

The effect of the attention deficit and the hyperactivity disorder on the calculus skills of the students of the second cycle at the primary education

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Abstract:

This paper tackles one of the developmental troubles that affect the humans during childhood. It studies the effect of the attention deficit and the hyperactivity disorder ADHD on the calculus skills of the students of the second cycle at the primary education. To achieve the study aims, we conducted a field study on sample of 20 students (males and females) aged between 08 and 11. The sample was divided into two equal groups; a group of the normal students and a group of those showing ADHD. The informants had been chosen on purpose after making the diagnosis through interviews, Stroop test, and Conners scale. To check the hypotheses, the author used Zareki Battery of calculus, adapted to the Algerian environment by Hassan Lamia. Besides, she conducted the two independent samples t test to study the differences between the two groups. Findings show that there are statistically significant differences between the ADHD students and the normal ones regarding the calculus.

Keywords: hyperactivity; attention deficit; calculus skills; second cycle of the primary education.

1. INTRODUCTION

Childhood is a vital phase of life, as it witnesses the acquisition of behaviors, trends, and values that hugely affect the character. It lasts from birth until the age of adolescence. During childhood, the child experiences many changes and rapid growth at the physical, cognitive, social, and emotional aspects. In this context, some children may suffer development troubles, including the ADHD that is very common among schoolchildren. According to DSM-5, around 05 to 09% of schoolchildren suffer this trouble that lasts until adolescence and adulthood for around 50-65% of the cases. Besides, it is more common for the males (01 out 02) compared to the females (01 out 03) (APA, 2013).

ADHD is defined as a nervous trouble that causes inappropriate behaviors. The affected children may show hyperactivity and high curiosity (Cleveland Clinic, 2023). The main symptoms are the inability to stay still in one place, the easy occupation, the reckless behaviors, the difficulty of waiting the turn, and the inability to control the emotions. These symptoms negatively affect the academic performance of the child and his relations with the others, and even self-esteem if not provided with the necessary support.

Due to the high rate of the disorder, and with the development of the health services internationally, the interest of the researches in this issue increased. In this regard, many studies have been carried out to know its causes, characteristics, diagnosis methods, and the medical and cognitive behavioral treatment to reduce its effects and improve attention of these children. Among these studies that focused on the cognitive aspect, we find that of Sanchis & al (2021) on the attentive performance of the children with ADHD. Findings showed statistically significant differences in the attentive tasks between the affected children and the normal ones, on behalf of the normal ones. In addition, children with ADHD suffer problems in the sustained attention and the cognitive flexibility, what affects their daily tasks (Martinez- Sanchis & al, 2021).

Moreover, Bowman & Jacobson (2016) conducted a study to evaluate the working memory of a group of children suffering ADHD and compare them to the control group that included normal children. They used various tasks and tests to evaluate the various items of the working memory, such as the vocal store, the spatial visual store, the central procession, etc. Findings showed a statistically significant deficit in the performance of children with ADHD regarding all the items of the working memory, mainly the central procession of information and their storage for short periods. This shows that these children have issues in processing and storing the information for short periods during the cognitive tasks (Bowman & Jacobson, 2016).

As studies by Leonard & al (2011) Kim & al (2014), Bruce & al (2006), LET bead & al (2015) have shown, there is a relationship between ADHD and weaknesses in some basic language skills such as comprehension and verbal expression, vocabulary and meanings, sentence construction, and verbal fluency.

Beside, many pedagogical scholars focused on the educational aspect. In this context, most of the studies showed that children with ADHD suffer learning deficits. Amaronson & Craig (2021) found out that around 30% of the children with ADHD suffer learning deficits accompanied by dyslexia and deficits in mathematics. Furthermore, Datey & Birchwood (2010) found out that there is a relation between the symptoms and severity of ADHD and the learning difficulties. In addition, Pennington & Willcutt (2000) showed a strong correlation between ADHD and dyslexia, and that around 35% of children suffering dyslexia have symptoms of ADHD.

The current study sheds light on calculus that is one of the basic skills learned by children in the primary education. It is defined as the ability of understanding the basic mathematical concepts such as the calculation, the numbers, and the relations, and of solving the simple mathematical issues and showing good ability to remember and use the facts and algorithms (Abdelmonem & Money, 2015, p. 83). In the same vein, Piaget's theory on the cognitive development of the child confirms the existence of requirements and conditions for the acquisition of the ability to deal with the mathematical questions and concepts, mainly reaching the age where the brain grows and understands the abstract things, acquiring perceptual experiences, interacting with the palpable things, and being psychologically prepared and motivated to accept learning. Besides, the concepts must be gradually introduced (from simple to complex), the child must be given the chance to practice, and the continuous feedback on the performance must be made (Salama, 2006, p. 130).

We try to know the calculus skills of the students with ADHD of the second cycle at the primary education. In so doing, we evaluate their calculus skills and reveal the difficulties they face compared to the normal children. Based on what was said, we raise the following problematic:

- Does ADHD affect the calculus skills of the students of the second cycle at the primary education?

From this question, sub-questions arise as follows:

- Are there statistically significant differences between the means of the students with ADHD and the normal ones of the second cycle at the primary education regarding the points counting?

- Are there statistically significant differences between the means of the students with ADHD and the normal ones of the second cycle at the primary education regarding the oral mental calculus?
- Are there statistically significant differences between the means of the students with ADHD and the normal ones of the second cycle at the primary education regarding the comparison of two written numbers?
- Are there statistically significant differences between the means of the students with ADHD and the normal ones of the second cycle at the primary education regarding the visual estimation of the quantities?

2. Aims of the study:

The main aim of the study is knowing the level of the calculus skills of the students with ADHD. The other aims are:

- Raising social awareness about the nature of ADHD and its differences from the other developmental deficits.
- Identifying the challenges faced by the students with ADHD during learning the mathematical concepts, and how to overcome them.
- Revealing the differences in the calculus learning between the students with ADHD and the normal ones.

3. Importance of the study:

- ✓ It sheds light on students with ADHD and their level of calculus, as it is very important for the academic path, mainly in learning mathematics.
- ✓ It is a scientific study that helps the students and the pedagogues.

4. Identifying the study terms:

4.1 The hyperactivity:

It is a set of physical movements that exceed the logical natural amount. It is a hyper reckless and inappropriate behavior with no direct goal. It grows in an inappropriate way to the age and negatively affects the behavior and performance of the child. It is more common for males than females (Abu Saad, 2009, p. 268).

4.2 Attention:

It is the psychological process of choosing the stimulants coming to the self, focusing on them, and ignoring the other stimulants (Fakher Akel, 1972, p. 624).

4.3 Attention deficit:

It is the low ability of focusing attention on the stimulants, the much forgetfulness, the shift from one activity to another, the focus on many topics, and the difficulty of thinking (al Marsoumi, 2011, p. 98).

4.4 The calculus skill:

It is the language of signs, relations, and numbers that helps the mental and logical thinking. Besides, it is a science based on 03 components, namely the calculation, the practical exercises of the weight, size, length, and surfaces, and the geometric shapes (Khayr Allah, 1980, p. 38).

4.5 The calculus difficulties:

They are the difficulties in using and understanding the mathematical concepts and facts, in the inferential and mathematical understanding, and in making mathematical calculations. They manifest in the inability to digest the mathematical calculations (Al Zayat Fetehi Mostefa, 2008, p. 549).

5. The procedures of the field study:

5.1 The method of the study:

We used the comparative descriptive method because it suits the nature of the study.

5.2 The sample of the study:

We chose the informants on purpose based on some conditions. The sample includes 20 male and female students aged between 08 and 11 from the classes of the second cycle of the primary education; suffering no visual or acoustic disability. The sample was divided into two equal groups after checking their medical files and the results of the diagnostic tests (interviews, Stroop test, and Conners scale), which we applied on a pilot sample of 15 students with ADHD. Then, after analyzing the results, we chose 10 cases showing ADHD. Thus, we got a group of the normal students and a group of those showing ADHD from the private school Al Salim and the school of Hassiba Ben Bouali in Bordj al Bahri, Algiers.

5.3 The study tools:

5.3.1 The interview:

To achieve the main goal, we conducted semi-structured interviews with the mothers and the teachers.

Interview with the mothers: It includes a set of questions about the growth and behavior of the children.

Interview with the teachers: It includes a set of questions about the behaviors of the children inside the classroom (with the peers and teachers), and about the difficulties they face in their studies.

5.3.2 Stroop test:

It was made by Stroop (1935) and amended by Michael Albaret & Jean- Laetitia Migliore (1999). It aims at measuring the selective attention of children of various ages. It is made up of colored words and rectangles distributed on three cards.

5.3.3 Conners scale:

It allows evaluating the severity of the behavioral trouble and giving an index of the hyperactivity. Its questions are based on the scientific methods used in the US specialized centers. The questions rely on three symptoms to diagnose the ADHD. The scale had been developed in two forms. The 1st is for the parents and includes questions about the family; they must be answered by the mother and the father with a strict focus on not attributing the behaviors of the child to educational factors. The 2nd is for the teachers who must answer the questions considering the objectivity and exactness. The questions are about the behavior and mentality of the child inside the school and with his peers.

5.3.4 Zareki –R- A test:

This battery had been first designed by the German Von Aster in 2001. Then in 2006, the French Dellatolas George adapted it to the French environment. Later in 2011, the Algerian Hassan Lamia adapted it to the Algerian environment. It is one of the important modern scales that diagnose the calculus deficits. It allows evaluating the various components of numbers procession by children of 06-11 years old in the primary education. Moreover, it aims at revealing the various deficits and includes 12 tests that include 92 items in total.

6. Data presentation and analysis:

To test the hypotheses and give a scientific credibility to this study, we conducted a statistical study to know the differences between the means of the two groups using two independent samples t Test.

6.1 Presentation and analysis of the results of the 1st sub-hypothesis:

It states that there are statistically significant differences between the means of the students with ADHD and the normal ones of the second cycle at the primary education regarding the points counting.

Table 01 shows the statistical results.

Table 01: the differences between the means of the two groups regarding the points counting

	Two groups	Arithmetic mean	Standard deviation	T	Statistical significance	Significance level
Points counting	Normal students (G1)	6.00	0.547	0.325	Significant	0.01
	Students with ADHD (G2)	5.60	0.635			

The table shows statistically significant differences at significance level 0.01 between the means of G1 and G2. In this regard, the arithmetic mean of G1 is 06 and of G2 is 5.60. Besides, the value of the calculated T is 0.325, which is statistically significant at significance level 0.01.

6.2 Presentation and analysis of the results of the 2nd sub-hypothesis:

It states that there are statistically significant differences between the means of the students with ADHD and the normal ones of the second cycle at the primary education regarding the oral mental calculus.

Table 02 shows the statistical results.

Table 02: the differences between the means of the two groups regarding the oral mental calculus

	Two groups	Arithmetic mean	Standard deviation	T	Statistical significance	Significance level
Oral mental calculus	Normal students (G1)	6.50	0.251	2.932	Significant	0.01
	Students with ADHD (G2)	4.30	0.350			

The table shows statistically significant differences at significance level 0.01 between the means of G1 and G2. In this regard, the arithmetic mean of G1 is 6.50 and of G2 is 4.30. Besides, the value of the calculated T is 2.923, which is statistically significant at significance level 0.01.

6.3 Presentation and analysis of the results of the 3rd sub-hypothesis:

It states that there are statistically significant differences between the means of the students with ADHD and the normal ones of the second cycle at the primary education regarding the comparison of two written numbers.

Table 03 shows the statistical results.

Table 03: the differences between the means of the two groups regarding the comparison of two written numbers

	Two groups	Arithmetic mean	Standard deviation	T	Statistical significance	Significance level
Comparison of two written numbers	Normal students (G1)	4.325	0.124	7.52	Significant	0.01
	Students with ADHD (G2)	4.001	0.239			

The table shows statistically significant differences at significance level 0.01 between the means of G1 and G2. In this regard, the arithmetic mean of G1 is 4.325 and of G2 is 4.001. Besides, the value of the calculated T is 7.52, which is statistically significant at significance level 0.01.

6.4 Presentation and analysis of the results of the 4th sub-hypothesis:

It states that there are statistically significant differences between the means of the students with ADHD and the normal ones of the second cycle at the primary education regarding the visual estimation of the quantities.

Table 04 shows the statistical results.

Table 04: the differences between the means of the two groups regarding the visual estimation of the quantities

	Two groups	Arithmetic mean	Standard deviation	T	Statistical significance	Significance level
Visual estimation of the quantities	Normal students (G1)	4.998	0.021	1.85	Significant	0.01
	Students with ADHD (G2)	2.197	1.218			

The table shows statistically significant differences at significance level 0.01 between the means of G1 and G2. In this regard, the arithmetic mean of G1 is 4.998 and of G2 is 2.197. Besides, the value of the calculated T is 1.85, which is statistically significant at significance level 0.01.

7. Discussion of the results:

The results show that ADHD affects the calculus skills of the students of the second cycle at the primary education regarding the various levels of calculus. The study of the differences between the means of the normal students and those with ADHD regarding the grades showed statistically significant differences on behalf of the normal ones. This may be due to the inability of concentration and attention, leading to the inability of mastering the necessary calculations and steps of counting the points. These findings agree with those of other studies that showed that about 65-80% of children with ADHD suffer difficulties in calculation, which affect their school performance. In addition, our results agree with those of Costa et al (2011) that found statistical significant differences between the children with ADHD and the normal ones regarding the calculation skills, on behalf of the normal ones. It found out that children with ADHD suffer high difficulty in understanding and executing the basic counting compared to their peers. Besides, our results go with those of Raghubar & al (2009)

which showed that the low working memory of children with ADHD is directly linked to the difficulties of counting.

Moreover, the study of the differences between the means of the normal students and those with ADHD regarding the oral mental calculus showed statistically differences, on behalf of the normal ones. This agrees with the findings of Coghil & Matthews (2014) who found out that children with ADHD suffer low skills of attention, memory, and self-regulation. This negatively affects the mental calculus. In addition, the study of Rubia & al (2009) attributed this weakness to functional deficits in the frontal lobe, leading to the low attention and difficulties in the executive functions.

Regarding the 3rd and 4th hypotheses, we found out that children with ADHD face difficulties in comparing two written numbers and in the visual estimation of the quantities. Besides, there are differences between their means and those of the normal ones, on behalf of the normal ones. We can explain this with the theory of the attention deficits that states that the low attention leads to the inability of concentration and the exact perception of the visual stimulants, such as the quantities. Thus, we find difficulties in the visual estimation (Martinussen & al, 2005).

Besides, Barkley (1997) points that the executive deficit that manifests in the low attention, responsiveness, and executive functions interprets the symptoms of ADHD, including the planning, organization, and problem-solving, leading to deficits in the visual estimation of the mathematical quantities. Hence, the studies of al Sartaoui & al Chakhs (2007), Sadek (2010), and al Zahrani (2020) recommended the early diagnosis of ADHD and insisted on making training programs to develop the calculus skills of these children.

8. Conclusion:

We tried to study the effect of ADHD on the calculus skills to make an additional work that benefits the society. Thus, we conducted a field study on 20 students from the classes of the second cycle of the primary education. 10 of them suffer ADHD while 10 do not. We applied Zareki battery of calculus on the informants. The quantitative results helped study the differences between the two groups using two independent samples t Test. Findings showed statistically significant results between the means of students with ADHD and those who do not regarding the various levels of the calculus skill. Based on these findings, we suggest that:

- ❖ It is necessary to make the early interdisciplinary diagnosis regarding ADHD.

- ❖ It is necessary to follow special programs in dealing with ADHD children.
- ❖ The parents must be informed about the methods of dealing with the children to reduce recklessness and hyperactivity.
- ❖ It is necessary to establish communication between the teachers and the parents for the continuous evaluation and the communication of the educational results and progress.

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