
Psychomotor intervention in dysgraphic children

Intervenção psicomotora em crianças disgráficas

Intervención psicomotriz en niños disgráficos

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Abstract

Objective: To identify the amount of dysgraphic subjects in a specific population of children, apply them a psychomotor intervention and verify its effect. **Methods:** The study group consisted of 35 children with an average age of 9.8 ± 0.5 years old participating in a social program for the eradication of child labor, and where it was found that 17.2% (6) are dysgraphic. The instruments used were the Motor Development Scale (MDS), Dysgraphia Scale (DS) and a field diary. The intervention was composed of specific activities to remedy deficit engine identified in MDS, with 45-minute duration, three times a week for two months. For data analysis, descriptive statistics were used (average, standard deviation, absolute and relative frequency), and were presented using multivariate analysis of time series. **Results:** Four cases of subjects were analyzed with an average age of 10.0 ± 0.5 years old. In MDS it was found that only the dysgraphic group showed a deficit in temporal organization. Psychomotor intervention was designed and implemented to remedy this difficulty. In the post-test it was observed an improvement in temporal organization and in writing in three of the four subjects of the study. **Conclusion:** The intervention was effective, considering the improvement in the temporal organization and writing of the three subjects. The subject who had kicker motor should be better investigated, since there was seen the possibility of other learning disabilities or neurological disorder.

Keywords: Motor Skills; Learning Disorders; Child.

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Resumo

Objetivo: Identificar a quantidade de sujeitos disgráficos em uma população específica de crianças, aplicar-lhes uma intervenção psicomotora e verificar seu efeito. **Método:** O grupo de estudo foi formado por 35 crianças com idade média de $9,8 \pm 0,5$ anos participantes de um programa social para a erradicação do trabalho infantil, no qual se constatou que 17,2% (6) são disgráficos. Os instrumentos utilizados foram a Escala de Desenvolvimento Motor (EDM), Escala de Disgrafia (ED) e um diário de campo. A intervenção foi composta por atividades específicas para sanar déficits motores identificados na EDM dos sujeitos disgráficos e teve duração de 45 minutos, três vezes por semana, durante dois meses. Foi utilizada a estatística descritiva (média, desvio padrão, frequência absoluta e relativa), cujos dados foram apresentados utilizando-se a técnica de análise de séries temporais. **Resultados:** Foram analisados 4 casos de sujeitos com idade média de $10,0 \pm 0,5$ anos. Na EDM verificou-se que só o grupo disgráfico apresentou uma insuficiência na organização temporal. A intervenção psicomotora foi elaborada e aplicada para sanar essa dificuldade. No pós-teste observou-se a melhora da organização temporal e da escrita de três dos quatro sujeitos do estudo. **Conclusão:** A intervenção mostrou-se eficaz, considerando a melhora na organização temporal e na escrita de três sujeitos. O sujeito que teve retrocesso motor deve ser mais bem investigado, uma vez que se percebeu a possibilidade de existência de outras dificuldades de aprendizagem ou de ordem neurológica.

Palavras-chave: Destreza Motora; Transtornos de Aprendizagem; Criança.

Resumen

Objetivo: Identificar la cantidad de sujetos disgráficos en una población específica de niños, aplicarles una intervención psicomotriz y comprobar su efecto. **Método:** Se analizó un grupo de 35 niños con una edad media de $9,8 \pm 0,5$ años que participan de un programa social para la erradicación del trabajo infantil, y se constató que 17,2% (6) son disgráficos. Los instrumentos utilizados fueron la Escala de Desarrollo Motor (EDM), la Escala de digrafía (ED) y un diario de campo. La intervención consistió en actividades específicas para resolver el déficit motor identificado en la EDM, con 45 minutos de duración, tres veces a la semana durante dos meses. Para el análisis de los datos, se utilizó estadística descriptiva (promedio, desviación estándar, la frecuencia absoluta y relativa), y se presentaron utilizando análisis multivariado de series de tiempo. **Resultados:** Se analizaron cuatro casos de sujetos con una edad media de $10,0 \pm 0,5$ años. En EDM se encontró que sólo el grupo disgráfico mostró un déficit en la organización temporal. La intervención psicomotriz fue diseñada e implementada para remediar esta dificultad. En el post-test se observó mejoría en la organización temporal y en la escritura de tres de los cuatro sujetos del estudio. **Conclusión:** La intervención fue efectiva, teniendo en cuenta la mejora en la organización temporal y la escritura de los tres sujetos. El sujeto que tenía retroceso motor debe ser mejor investigado pues se observó la posibilidad de otras discapacidades de aprendizaje o de orden neurológico.

Palabras clave: Destreza Motora; Trastornos del Aprendizaje; Niño.

Introduction

Psychomotor stimulation, in order to develop specific motor skills in the future, can positively influence learning difficulties^{1,2}. A way to improve children's motor development may be through physical education classes planned and developed by physical education teachers³. This education or psychomotor reeducation must cover the physical, cognitive and emotional aspects of the children, indispensable for their integral formation, being

able to be explored through games and recreational activities that provide the knowledge of their own bodies and their potentialities^{4,5}.

Motor skills, such as writing, are made up of patterns and motor abilities, which can be predetermined genetically or modifiable through training⁶. Motor or perceptual-motor abilities, such as finger dexterity, control precision, static balance, kinaesthetic sensitivity, temporal organization, among others, are also called by other authors^{7,8} as motor skills. It is worth mentioning that in this research,

the term motor skills was used as a synonym for motor capacity.

In studies^{1,3} with children with learning difficulties, it was observed that the results of the motor development scale were below the ideal for their age, sustaining the idea that the motor deficit can cause learning difficulties. The results of another study⁹ with schoolchildren aged from 7 to 11 years corroborate this assertion, since they found lower levels of fine motor coordination in the subjects with learning difficulties.

Among the learning difficulties, in particular the disorders that affect calligraphy, we have dysgraphia, which is characterized by the inability of the individual to reproduce culturally acceptable writing¹⁰. This graphic disorder affects only the forms and the quality of writing, not being responsible for letter changes, and may or may not be associated with other learning difficulties^{11,12}.

Dysgraphia can be functional, that is, when the subject does not present any intellectual, neurological and sensory or organic dysfunction when any of these dysfunctions are identified. Functional dysgraphia is considered a learning disorder that must be investigated, as it may interfere in academic performance, especially in children¹⁰.

The factors that cause dysgraphia may be related to disorders in specific areas of the central nervous system⁴, responsible for the notions of body, spatial and temporal schema^{13,14}. As well as psychomotor dysfunctions in spatial-temporal organization, language and reading disorders, affective disturbances¹⁵, alterations in visual and auditory perception can also cause dysgraphia^{16,17}.

The literature relates this graphic disorder to a set of motor difficulties, being evident the divergence in which the motor skills are involved. However, temporal organization is present in numerous investigations on dysgraphia^{7,14,17}. However, another study¹⁸ points out that dysgraphic children have altered fine motor coordination, but it should be emphasized that in the present study the temporal organization of the subjects was not evaluated, being limited only to the evaluation of fine motor coordination.

The group most affected by this disorder is from public school system, and it is noted that the lower the income of the family is, the greater the presence of dysgraphia in schoolchildren from the 2nd to 5th grade of fundamental is¹⁹. Another important fact to highlight is that dysgraphia may

be present in students with learning difficulties and in students with good academic performance²⁰. In a study¹⁸ that evaluated children from 7 to 11 years of public school with and without learning difficulties, it was found that the group without learning difficulties obtained a lower number of subjects (15%) in relation to the group with dyslexia (85%), Learning disability (100%) and learning difficulties (45%). But in another study²⁰, it was identified that about 63.2% of the subjects that presented some learning difficulties were dysgraphic. In view of the above, the present case study aimed to identify the number of subjects in a specific population of children, to apply a psychomotor intervention and to verify its effect.

Methods

The research is characterized as a case study²¹, considering that a survey was carried out, from which the study was developed with the specific subjects/cases that presented dysgraphia.

Study group

The study group was composed by 35 children with a mean age of 9.8 ± 0.5 years, who participated in a social program for the eradication of child labor, located in the Seminário district in the city of Chapecó-SC. The group was chosen by convenience.

To participate in the selection, the subjects needed to have between 9 and 10 years old and be attending classes in the social program for the eradication of child labor in the Seminário district of Chapecó-SC. The motor performance and the orthography of the subjects (pre-test) were first evaluated. The six subjects (17.2%) identified as having writing disorder, it means, the ones who have dysgraphia, were selected for the case study (Figure 1), and because of the number of subjects chose it was an option not to have a control group.

Tools

The Motor Development Scale (MDS) of Francisco Rosa Neto⁸ was used to verify the motor performance and to compare the subjects with dysgraphia with those without dysgraphia. The MDS makes it possible to evaluate motor performance

in General Motor Age (MA), and subdivides it into six categories: fine motor (MA1), wide motor (MA2), balance (MA3), body schema / speed (MA4) (MA5) and temporal organization (MA6).

Marlene Valdicea Lorenzini's Dysgraphia Scale (DS) was used to identify the orthography disorder²². This scale evaluates the writing from the dictation of a sentence, being identified and assigned grades for 10 aspects of the writing, being able to reach 17 points (divided into floating lines: 2 points; descending / ascending lines: 1 point; irregular space between words: 1 point; curvatures and angulation of letters, retouched letters: 2 points, curvatures and angulations of the arcades of m, n, v, u: 1 point; junction points: 2 points; collisions and adhesions: 3 points; sharp movements: 2 points; dimension irregularity: 2 points; and bad shapes: 1 point). A subject with dysgraphia will have a mark equal to or greater than half the score (≥ 8.5 points).

The control of intermittent variables, such as attention in class and frequency of subjects, was verified through a field diary and the class attendance. In the field diary the behavior of the subjects during the intervention and their interests in the activities were noted.

Procedure

The study measured the motor performance of the study group, identified the subjects with dysgraphia to select the subjects/cases, analyzed the results to develop a psychomotor intervention, which approached the motor deficits identified in the subjects/cases, and reappraised them after two months of intervention (Figure 1).

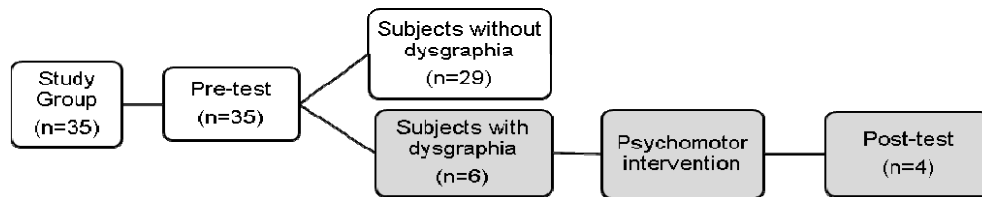


Figure 1. Study design

The project was approved by the Research Ethics Committee of the Universidade do Oeste de Santa Catarina, with the ethical opinion 491,567 / 2013 (CAAE nº 24206413.3.0000.5367), it was started after the signing of free and informed consent form by the subjects and responsible people.

Psychomotor intervention

The proposal of psychomotor intervention was elaborated to emphasize the deficiency in the temporal organization presented by the subjects, with ludic activities that enabled the subject to know his/her potentiality from his/her own body, and thus increase their participation and frequency in the intervention^{4,5}. The intervention consisted of 45-minute classes, three times a week, for two months, totaling 24 classes (Table 1).

Results Analysis

Descriptive statistics (average, standard deviation, absolute and relative frequency) was used, of which data were presented using the technique of time series analysis²¹.

Results

In the pre-test there were six subjects with dysgraphia (17.2%) present and 29 subjects without dysgraphia (82.8%). The motor performance presented in months of both groups can be observed in table 1. The mean of MA1, MA2, MA3, MA4, MA5 of the group with dysgraphia remains an 8.68% lower average than the chronological age of the subjects, however, MA6 had a deficit of 37.70%, being 46 months below the chronological age.

For the analysis, four cases of subjects with an average age of 10.0 ± 0.5 years were detailed, due

Chart 1. Psychomotive Intervention Proposal

NUMBER OF THE CLASS	MOTOR ABILITY	PLANNED ACTIVITIES
1st, 2nd, 7th, 13rd, 15th, 16th, 17th, 18th	Time Organization	Rhythmic activities with balls. Ex: The subjects should move around the court with the volleyball ball, performing forearm pass movements, and every two forearm pass movements they should clap.
3rd, 8th	Time Organization	Metronome: perception of the difference of rhythm with the use of balls. Ex: The subjects arranged by the volleyball court using balls of various sports should keep the rhythm of bounce according to the metronome signaling, several frequencies we used.
4th, 5th, 6th, 9th, 20th, 21st, 22nd	Time Organization	Ring songs. Ex: The ring song "escravos de jó", with several variations, among them, the subject sang upright and performed the choreography taught by the teacher.
10th	Time Organization	Montagem de coreografia: luz e sombra, e marionete. Ex: Técnicas de montagem de coreografias luz e sombra, que o sujeito deveria preencher o espaço deixado pelo colega anterior na sua pose.
11th, 12th, 14th	Time Organization	Storytelling and time structuring with drawings. Ex: The teacher told small stories and after a few minutes the subjects would have to draw it, to be able, through the drawings, to recount it to their colleagues.
19th, 23rd, 24th	Time Organization	Recreational activities and adapted games using ball time. Ex: The subjects arranged in circles, at the teacher's signal should clockwise throw their piece of cloth up, take a side step and pick up the piece of cloth of the colleague.

to the transference of two subjects during the period of the research. Three females were identified by the letter F, followed by number (F1, F2 and F3), and the male was identified by M1.

The subject F2 was easily distracted and showed difficulty in maintaining a rhythm in ball activities and with the metronome. The subjects F1 and F3 evolved gradually; along with F2 they had a participation considered positive within the proposed intervention. The subject M1 presented a gradual improvement during the classes, however,

showed a certain rejection to the repetitive activities, completely losing concentration in the class. The participations in the intervention proposal were 87.5% for F1 and F2, 95.8% for F3, and 75.0% for M1.

Table 2 presents the comparison between the pre- and the post-test of temporal organization of MDS in children with dysgraphia.

Table 3 shows the results of the pre and the post dysgraph tests, the evolution on the dysgraph scale and the percentage of improvement.

Table 1. Comparison between the averages of MI of the subjects with dysgraphia and the subjects without dysgraphia.

	Chronological age (months)	MI1 (months)	MI2 (months)	MI3 (months)	MI4 (months)	MI5 (months)	MI6 (months)
Subjects with dysgraphia (n=6)	122,0±5,5	111,0±13,0	111,0±3,3	115,0±7,9	108,0±18,6	112,0±23,6	76,0±6,2
Subjects without dysgraphia (n=29)	116,7±5,5	123,0±15,6	118,3±11,3	123,3±10,0	113,3±20,8	116,2±16,9	110,7±26,0
General (n=35)	117,6±5,7	120,8±15,2	117,0±10,3	121,8±9,8	112,4±19,6	115,4±17,4	104,4±26,4

Legend: MI (Motor Age); MI1 (fine motor); MI2 (motricity); MI3 (balance); MI4 (body scheme/velocity); MI5 (spatial organization); MI6 (time organization).

Table 2. Comparison between pre and post-tests of MI6 in children with dysgraphia.

Subject	Chronological age (months)	Pre-test MI6 (months)	Motor deficit (months)	Post-test MI6 (months)	Motor deficit (months)	Difference (months)	Improvement (%)
F1	116	72	44	84	32	12	27,27
F2	126	72	54	84	42	12	22,22
F3	124	72	52	84	40	12	23,07
M1	114	84	30	60	54	- 24	-80,00

Legend: MI6 (Time organization).

Table 3. Comparison between pre and post-tests dysgraphia of the children with dysgraphia.

Subject	Pre-test	Post-test	Evolution	Improvement (%)
F1	11,0	8,0	3,0	27,27
F2	9,5	4,0	5,5	57,89
F3	9,0	5,5	3,5	38,88
M1	10,0	8,5	1,5	15,00

Legend: Results presented in points.

Discussion

In this study, the percentage of subjects with dysgraphia was lower than in other studies^{10,11} with schoolchildren, that presented 24% and 22% of subjects with dysgraphia, respectively. However, the values were higher than those found in the literature (3 to 4%) for the school population¹⁰.

Motor insufficiency in the temporal organization presented by the subjects with dysgraphia may be the result of a lack of experience with specific activities³. This motor shortage may be responsible for dysgraphia, contradicting, in part, some theories^{7,17} that approach that the execution of the graphism is related to the spatial and temporal organization.

Psychomotor intervention proved to be effective in improving the temporal organization of subjects F1, F2 and F3, as in two months they had 12-month advancement in MI6. This fact corroborates with a study²³ that points out the effectiveness of motor intervention programs in the development or enhancement of specific motor skills, diminishing or extinguishing a possible motor deficit.

Regarding the motor regression of M1, it would be necessary to apply new tests to verify if this fact is related to other learning difficulties or to neurological order, as the subject was impatient in the accomplishment of the temporal organization post-test. The lack of interest in previously

done activities may have damagingly affected the test. This lack of attention associated with motor instability may be symptoms of psychomotor instability, which is initially normal in the child in a period from 2 to 3 years, becoming worrying when it interferes in school performance¹⁵. The same author adds that instability may be related to other attention deficit disorders.

The data show that although no graphomotor reeducation was carried out, with specific activities of calligraphy, the subjects had a considerable advance, as only M1 remained in the zone of dysgraphia.

A fact perceived during the application and analysis of the post-test of dysgraphia was that the writing rhythm of the subjects changed, becoming a more constant writing. The constancy in writing associated with fine motor and spatial organization probably made it even more uniform without deformation of letters, unnecessary spacing and irregular occupation of spaces, corroborating with the literature¹⁶. A study²⁴ evaluated 50 proficient children and 50 non-proficient children in writing between 8 and 9 years of age, noting that subjects who were not proficient in writing required higher total writing time and higher standard deviation than proficient ones.

From the data we can point out that the reeducation and the temporal organization influenced positively in the subjects' writing, passing from subjects with dysgraphia to subjects without dys-

graphia in two months of intervention. The subject M1 was a case to be studied in particular, because of the presentation of possible symptoms that are related to other learning difficulties, which were not the focus in the present research.

Conclusion

When identifying the number of subjects with dysgraphia in a specific population of children, it was verified that 17.2% of the subjects presented this disorder. In the diagnosis of the motor performance of the subjects, it was verified an insufficiency in the temporal organization, in an average of 46 months below the chronological age of the subjects.

In the application of the psychomotor intervention with rhythmic activities, the effectiveness of the program was observed, since three subjects had an advance of 16.67% in the temporal organization, and one of them presented a retrocession of 28.57%, a fact that should be investigated to verify the possibility of the presence of other learning difficulties or of neurological order.

Some limitations were found throughout the research, such as the small number of subjects that did not allow inferential statistics, allowing only the descriptive analysis of the cases, and the restricted access to the files of the subjects, which could solve what caused the retreat of the subject M1. In spite of these limitations, the development of the present research opens possibilities for other investigations, so it is questioned: What is the percentage of children with disabilities in regular education and if this percentage resembles those found in this research? Is the intervention proposed in this study capable of healing dysgraphia in an experimental study?

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