

Depression Symptoms and Neuropsychological Function in Children with Learning Difficulties

Sintomas depressivos e funções neuropsicológicas em crianças com dificuldades de aprendizagem

Ricardo Franco de Lima¹, Sylvia Maria Ciasca²

ABSTRACT

Objective. The objective of this study was to identify correlations between depression symptoms and cortical functions in children with learning difficulties. **Method.** A sample of 33 students participated in the study, 25 males and 8 females, with average age of 10.7 years old, recruited from outpatients clinics of Neurology, specialized in learning problems with multidisciplinary evaluation. The participants were evaluated with the following instruments: the Wechsler Intelligence Scale for Children (WISC) and Children's Depression Inventory (CDI). For data analysis, the Statistical Package for Social Sciences was used for descriptive and inferential statistics. **Results.** Three students presented depression symptoms. Negative correlations (the more depressive were the children the less scored in WISC) were found between CDI and the WISC verbal subtests: Similarities, Vocabulary, and Comprehension; between the CDI and the WISC Verbal Intelligence Quotient (IQ), Total IQ, and Verbal Comprehension Index; between the CDI and the WISC test of sustained visual attention: Symbol Search and Speed of Processing Index. **Conclusions.** We observed that the depression symptoms interfered negatively in verbal functions and sustained visual attention. The study demonstrates that it is important to investigate depressive symptoms in children, mainly in those who present learning difficulties.

Keywords. Neuropsychology, Depression, Learning Disorders.

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Study performed at Department of Neurology. Laboratory of Learning Disabilities and Disorders of Attention. Hospital das Clínicas. Faculty of Medical Sciences. University of Campinas (UNICAMP), Campinas-SP, Brazil.

1. Neuropsicólogo, Mestrando em Ciências Médicas – Área de Concentração: Saúde Mental – FCM/UNICAMP, Campinas-SP, Brasil.
2. Neuropsicóloga, Livre Docente em Neurologia Infantil - FCM/UNICAMP, Campinas-SP, Brasil.

RESUMO

Objetivo. O objetivo do estudo foi identificar as correlações entre os sintomas depressivos e as funções corticais em crianças com dificuldades de aprendizagem. **Método.** Participaram 33 estudantes, sendo 25 meninos e 8 meninas com idade média de 10,7 anos, encaminhados a um Ambulatório de Neurologia especializado em problemas de aprendizagem para avaliação multidisciplinar. Os participantes passaram por avaliação na qual foram aplicados os instrumentos: Escala de Inteligência Wechsler para crianças (WISC) e Inventário de Depressão para Crianças (CDI). Para a análise dos dados foram utilizadas estatística descritiva e inferencial (SPSS). **Resultados.** Três estudantes apresentaram sintomatologia depressiva. Foram encontradas correlações negativas (quanto maior a depressão, menor os scores no WISC) entre o CDI e os subtestes verbais do WISC: Semelhança, Vocabulário e Compreensão; entre o CDI e o Quociente de Inteligência (QI) Verbal, QI Total e Índice de Compreensão Verbal do WISC; entre o CDI e o teste de atenção sustentada visual do WISC: Procurar Símbolos e o Índice de Velocidade de Processamento. **Conclusões.** Observamos que a sintomatologia depressiva interferiu negativamente nas funções verbais e na atenção sustentada visual. O estudo demonstra a importância da investigação dos sintomas depressivos em crianças e principalmente naquelas que apresentam dificuldades de aprendizagem.

Unitermos. Neuropsicologia, Depressão, Transtornos de Aprendizagem.

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Endereço para correspondência:

Ricardo F Lima
R Jorge Miranda, n° 104, apt. 43 – Botafogo
CEP 13020-180, Campinas-SP, Brasil.
E-mail: rilima@fcm.unicamp.br

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INTRODUCTION

The study of childhood depression is recent, because up to the 1960's it was believed that such clinical condition was rare or inexistent for this age range. Over the last years, with the systematization of research in child psychology and psychiatry, it has been observed that depression during childhood and adolescence presents a lasting nature, affects multiple functions and causes significant psychosocial harm¹.

Nowadays, systems of diagnostic classification define the basic symptoms of depression as relatively similar in children, adolescents and adults; however, clinical manifestation occurs according to the characteristics of each developmental phase. In children during school phase, from seven to twelve years old, the main complaints or clinical manifestations are: sadness, irritability, boredom, sad looks, constant fatigue, social phobia, fears, physical symptoms, sleeplessness, psychomotor restlessness or slowness, difficulty in concentrating, decline in school performance and learning difficulties¹.

Data in the literature about prevalence of childhood depression have high variability. An epidemiological study with 807 students between 7 and 17 years old, using the Children's Depression Inventory (CDI), finding high prevalence (22%) of symptoms, mainly between 13 and 14 years of age².

In another epidemiological study conducted at a public school in Curitiba (PR) with 463 students of junior high and high school level, age range between 10 and 17 years old, it was noticed that 20.3% of the participants presented significant depression symptoms with probable symptom peaks between 12 and 15 years old³. In another study was observed rate of 21.1% of depression symptoms in school children aged between 7 and 12 years old assessed through the CDI⁴.

Other investigators have indicated low prevalence as the study conducted with 135 students aged 7 to 14 years old and rate of 1.48% of the symptoms corresponding to 2 individuals of the total sample⁵. In the study with 169 students between 8 and 15 years old, 6 (3.55%) presented significant depression symptoms in the CDI⁶. Other study identified prevalence of 1% of depressive disorder in a group of 1,251 students aged between 7 and 14 years old in Taubaté (SP)⁷.

In general, it has been observed that prevalence is higher when specific groups are studied, such as adolescents with family problems⁸, hemophilic children and adolescents⁹ and children with learning disorders¹⁰. In a study that evaluated 53 children between

8 and 11 years old presenting learning disorder was found that 35.85% of these children presented depression symptoms in the CDI¹¹.

A worsening factor of depression state is that it does not occur in an isolated form, but associated to other difficulties, mainly social and school-related. Several studies have claimed that depressive symptom in students may cause decline in school performance, harm to attention, loss of interest and damage to cognitive processes^{6,12-15}.

Research indicates that children with depressive symptoms had a significant reduction in school performance compared with those without symptoms¹⁵. Similar results are observed in studies conducted with adolescents^{12,14}.

Other symptoms, which may be observable in school context, are cognitive difficulties, which probably cause decline in school performance. Thus, cognitive deficits such as decision making and mainly attention deficit (selective and sustained attention) and its implications in other cognitive processes (memory, reasoning) interfere in learning at school^{6,13}.

Some studies have identified alterations not only in school performance, but also in cognitive and neuropsychological functions: attention, slowness to accomplish tasks and executive functions, mainly in mental flexibility. Activities which demand active mental effort cause worse performance due to loss of cognitive initiative^{6,12-15}.

In our context, recent studies indicate that in addition to lowering the performance, are correlations between the presence of depressive symptoms and impaired quality of visual sustained attention¹² and in the use of learning strategies⁶. According to the author's explanations, cognitions of depressed children and adolescents are negative and dysfunctional, for they present a negative style of evaluating themselves, the world and the future. These individuals tend to select and prioritize negative events in their lives and it is likely that, when faced with a situation of failure at school, they may nurture exaggerated feelings of self-devaluation, helplessness and pessimism. In this way, their cognitions influence motivation, their performance and learning.

Despite the increase in the number of studies about evaluation of depression symptoms in school context, literature is scarce in specifically relating such symptoms in childhood and neuropsychological functions. In this way, little is known about how these symptoms may interfere in cognitive functions, especially in children's attention. Moreover, the relation be-

tween these variables in children with learning difficulties has been little explored. Hence, it was aimed by the present study to identify the prevalence of depression symptoms and correlate them to the neuropsychological performance of children with learning difficulties.

In order to do it, we propose a descriptive study of correlation, whose hypothesis is that the presence of depression symptoms interferes negatively in neuropsychological functions.

METHOD

The study has been approved by the Committee of Ethics in Research of the Faculty of Medical Sciences/UNICAMP with protocol number 168/2006.

In this study, 33 students participated, being 25 (75.8%) males and 8 (24.2%) females, with age range from 8 to 14 years old. The average age was 10 years and 7 months. All children participating in the study were selected among those who were sent to the Neuro-Difficulties in Learning Outpatients at the Hospital das Clínicas/UNICAMP to multidisciplinary evaluation. Schools and other public health services in the metropolitan region of Campinas referred the children, with complaints related to learning disabilities, especially in reading and writing. The children were included according to the criteria (learning difficulties in reading and writing, and preserved intellectual level: $IQ > 80$) after neuropsychological assessment. The criteria for exclusion were: low intellectual level, use of psychotropic medication and neurological conditions.

For collecting the data, the following instruments were used:

a) Evaluation of Neuropsychological Functions through the “*Wechsler Intelligence Scale for Children*”-WISC-III¹⁶, considering the scores of the subtests, the intelligence quotients (IQ) and factorial indexes. These scores were grouped according to neuropsychological functions: Visual and Auditory Sustained Attention, Auditory Immediate Memory, Remote Memory, Visual and Visual-Spatial Organization, Perceptual Organization, Functions – Verbal, Non-Verbal and Intellectual. WISC-III is an instrument composed by 12 subtests, for clinical evaluation and individual test application.

b) Evaluation of depression symptoms through the “*Children’s Depression Inventory*” (CDI) developed by Kovacs¹⁷ and adapted to the Brazilian population¹⁸. The CDI is an inventory self-reported composed by

20 items, in which the child must check one among three alternatives given for each item, and the score varies from 0 (absence of symptom) to 2 (strong symptom). In this study, the full score and the cut-off point of 17 for significant symptoms were considered. The child was told to select an item that better described his or her feelings, thoughts and behaviors in the last couple of weeks. Each item was read to the child and the terms or items that presented more difficulties to be answered were explained.

The psychologists of the team evaluated the children after the signature of the Consent Form by parents or caretakers. The evaluation was individual and occurred in two sessions with duration of 1 hour each. The researchers provided explanations, according to the instructions of the test manual. Afterwards, the data was tabulated and analyzed through the Program SPSS (Statistical Package for Social Sciences) v15.0 and for the value of “p” it was considered the significance level of 0.05.

RESULTS

In relation to the characterization of the sample, the average ages of the boys was 10.8 ± 1.6 years old and of the girls was 10.1 ± 1.6 years old. There was no difference in age and school grade (Table 1).

Table 1
Participant Characteristics

Itens	F (%)
Gender	
Males	25 (75.8)
Females	8 (24.2)
Age	
08 - 09	10 (30.3)
10 - 11	13 (39.4)
12 - 14	10 (30.3)
Series	
2nd - 4th	18 (54.5)
5th - 6th	15 (45.5)
Total	33 (100)

F = Frequency

The general mean score in the CDI was 9.0 ± 5.7 points, with minimal score of 0 and maximum of 23 and higher frequency of scores 4 and 7. The number of participants who outscored the cut-off point 17 was 3 (9.1%, Table 2).

Table 2
Demographics Characteristics and Performance in CDI

Characteristics	N	M (\pm SD)
Gender		
Males	25	8.7 (5.1)
Females	8	11.4 (7.2)
Age		
08 - 09	10	7.4 (4.7)
10 - 11	13	10.8 (6.8)
12 - 14	10	9.4 (4.8)
Grades		
2nd, 3th, and 4th	18	9.2 (6.1)
5th and 6th	15	9.5 (5.3)
Total	33	9.0 (5.7)

N = Number; M = Mean; SD = Standard Deviation

There were no significant differences among CDI score and age ($F = 1.00$; $p = 0.378$) and school grade ($F = 0.396$; $p = 0.809$). Although the girls presented a greater score on the CDI than the boys, there were no significant differences ($p = 0.323$).

There were no significant correlations among depression symptoms and school grade ($r = 0.014$; $p = 0.938$) and age ($r = 0.097$; $p = 0.591$).

The analysis of correlation between each item of the CDI and age showed positive correlation for age and question 9 – suicidal ideation ($r = 0.386$; $p = 0.026$) and question 11 - worry ($r = 0.342$; $p = 0.051$).

There were negative correlations among age and subtests: *Similarities* ($r = -0.378$; $p = 0.030$), *Codes* ($r = -0.388$; $p = 0.025$), *Symbol Search* ($r = -0.296$; $p = 0.095$), and *Processing Speed* ($r = -0.375$; $p = 0.031$). There were no correlations among the other WISC-III subtests or IQ's and the variables age and school grade.

There were significant negative correlation (the higher depressive symptoms the lower WISC scores) among the CDI scores and scores of different subtests of the WISC-III: symbol search, speed of processing, comprehension, similarities, vocabulary, IQ verbal, verbal comprehension, and IQ total (Table 3).

DISCUSSION

The present study aimed to identify the correlation of depression symptoms and neuropsychological functions in children with learning difficulties.

The study sample consisted of children in higher frequency of males (75.8%), corroborating with other studies conducted with children with learning disabilities^{19,20}.

In relation to the depression symptoms, the study indicated that 3 subjects of the total sample outscored the cut-off point of the test (9.1%). Studies with epidemiologic perspective have identified higher rates of prevalence³⁻⁵. We can not compare our study with literature because our study did not have epidemiological aim and participants presented learning difficulties. Nor do we aim to show that depressive symptoms are caused by learning difficulties, despite some studies indicated that children with such difficulties are more likely to develop psychological problems^{10,11}. To this conclusion it would require an experimental design study.

Furthermore, we must consider some factors when analyzing these data: the perspective of the study, the instrument used, and its assessment (individual or collective), the group studied, the size of the sample, and difficulties of investigating the symptoms of depression during childhood, once the child may have difficulty in identifying and reporting his or her own symptoms, therefore decreasing the prevalence index.

Many times the child does not realize that is depressive and it may also be unnoticed by the family. The child or adolescent may also deny feelings or become uncooperative, which it makes the evaluation more difficult^{21,22}.

In order to minimize such limitations, we have chosen the individual evaluation of the symptoms. The CDI was selected because it has been most widely used in research about depression symptoms during childhood both national and internationally. Nevertheless, it is important to say that the aim of our study was to report depressive symptoms in children with learning difficulties. Thus, what was evaluated here were the symptoms and not clinical depression as a state, for us it would have needed other instruments and informants (school, parents) in order to draw a diagnostic conclusion. Although it is the most widely used test, the CDI has limitations and its results may not be used in an isolated way to diagnose depression²³.

In relation to demographical variables, we found that increase in age was associated to symptoms of suicidal ideation and worry. The type of suicidal ideation identified in the accounts was the passive one, that is, there are thoughts about death, but no desire or planning.

Although it is not frequent, suicidal ideation must be investigated even at younger ages when there are depression symptoms and mainly when associated to another difficulty, such as learning^{13,22}.

Table 3
Correlations among CDI score and Neuropsychological Functions

WISC Subtest	Function	r	P value
Symbol Search		-0.416	0.016*
Coding	Sustained Visual Attention	-0.255	0.153
Speed of Processing		-0.381	0.029*
Arithmetic	Sustained Auditive Attention/ Immediate Memory	-0.289	0.103
Digit Span		-0.274	0.124
Distraction Resistance	Sustained Auditive Attention	-0.317	0.072
Information	Remote Memory/ Verbal	-0.223	0.212
Picture Completion	Remote Memory/ Visual Organization	-0.062	0.730
Comprehension	Remote Memory/ Verbal	-0.431	0.012*
Picture Arrangement	Visual Organization	-0.258	0.146
Perceptual Organization	Perceptual Organization	-0.189	0.291
Object Assembly		-0.118	0.514
Block Design	Visuospatial Organization	-0.159	0.378
Similarities		-0.346	0.048 *
Vocabulary	Verbal	-0.361	0.039 *
IQ Verbal		-0.405	0.019 *
Verbal Comprehension		-0.403	0.020 *
IQ Execution	Performance	-0.306	0.083
IQ Total	Intellectual	-0.397	0.022 *

r: correlation coefficient; IQ= intelligence quotient; *p<0.05

When considering the performance of gender in CDI, it was observed that females had higher scores, but did not differ from the boys. Studies of depressive symptoms and childhood depression does not indicate gender differences in this age group^{22,24,25}, fact that is evident in adolescence with girls showing more symptoms:^{26,27}.

The results indicated that the depression symptoms were negatively correlated to the following functions: a) *Visual Sustained Attention* – Symbol Search Subtest and Processing Speed Index; b) *Verbal* – Similarity Subtest (abstraction ability), Vocabulary (verbal repertoire), Comprehension (knowledge and judging of practical and social actions), Verbal Intelligence Quotient, Verbal Comprehension Index; c) *Intellectual* – Total Intellectual Quotient. This suggests that the higher the score on the CDI, the lower the test scores of the WISC-III mentioned above.

In relation to the other functions (memory, visual organization, visual-spatial organizational, perceptual organization and non-verbal) no correlation of depression symptoms was found.

Whereas our goal was to determine whether a relation between depressive symptoms and neuropsychological functions, the results suggest association between such symptoms and the alterations of basic neuropsychological functions (attention, verbal and intellectual) which are important for adequate school performance. As for the relation between depression symptoms and attention, correlation was found between the symptoms and the performances in the tests of Symbol Search and the Processing Speed Index of non-verbal Information, but not in the subtests of Code, Digit, Arithmetic, and Distraction Resistance Index. Despite the absence of correlation between the symptoms and the formerly described tests, we may consider that those describe less the functions of attention, once they evaluate mainly other functions – auditory immediate memory and mathematic reasoning. Thus, the symptoms may interfere with some attention components and not others²⁸.

Thus, the symptoms may interfere with some attention components and not others²⁸.

CONCLUSION

These data indicated the importance of early identification of depressive symptoms in childhood and their relationship with cognitive functions, important for school performance. Furthermore, the lack of information from parents and teachers about depres-

sion symptoms during childhood may contribute to increase difficulties faced by the students, and thus a closer look may allow the early identification and adequate referrals¹³.

The present study had an exploratory character and not experimental, so there were no intention to determine the causes of difficulties, but to identify the relationships between them. Thus, some limitations found may serve as suggestions for future studies: larger sample, a sample of research with specific learning disorder, for example, developmental dyslexia, comparison of performance with the control group, control of variables between groups with no/difficulties and depressive symptoms, the possibility of research groups with learning disabilities and depression, not only depressive symptoms, increasing the number of neuropsychological assessment instruments, and use of specific tests, especially of attention and executive functions.

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