

PERFORMING SELECTIVE ATTENTION IN PUPILS WITH READING DIFFICULTIES ON THE STROOP TEST: DOES IT REFLECT ATTENTION DEFICIT OR SLOW READING PROCESSING?

أداء الانتباه الانتقائي لدى تلاميذ ذوي صعوبات تعلم القراءة في اختبار ستروب:

هل يعكس قصورا انتباهيا أم بطئا في المعالجة القرائية ؟

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ABSTRACT

This study aimed to analyze the performance of pupils with reading learning difficulties on the Stroop test by examining whether it reflects a deficit in selective attention or is mainly related to slow reading processing. The study adopted a comparative descriptive approach on a sample of 22 fourth-year primary school pupils, equally divided into two groups (pupils with reading learning difficulties and typical readers). The modified Stroop test was used, along with a corrective equation to control for reading speed and color-naming effects. The results showed descriptive differences in initial performance in favor of typical readers; however, the Mann–Whitney test revealed no statistically significant differences in the adjusted interference score ($U = 37$, $Z = 1.34$, $p > 0.05$), with a weak effect size ($r = 0.28$). These findings suggest that Stroop performance differences do not indicate an independent deficit in selective attention, but are mainly linked to slower reading processing. This supports contemporary views emphasizing the interaction between executive functions and linguistic processes, highlighting the need for caution when interpreting performance in linguistically loaded executive tasks.

Keywords:

executive functions ; reading learning difficulties ; reading processing; selective attention.

ملخص

هدفت هذه الدراسة إلى تحليل طبيعة أداء تلاميذ ذوي صعوبات تعلم القراءة في اختبار ستروب، من خلال فحص ما إذا كان هذا الأداء يعكس قصورا في الانتباه الانتقائي أم يرتبط ببطء في المعالجة القرائية. اعتمدت الدراسة المنهج الوصفي المقارن على عينة مكونة من (22) تلميذا من السنة الرابعة ابتدائي، موزعين بالتساوي إلى مجموعتين (ذوو صعوبات تعلم القراءة/عاديون). استخدم اختبار ستروب في نسخته المعدلة، مع تطبيق معادلة تصحيحية لضبط أثر سرعة القراءة وتسمية الألوان، أظهرت النتائج فروقا وصفية في الأداء الأولي لصالح التلاميذ العاديين، إلا أن اختبار مان-ويتني لم يكشف عن فروق دالة إحصائية في درجة التداخل المعدل ($U=37, Z=1.34, P>0.05$) مع حجم أثر ضعيف ($r=0.28$)، تشير هذه النتائج إلى أن الفروق في أداء اختبار ستروب لا تعكس قصورا مستقلا في الانتباه الانتقائي، بل ترتبط أساسا ببطء المعالجة القرائية. وتدعم هذه النتيجة الطروحات المعرفية الحديثة التي تؤكد تداخل العمليات التنفيذية مع الأنظمة اللغوية، مما يستدعي الحذر في تفسير الأداء في المهام التنفيذية ذات الطابع اللغوي.

الكلمات المفتاحية:

الانتباه الانتقائي؛ صعوبات تعلم القراءة؛ المعالجة القرائية؛ الوظائف التنفيذية.

1. INTRODUCTION

Reading difficulties are one of the most common developmental disorders in the school context, due to their direct link to the acquisition of basic academic skills and their extended impact on the student's educational path. These difficulties are not limited to impairments in achievement, but are related to a complex cognitive structure that includes interactions between linguistic and executive processes, such as cognition, attention, and memory (Al-Tuhami et al., 2018; Lakhali, 2011).

A number of researchers have pointed out that failure to read not only reflects a lack of decipherment or comprehension, but extends to an imbalance in the organization and processing of linguistic information (Dao, 2024; Chico, 2022).

In this context, attention, especially selective attention, occupies a central place in the interpretation of reading performance, as a cognitive mechanism responsible for directing mental activity towards relevant stimuli with inappropriate stimuli (Sassi, 2025). Multiple studies (Jalab, 2021; Saadi, 2024) have shown that pupils

with reading learning difficulties show impairment in this function, both in terms of the ability to concentrate and to remain attentive compared to their normal peers. However, this proposition does not enjoy full consensus, as other works, such as a study (SUREAU & fall, 2024), indicate that poor performance in tasks that measure attention, especially those of a linguistic nature, may be influenced by basic linguistic factors, such as slow reading processing or poor fluency, rather than being the result of independent executive deficiencies.

The Stroop test is one of the most widely used tools in evaluating selective attention and executive palm, but the interpretation of its results in the group of people with reading difficulties remains debated, given the overlap of its components with basic linguistic processes, such as reading words and naming colors. Some studies have shown that low performance on this test in this group may reflect slower language processing rather than being a direct indicator of impairment in executive control (kerdja, 2020)

Based on this discrepancy in the literature, the problem of distinguishing between what is linguistic and what is executive arises in explaining the performance of pupils with reading difficulties in complex cognitive tasks, especially in Arab environments in which studies are still relatively limited in this field. Accordingly, the present study seeks to analyze the nature of the performance of this group in the Stroop test, by examining whether this performance reflects a lack of selective attention or is mainly related to a slow reading processing.

Accordingly, the study seeks to answer the following question:

Are there differences between normal pupils and those with reading learning difficulties in the degree of modified overlap in the Stroop test after adjusting the effect of reading processing speed?

2. Importance of the study

This study gains its importance through:

-Its contribution to clarifying the nature of the overlap between linguistic processes and executive functions in explaining the cognitive performance of students with reading difficulties, by re-examining the indications of performance in the Stroop test in the light of reading processing. While many studies tend to interpret underperformance on this test as an indicator of deficits in selective attention or executive immobility, this study seeks to provide an alternative interpretive reading that takes into account the effect of language processing speed.

-This study also contributes to bridging a research gap related to distinguishing the cognitive sources underlying performance in executive tasks of a linguistic nature. This proposal would support modern cognitive trends that emphasize the integrative nature of executive functions and language systems and enhance the accuracy of interpreting the results of psychological tests used to diagnose learning difficulties.

-At the practical level, the importance of the study is highlighted in guiding diagnostic and intervention practices towards adopting more accurate evaluation tools, taking into account the distinction between linguistic and operational factors, which contributes to improving educational and therapeutic care programs directed to this group

3. Objectives of the study

The study aims to analyze the nature of the performance of pupils with reading learning difficulties in the Stroop test, by distinguishing between the contribution of executive factors (selective attention) and linguistic factors (reading processing speed) in explaining this performance. This is done through:

- Evaluating the level of performance on the Stroop test in pupils with reading difficulties compared to normal pupils.
- Examining the differences between the two groups in the basic conditions of the test: (word reading, color naming, overlap condition).

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-Analyzing the effect of adjusting the speed of reading processing on the significance of differences in executive performance (degree of modified overlap).

-Determining whether differences in performance reflect deficits in selective attention or are related to underlying linguistic factors.

-Contributing to improving the interpretation of the results of the Stroop test when used in the evaluation of executive functions in the category of learning disabilities.

4. Limits of the study

- **Time Limits:** The study was conducted during the month of January for the academic year 2025-2026.
- **Spatial Boundaries:** The study was applied to a sample of fourth-year primary students at Umm al-Sheikh Zaytouni School in the city of Meliana, Ain al-Dafla Governorate.

5. Concepts of the study

This section explains the main concepts of the study : selective attention and reading difficulties, it provides theoretical background needed for the research.

5.1 Selective Attention:

Reed and Ruscon defined it as: “the ability to focus consciousness on external and internal stimuli.”

Al-Meligi defines it as: “The use of mental energy in a cognitive process, or is the directing and focusing of feeling in a particular thing in preparation for observing, performing, or thinking about it.”(Mithqal Al-Qasim, 2015,p.57)

5.2 Difficulties learning to read:

They are deficiencies in achieving the intended objectives, including reading comprehension, perception and expression of relationships between meanings and ideas, slow pronunciation, defective pronunciation, or incorrect pronunciation (Lekhali, 2011,p.45).

6.Methodological Procedures

This section describes the methodological procedures adopted in the study, including the reserch desing and data collection methods .

6.1 Study Methodology:

The comparative descriptive approach was adopted because the nature of the study and its variables impose this approach, which is based on knowing and determining the reasons (indépendant variables) that led to the results (dependent variables) without changes or experiments on independent variables as in the experimental approach, but through comparison in the dependent variables between those who own the characteristics of the variables and those whodo not (Al-Rashidi, 2000 ,p. 56).

In this study, the degrees of selective attention among pupils with reading difficulties and normal pupils at the fourth primary level are compared.

6.2 Study population and sample:

The statistical community of the research included students at the fourth primary level with reading learning difficulties and ordinary students, and since the number or variation of the statistical community is unlimited, the sample items were chosen from it in a purposeful way, which is a type of improbable samples that the researcher resorts to because randomness cannot be applied for some reas on, so he chooses it according to the purpose he aims to achieve through the research, and it is chosen on the basis of the availability of specific qualities in the sample items that are the qualities that characterize the vocabulary of the community under study.

The sample consisted of 22 pupils divided into two groups equally (with reading difficulties and normal), by 11 words for each group, after adjusting their homogeneity in some variables (such as intelligence and age).

7. Presentation and analysis of the results in light of the hypothesis of the study

The study attempted to test the following research hypothesis: There are no differences between normal pupils and those with reading learning difficulties in the degree of modified overlap in the Stroop test after adjusting for the effect of reading processing speed.

Group	Cases	Card A	Card B	Card C	Degree of overlap	Performance level
Ordinary	BN	67	67	40	6.5	High
	S.B.	63	58	52	21.8	Very High
	SA	79	65	47	11.4	High
	M.R	65	59	51	20.1	Very High
	R.A	72	62	43	9.7	High
	T.T	61	62	60	29.3	Very High
	B.A	62	58	38	8.1	High
	B.M	76	65	62	27	Very High
	A.O	70	71	36	0.7	Average Normal
	K.V	75	58	50	17.3	High
	C.U	72	72	50	14	High
Group	Cases	Card A	Card B	Card C	Degree of overlap	Performance level
People with Difficulties Learn to read	S.A	36	41	37	17.8	High
	A. E	51	41	45	22.3	High
	B.C	59	41	38	13.8	High
	G.P	46	50	28	4.1	Normal
	R.W	41	29	43	26	High
	T.U	60	60	50	20	High
	S.R	50	43	36	12.9	High
	W.H	43	42	55	33.8	Very High
	P.O	39	43	40	19.5	High
	C.K	47	49	50	26	High
	R.O	43	42	37	15.8	High

Table1: Results of the sample members on the Stroop test and performance levels

The results of the raw data showed descriptive differences between ordinary fourth graders and those with reading difficulties in the basic reading conditions of

the Stroop test, which is consistent with the literature linking reading difficulties to slow language fluency .

In the word-reading condition **(A)**, the scores of the group of people with reading difficulties were significantly lower, which indicates a weakness in the speed of basic linguistic processing, a pattern that was reported in a study by Mansouri and Ben Arrom(2015) that linked the level of reading fluency to the basic cognitive factors in these students.

As for the condition of naming colors **(B)**, the differences were not sharp, which indicates the absence of a general deficiency in the speed of visual processing, which is consistent with the results of a study Faccioli et al (2007) that found that performance in non-linguistic tasks among students with reading difficulties is not significantly different from their normal peers.

When analyzing the overlap condition **(C)** according to the modified version of the Stroop test, it was found that the decrease in performance in the group of people with learning difficulties was proportional to their weakness in basic reading fluency, without showing a qualitative decrease in the mechanism of executive cessation itself after adjusting the impact of reading speed, and this is consistent with the findings of a study Wang & Gathercole (2014) that found that the performance of children with reading difficulties in cognitive overlap tasks is often affected by the basics of language more than the impact of pure executive functions, as well as a study Faccioli et al (2007) that confirmed that poor performance in the Stroop test among students with reading difficulties in the primary stage is closely related to the level of reading fluency and not a deficit in selective attention itself.

Thus, the results indicate that the executive difficulties apparent in the overlap condition are not an independent executive disorder, but rather a reflection of the nature of the poor linguistic fluency of these pupils, which reinforces the trend that confirms that reading difficulties in the primary stage are mainly related to

phonological and linguistic factors (Diamond, 2020) rather than to a fundamental imbalance in selective attention or general executive stopping.

To ascertain the significance of this discrepancy between the two groups, the Mann-Whitney ordinal test was used, which resulted in the following delete:

Group	Sample	Average Ranks	U Value	Z-value	Statistical significance	Impact size r
Ordinary	11	9.36	37	1.34	0.156	0.28 Weak Impact Volume
People with reading difficulties	11	13				

Table 2: Results of the Mann-Whitney test to indicate differences in performance levels between the two groups

The results of the Mann-Whitney test for two independent samples showed that there were no statistically significant differences between ordinary pupils and those with reading difficulties in the degree of modified interference on the Stroop test B (**U=37**), (**Z=1.34**), (**p > 0.05**), and although descriptive differences were observed in favor of the ordinary group in selective attention, these differences did not reach the level of statistical significance, which indicates a relative convergence in the efficiency of resistance to cognitive interference when adjusting the speed of reading and the speed of color naming using the corrective equation.

The size of the trace was (**r = 0.28**), which is a small trace size, indicating that the differences that exist are of a limited nature in practice. These results suggest that the differences that have emerged in raw scores may be influenced by the speed of the baseline reading, while when corrected statistically, the executive difference between the two groups narrows.

These results indicate that the differences between normal pupils and those with reading difficulties in the degree of modified overlap do not rise to the level of statistical significance, despite the appearance of descriptive differences in raw scores.

This can be explained in remove light of the modern cognitive subtraction, which confirms that the performance of the Stroop test is affected by two overlapping factors: the speed of basic processing (reading words and naming colors) on the one hand, and the executive control represented in the cessation of response and attention control on the other hand. When adjusting the effect of processing speed using the corrective equation, the apparent differences diminish, indicating that a significant part of the variation in performance is due to slow reading processing and not to executive deficiency.

This finding is consistent with the neurocognitive literature, which sees reading difficulties as a multi-component disorder. The double deficit model confirms that the defect is not limited to phonological processing, but includes slow rapid naming and partial weakness in executive control mechanisms (Margolis et al, 2020).

The current results also support the integrative model presented by Diamond (2020), which confirms that executive functions – especially cognitive palm – interact with linguistic systems in the context of reading performance, and do not work in isolation from them.

In contrast, a study Jalab (2021), whichincluded selective attention among people with dyslexia, indicated that students with dyslexia suffer from severe weakness in selective attention, and this was shown in the slow response time and the occurrence of errors and hesitations.

In another study Saadi and Tashima (2024) remove included the level of executive functions (selective attention and working memory) in the dyslexic, its results showedthatthere is a deficit in executive functions manifested in written language.

Therefore, the apparent executive functioning of the LD group can be interpreted as a secondary effect of slow language processing rather than as independent evidence of deficits in attention mechanisms or executive functions.

These findings highlight the importance of using supportive non-linguistic executive assessment tasks when examining executive functions in samples of learning disabilities.

8. Conclusion

In light of the results obtained, it is clear that the performance of pupils with reading learning difficulties on the Stroop test does not necessarily reflect an independent deficiency in selective attention or in the mechanisms of executive stopping, but is more slowly associated with basic reading processing. The results showed that the differences that emerged in raw performance between the two groups are reduced when adjusting the reading speed effect, which confirms that a significant part of the variation in performance is due to linguistic factors rather than to executive deficiencies.

This finding supports modern cognitive trends that emphasize the interactive nature of executive functions and linguistic systems, as performance on cognitive tasks of a linguistic nature cannot be explained in isolation from the underlying processing components.

Accordingly, the use of the Stroop test in assessing selective attention in this category calls for a degree of systematic caution, especially when the impact of linguistic variables is not controlled.

The importance of these results is highlighted in reorienting the diagnostic interpretation of learning difficulties towards more integrated models, taking into account the overlap between different cognitive processes, rather than relying on one-dimensional interpretations.

This opens up future research horizons for the study of this topic, and this is what leads us to formulate the following proposals:

- Caution when using tests of a linguistic nature in diagnosis, **especially** when evaluating executive functions, with the need to integrate them with other more neutral tools.

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- Conduct future studies on larger and more representative samples, adopting more rigorous methodological designs, allowing the results to be generalized and reinforcing their explanatory power.
- Paying attention to early detection of people with reading difficulties.
- The need to develop therapeutic protocols and training activities geared to the development of executive functions adapted to the Algerian environment, especially in the early years of primary education.
- The need for early care for people with learning difficulties in order to reduce the aggravation of these difficulties.
- Involve parents in the therapeutic process by educating them on ways to support attention and reading at home.
- Activating the role of specialists (Orthodox psychologists and educators) in preparing individual intervention programs that suit the specificity of each student.
- Forming and training teachers on strategies for dealing with students with learning difficulties in general, with a focus on developing basic cognitive skills within the department.

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