

Cognitive Profile of Children with ADHD (Attention Deficit Hyperactivity Disorder): A Neurological Assessment

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ABSTRACT

Neurological disorders during infancy, childhood, and adolescence may adversely affect the acquisition of cognitive and emotional milestones Sadock B.J., Sadock V. A. (2000). There is growing consensus that the fundamental problems in ADHD are in self regulation and that ADHD is better conceptualized as an impairment of higher-order cognitive processing known as “executive function”. Tannock Schachar R. R, Therefore in order to provide help to the children with ADHD it is necessary to know the weaknesses and strengths of cognitive processes. The study was planned to prepare a cognitive profile of children with ADHD in order to measure the cognitive attributes children with ADHD may share. For the purpose of assessing the cognitive function of children with ADHD, Cognitive Assessment System (CAS) was utilized. It was hypothesized that children with ADHD would be low in cognitive processes or functioning. From the findings of the study it was concluded that there was a deterioration of cognitive functioning in all the four areas attention, planning, simultaneous and successive processing measured by Cognitive Assessment System.

Keywords: Cognitive Functioning, Attention, Planning, Simultaneous And Successive Processing, Cognitive Assessment System And Attention Deficit Hyperactivity Disorder

Attention-Deficit Hyperactivity Disorder (ADHD) is a prevalent, chronic, and impairing disorder occurring in 3% to 7% of school-aged populations (Angold, Erkanli, Egger, & Costello, 2000). Research has also shown that children and adolescents with ADHD demonstrate deficiencies in other abilities generally considered to fall within the domain of executive functioning (Barkley, 2006). It has been observed that children with ADHD tend to show specific impairment in frontal lobe tasks associated with executive function, therefore, the deficits in ADHD appear to be relatively specific to executive function rather than reflecting generalized cognitive impairment. (Tannock Schachar). According to Siedman and Douglas, Cognitive deficits, particularly impairment in focused attention and executive functions, are hypothesized to be a core component of ADHD and are thought to play a major role in the adaptive functioning of children with ADHD.

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According to Sadock B.J., Sadock V. A. (2000) Attention-deficit/hyperactivity disorder (ADHD) is the most common psychiatric disorder among school-age children and the best understood. Children with ADHD display the early onset of symptoms consisting of developmentally inappropriate over activity, inattention, academic underachievement, and impulsive behavior. The need for treatment of ADHD is highlighted by the increased risk of ADHD children for delinquency, accidents, and substance abuse. Therefore the present study was designed

Executive functioning is a broad construct that refers to a variety of processes including attention, working memory (WM), flexibility of thought, planning, and the regulation of goal-directed behavior. Working Memory is a key function that is necessary for many cognitive tasks, such as remembering instructions and completing tasks, and is implicated in such practical applications as academic learning and reasoning (Nigg, 2006)

In preparing the cognitive profile of the children with ADHD, four basic cognitive processes were tested with the help of Cognitive Assessment System (CAS) developed by Naglieri & DAS, (1997). These four cognitive functioning or processes included: Planning, Attention, Simultaneous Processing and Successive Processing. Planning is critical to all activities where the person has to determine how to solve a problem, which includes self-monitoring and impulse control as well as generation, evaluation, and execution of strategies for problem solving. Attention is involved when a person selectively focuses on particular stimuli and inhibits responses to competing stimuli. The process provides focused and selective attention over time. Focused attention involves directed concentration toward a particular activity and selective attention is important for the inhibition of responses to distracting stimuli. An essential aspect of simultaneous processing is the conceptualization of interrelated elements into a whole, which is why this process is often, tested using visual spatial tasks. Successive processing is required when information must follow a strictly defined order where each element is only related to those that precede it and these stimuli are not interrelated.

Therefore it can be inferred from the above paragraph that CAS is multidimensional and it can be used to understand the cognitive functioning of individuals very comprehensively and in totality.. A lot of researches have used general intelligence as the requirement to assess cognition of children with ADHD but it has been emphasized by Jepsen, Fagerlund, & Mortensen (2009), tests of general intelligence are not sensitive to the cognitive problems experienced by children with ADHD. Thus, in order to be sensitive to the cognitive problems observed in several children affected by ADHD, an ability test should be able to measure what has been described as executive functions or cognitive processes. Neuropsychological researchers have described ADHD as an executive control problem.

METHODOLOGY

57 children with ADHD were selected for the present study. These children were diagnosed with ADHD by the psychiatrists. After selecting them a cognitive profile was prepared. Cognitive Assessment System (Naglieri & Das, 1997) was used to examine the cognitive functioning/processes of children with ADHD and without ADHD

Description / Administration of Cognitive Assessment System (CAS)

Das, Naglieri and Kirby (1994) conceptualized the PASS model of Luria (1973) as a new approach to the assessment of cognitive processes i.e., planning, attention, simultaneous and

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successive processing. CAS is organized into 4 different scales with subtests in each of the four scales. Each scale has a normative mean of 100 and SD of 15. The Planning scale includes tests like matching numbers, planned code, and planned connections. The Attention scale: expressive attention, number detection and receptive attention. The Simultaneous scale: non-verbal matrices, verbal-spatial relations and figure memory. The Successive processing scale: word series, sentence repetition, and sentence questions.

Each subtest obtains a raw score, which are converted to scaled scores and further a total scaled score is obtained for each of the 4 scales. Standard scores are further obtained for each scale and the percentile rank at which the standard score falls.

RESULT AND DISCUSSION

The scores of 57 children having Attention Deficit Hyperactivity obtained on the scales of CAS was analyzed according to the objectives of the study. The following results were obtained.

Table No.1 Profile of Children with ADHD

| Demographic Variables | | Frequency | Percentage |
|-----------------------|---------|-----------|------------|
| Gender | Male | 32 | 56.1 |
| | Female | 25 | 43.9 |
| Age Range | 7-11 | 16 | 28.1 |
| | 12-14 | 41 | 71.9 |
| Class | 2-5 | 24 | 42.1 |
| | 6-8 | 33 | 57.9 |
| Type of Family | Nuclear | 37 | 64.9 |
| | Joint | 20 | 35.1 |

Table No. 1 shows the demographic profile of children with ADHD. The findings of the above table depicts that that 32 (56.1%) of male children have ADHD and 25 (43.9%) female children had ADHD. According to the above table it can be inferred that 41 (71.9%) children with ADHD were 12-14 years of age and 16 children were between 7-11years of age (28.1%). In terms of class 33 (57.9%) ADHD children were found in classes 6th to 8th and 24 (42.1%) from classes 2nd to 5th. There were 37 (64.9%) Children who belonged to the nuclear family and 20 children were from joint family (35.1%). The present result is in accordance with other studies conducted in India. Behavioral problems have been reported to be high in Indian children belonging to nuclear families by Verghese and his colleagues (1973).

Table No. 2. Frequency (Percentage) Interpretation of Scores on Subscales and Full Scale of CAS

| S. No. | Subtests | CAS Interpretation | | | | | | |
|--------|-------------------------|------------------------|---|--------|----------|----------|----------|----------|
| | | Frequency (Percentage) | | | | | | |
| | | V.S | S | H.A | A | L.A | B.A | W.B.A |
| 1. | Planning | 0 | 0 | 0 | 8(14) | 25(43.9) | 14(24.6) | 10(17.5) |
| 2. | Simultaneous Processing | 0 | 0 | 3(5.3) | 19(33.3) | 22(38.6) | 8(14.0) | 5(8.8) |
| 3. | Attention | 0 | 0 | 1(1.8) | 13(22.8) | 6(10.5) | 15(26.3) | 22(38.6) |
| 4. | Successive Processing | 0 | 0 | 0 | 14(24.6) | 18(31.6) | 19(33.3) | 6(10.5) |
| 5. | Full Scale | 0 | 0 | 0 | 0 | 10(17.5) | 26(45.6) | 21(38.9) |

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Table No.2 shows the categories of scores on CAS subscales and CAS full scale. The findings of the above table shows that on the planning scale 25 (43.9%) children with ADHD were rated as low average, 14(24.6%) children were rated as below average, 10(17.5%) of children were rated as well below average and only 8 (14%) performed on average. In the Simultaneous processing 22(38.6%) children with ADHD were rated as low average, 19 (33.3%) were rated as average, 8 (14%) were rated as below average, 5 (8.8%) were rated as well below average and 3(5.3%) of children were high on average. On attention scale 22 (38.6%) of children with ADHD were rated as well below average encompasses the maximum number of children, 15 (26.3%) were rated as below average, 13 (22.8%) were rated as average while 6 (10.5%) were rated as low average and 1 (1.8%) were high on average. In successive processing 19 (33.3%) children were rated as below average, 18 (31.6%) children were rated as low average, 14 (24.5%) children were rated as average and 6 (10.5%) children were rated as well below average.

From the full scale it can be concluded that performance of maximum number of children with ADHD in totality i.e. 26 (45.6%) was below average, 29 (38.9%) was well below average and 10 (17.5%) was low average which shows that on the whole every child with ADHD lacked the ability of cognitive processing in one or the other four areas of cognitive processes. Therefore ADHD can easily be linked to cognitive dysfunction may play a part establishing ADHD in neuro developmental and neurological disorder. In the present study the findings on the test cognitive assessment system are also consistent with the earlier findings suggesting that ADHD children were found having significant impairment in cognitive functioning. The study conducted by Anand Pratap Singh (2012) revealed that on the test of executive function, both the groups were found having significant impairment but the mean value suggest that children with ADHD have shown greater degree of impairment in terms of commission of errors and achievement scores.

As revealed from the result on the planning scale 25 (43.9%) children with ADHD were rated as low average, 14(24.6%) children were rated as below average which shows that their planning ability or the ability to accomplish the task related to goal oriented was below average and they also committed number of mistakes and were poor in time management and thus were prevented to complete the given task. The findings are consistent with a meta-analysis of 83 studies conducted by Pennington in 1996 which indicated that groups with ADHD exhibited significant impairment on neuropsychological measures of response inhibition, set shifting, working memory, and planning.

Performance on attention scale showed significant impairment in their attentional ability which depicts deficit in cognitive functioning. Inattentiveness affects the executive functioning as well. Due to very small attention span, 22 (38.6%) of children with ADHD were rated as well below average encompasses the maximum number of children, 15 (26.3%) rated as below average thereby supporting the symptomatic criteria of inattentive among ADHD children. The children with ADHD have shown significant impairment on the test of focused attention. They took much time to committed significant number of errors during the completion of task. The present result is supported by the Studies conducted in the area Grodzinsky (1992) found that ADHD children have left more circles unconnected on the test of focused attention and the overall scores on different parameters of focused attention suggested greater impairment. Thus the ADHD children take longer time to complete TMT-B as compared to controls and also commit more errors. Similar findings by Dykman & others

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(1991) and Gorenstein & others (1989) help to validate significant findings of the present study that the children with ADHD develop deficits in their planning ability.

The above findings of the table regarding Simultaneous and successive processing are very poor which indicates that the strategies of information coding that an individual regularly uses to decode information and solve problems according to the demands of the task at hand is not properly functioning (Das and Naglieri, 1992). On the basis of the observation collected by the researcher the children were very anxious and restless while performing on Simultaneous processing which required children to organize and synthesize information into a systematic chain of relationships. The levels of intelligence, memory, and attention in ADHD children are lower than those in normal children. ADHD children have deficiency in executive functions, such as selective inhibition, working memory and plan implementation. Liu Y, Wang Y, 2002 Successive processing, on the other hand, required independent stimuli to be arranged in linear sequence or step-by-step temporal order where children with ADHD were very nervous and could not manage time and were not able to follow instructions properly. There is considerable literature supporting the validity, both of the entire PASS model, as well as the simultaneous and successive processing constructs (e.g. Ashman and Das, 1980; Naglieri et al., 1989).

CONCLUSION

1. Cognitive functioning in all the four areas attention, planning, simultaneous and successive processing measured by Cognitive Assessment System was retarded in children with ADHD.
2. Utilizing the CAS to uncover weaknesses in one or more basic psychological processes allows for a better understanding of cognition in ADHD children
3. CAS scores appear sensitive to the cognitive processing difficulties experienced by children.
4. ADHD children have deficiency in executive functions, such as selective inhibition, working memory and plan implementation.

Implication

1. Psychologists who are working with ADHD children need to be aware of the cognitive issues briefly outlined herein, in order to optimally care for children with ADHD.
2. The findings of the present study would help to provide more targeted way to educate and treat children with attention deficits since the problems in the specific area affected can be studied.
3. The study further opens new prospects for future research in the area of executive function of the brain

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Conflict of Interest

The authors clearly declared this paper to bear no conflict of interests

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