flexibility (68%), whereas those with SLD have more impairments in the working memory (74%). Conversely, the high executive functioning deficits in all domains are significantly lower in typically developing individuals. These results demonstrate common and disorder-specific executive functions issues and assign the value of differentiated assessment and intervention approaches to ASD and SLD groups.

5. DISCUSSION

The current research shows, the deterioration of executive functions is quite more severe in people with autism spectrum disorder (ASD) and Specific Learning Disorders (SLD) compared to the typically developing ones, with specific results of the differing degrees of impairment among the participants of the groups. The increased percentage of severe executive function impairments in the ASD group underscores the widespread impairments of self-regulation, behavioral inhibition and cognitive flexibility, which are fundamental aspects of the disorder and help to lead to the difficulties in social interaction and adaptive functioning. Conversely, people with SLD had significant weaknesses and limitations in the sphere of working memory and planning, the

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executive processes, closely related to academic learning and task organization. Although the two clinical groups had an overlapping executive dysfunction, the differences in domains reveal the heterogeneity of the executive functioning profile in the neurodevelopmental disorders. Specificity of the impairments to ASD and SLD is further supported by the fact that the amounts of deficits that are typical in the development of a normal person are comparatively low. The findings, on the whole, support the significance of disorder-specific assessment and specific intervention strategies that can be used to solve the individual executive functioning obstacles of each disorder.

6. CONCLUSION

The current paper finds that there are much higher rates of deficit of executive functions, both in persons with autism spectrum disorder and Specific Learning Disorders as opposed to typically developing persons, and the impairments are patterned in both conditions. The losses in inhibition and cognitive flexibility are predominant in ASD people, and these facts point to difficulties in self-regulation and flexibility, but in SLD people, the impaired working memory and planning that directly influence the academic results are displayed. The relatively lower rates of executive dysfunction in the generally developing population further highlight the particularity of these impairments to the neurodevelopmental disorders. All in all, the results support the importance of identifying the disorder at an early stage, conducting an in-depth evaluation, and disorder-specific intervention strategies to develop both executive functioning and educational and adaptive outcomes among people with ASD and SLD.

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