

PHYSICAL EDUCATION AND DYSLEXIA: POSSIBLE CONVERGENCES

Educação física e dislexia: possíveis convergências

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ABSTRACT

Developmental dyslexia is a language learning disorder, in areas such as reading, spelling, writing, expression, math, motor activities and social relations. In the literature, there are studies that relate the Physical Education area with this disorder, in the international and national levels, although the relevance of this is not highlighted. This study consisted in a bibliographical and qualitative research, which prioritized published papers that aimed at the approximation between subjects in Physical Education and dyslexia. From the data obtained, it was possible to infer that the research related to these areas is a possibility already considered by the literature, even though it is sparse. The studies found demonstrate that there is articulation between the themes investigated in the literature, albeit there are still few references about the specific area of Physical Education. However, the discussion about the possible contributions of this professional becomes pertinent, as movement constitutes an instrument for intervention in dyslexia cases.

KEYWORDS: Dyslexia; Physical Education and Training; Developmental Disabilities

■ INTRODUCTION

Developmental dyslexia is a learning disorder that affects areas such as reading, spelling, writing, expression, math, motor activities and social relations. It is a relatively common disorder and it occurs despite conventional instruction, adequate intelligence and socio-cultural opportunities. It is associated to other disorders, such as dyscalculia, dysgraphia, hyperactivity, hypoactivity and attention deficit^{1,2}.

Studies carried out by Nicolson et al. (1999)³ and Yang, Hong-Yan (2011)⁴ have shown that dyslexia, just as learning disorders in general, may involve cerebellar disorders, due to the fact that this organ is connected to the pre-motor and frontal areas, including Broca's area, responsible for language. Thus, cerebellum constitutes, due to its important connection with the cortex and the thalamus, a unified explanation of a variety of difficulties experienced by dyslexic children who learn new abilities

and perform automatic and unilateral motor abilities that are negatively affected.

In this sense, the process of brain plasticity is increasingly highlighted, which represents the changes occurred to the neural organization in several ways, from maturation, adaptation to changing environments, specific types of learning, and compensatory adjustments in losses due to brain damages. Thus, a possible hypothesis is that, regardless of the learning specificity to which the child is submitted or in relation to which the child has deficiencies along the process, neural changes may or may not occur, stimulating or unstimulating the neurological development in general. Specifically in relation to motor learning, it may be assumed that new motor abilities acquired may stimulate the acquisition of other abilities related to the other areas, just as deficits in other segments may influence an individual's motor aptitude⁵.

Due to the reasons presented above, several studies evidence that the motor performance of children with dyslexia or other learning disorders is below the expected for their age. From different approaches, the literature shows that at least 50% of the students with learning problems show developmental disorders related to motor coordination,

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specifically bimanual coordination, manual skills and fine motor abilities⁶.

Okuda and collaborators (2011)⁷ conducted a study with the purpose of comparing the performance of fine motor coordination in two groups of students, within the age range of 6 to 11 years old – one of them constituted by children with attention deficit disorder and hyperactivity, and the other group with dyslexia, evaluated according to the Motor Development Scale (MDS)⁸. The results obtained indicate that 90% of the examined individuals from both groups showed results that are quite lower than the expected average for their age, in relation to the motor requirement. It was also verified that 10% of students with dyslexia showed an “under normal” development, according to the MDS classification and, finally, 10% of the children with attention deficit disorder and hyperactivity showed results classified as an “inferior” development for their age range.

In their study, Capellini, Coppede and Valle (2010)⁶ point out that the development of the motor skills of approximately 50% of the children with reading problems is below the expected for their ages, and they state that this may be a sign of the vulnerability in the exchange of neural information in the sensory-motor system. They also indicate that people with dyslexia and other language difficulties have problems regarding bimanual coordination, manual dexterity and fine motor skills, which explains the occurrence of dysgraphia in this population.

In addition, Chaix et al. (2007)¹ report that motor deficiencies were found in this population, despite being due to different reasons, such as muscle tone inefficiency and lack of balance. This study evaluated 58 children with diagnosis of dyslexia, assessing their fine manual mobility, general and neuromotor coordination and balance. Motor damages associated to dyslexia were shown, with no casual relationship to reading deficit, in addition to a relationship between attention deficit and low coordination and balance test scores.

Cró and Pinho (2011)⁹, in a study conducted in daycare centers of a municipality in Portugal, highlight that, in many cases, the educators act with no deeper knowledge on the motor and psychological characteristics of the children, being supported by their own life experiences, that is, they act as practical “scientific” educators. There is no doubt that most of these educational measures contribute to the development of the children, however, in the specific cases in which deficits are manifested, they are not always handled with effective strategies. Thus, educators from all knowledge areas must know this dysfunction and its relationship with cognitive and motor aspects.

Studies that relate the area of Physical Education with this disorder are conducted and published both nationally and internationally, despite the fact that most researches do not explicitly state the role of this professional together with the intervention team regarding individuals with dyslexia. In sum, the participation of this professional in the rehabilitation programs and teams is a possibility that is not often indicated by the other areas and it is not a subject that is intensively investigated by physical educators. Thus, this paper intends to identify whether there are published studies regarding the relationship between Physical Education and dyslexia, in order to highlight the focus of these possible studies and, thus, assign sectors in which this professional may act within a multidisciplinary team, given the emphatic importance of this work.

■ METHODS

This is a bibliographic and qualitative research, in which we searched for published studies on the articulation of themes related to Physical Education and dyslexia. According to Mattos, Rossetto Jr. and Blecher (2004)¹⁰, “the bibliographic research method seeks to explain a problem through theoretical references and/or literature review about works and documents related to the researched theme”.

Therefore, the research consisted in verifying in databases that are frequently used by the area of Physical Education the incidence of articles, books or didactic materials related to the theme and analyze their content. Pubmed and Eric bases were searched, due to their relevance in the areas of health and education; these knowledge areas handle this theme under two different perspectives, since the first one concerns the biological aspect, while the second one focuses on the pedagogical aspects of learning in formal or non-formal education.

The search terms were the same in both bases and all verifications were conducted with no initial restriction of dates up to the end of the year 2011 and for the period between the months of January and May 2012, so that we could follow the emphasis given to the studies during this period. The terms were searched for in the English language and will be presented below.

Initially, the search was limited to the term dyslexia so as to verify whether the incidence was similar between the areas of health and education.

Then, in order to detect the main articulations of the subject dyslexia in researches in both consulted areas, the term “dyslexia” was combined to other descriptors, through which this approach could be verified. Thus, we recorded the number of findings in both search bases, for discussion purposes. The

descriptors used were review, treatment, brain, genetics, children, intervention, reading, attention, and working memory in the English language.

In order to verify the hypothesis about the existence of studies having an interface with the dyslexia theme with possibilities of action by the Physical Education area, different searches were conducted following the same process previously explained. The terms movement, Physical Education, motor, motor skills (skills – learned skills; ability – natural abilities), motor activity, and motor learning.

The Pubmed database allows us to search for articles by country of origin and, therefore, this resource was used to identify how many Brazilian studies were associated to indexed journals in this search instrument. Thus, it was possible to discuss the knowledge production on this subject in the country. This search could only be conducted in the Pubmed database, since the Eric database has no search resource of that kind enabled. Similarly, we tried to identify the area in which these studies were conducted.

After such procedures, we selected the searches that related the terms “dyslexia and Physical Education” and “dyslexia and motor learning” to detail the articles found. The first combination is necessary for the dialogue on the approximation between both subjects, which is the main purpose

of this study; the second combination was chosen based on the assumption that the term motor learning is broadly related to both the educational area and the teaching of sports, important work fields for the Physical Education professional.

Thus, after reading the obtained publications, we highlighted the years of the publications found in order to observe the higher incidence of researches on the articulation of themes, and categorized the objectives of the studies, in order to verify the content of the researches at hand. Therefore, according to Bardin (2008)¹¹, we conducted a categorical analysis, the one most used among the content analysis techniques, a stage in which the terms chosen as categories were: “review”, “diagnosis”, and “intervention”.

■ LITERATURE REVIEW

In Table 1 below, the search results for the term dyslexia are listed in both search databases. The Pubmed database showed twice more results than the Eric database, both for the category up to 2011 and the category up to May 2012. It is pertinent to note that the oldest article in this database dates from 1946, and the oldest article in the Eric database is from 1964; so, we can observe that, in the area of public health, there are studies on the theme almost 20 years earlier than in the area of education.

Table 1 – Results of the search for the “*dyslexia*” descriptor in the Pubmed and Eric databases, in the two periods chosen for the search

Database	Articles up to 2011	2012 only
Pubmed	7220	110
Eric	2479	54

This result represents the specificity of researches on learning disorders. We can notice that the area of health prevails in relation to the researches in this field, which appears faintly in the education domain. It is possible to notice that if the amount of articles found in the area of health represents almost three times the amount in the area of education since their first publication up to the year of 2011, it is also possible to see that in 2012 the production of researches using the Eric database has been more active. Since Physical Education is associated to both areas, these data indicate that this professional may focus both on the educational scope and on areas related to sports, rehabilitation or therapy, in which stimuli for motor learning occur. In all these

fields of work, this professional promotes brain plasticity, being able to help in the development of brain functions, which could possibly suppress the symptoms of dyslexia. In addition to such factors, a child’s good performance in a stimulating activity may help to develop his/her self-esteem and make him/her more confident to overcome the challenges brought by this problem.

The search for the terms that could associate the thematic on dyslexia and Physical Education according to its several approaches has resulted in the Table below; in it, we can observe that the Pubmed database has a significantly higher number of records than the Eric database. For the period comprised by 2012, it can be observed that the

same database showed a high index of publications in relation to the other area, although it is noteworthy that for the terms children and reading, the Eric database recorded a higher number when compared to the other descriptors. In relation to the descriptor intervention, the Eric database showed a higher number of articles indexed during the year of 2012. These data mirror the results shown in Table 1 and work as indications that the area of education is focusing mainly on the effects of dyslexia in the behavior of children, mainly in relation to learning – which may be stated due to the higher manifestation associated to the terms children, reading and intervention – while the area of health focuses on the origins of this disorder.

It may be inferred that the area of Physical Education is associated, based on predictions related to learning and brain plasticity, to a major part of the terms mentioned below. In relation to treatment, a multidisciplinary approach may consider motor activities as one of the important aspects to be stimulated, just as the term intervention. Children are the focus of these studies, just as Physical Education could be. In relation to attention and reading, such factors would be secondarily stimulated, since the cerebral approach simulated by such activities would contribute to this development.

Table 2 – Results of combined terms, including “dyslexia”

Terms	Pubmed – Up to 2012	Eric – Up to 2012	Pubmed – 2012 only	Eric – 2012 only
Review	786	139	11	2
Treatment	1812	166	11	4
Brain	2183	355	40	14
Genetics	652	97	6	4
Children	4505	1202	53	29
Intervention	306	250	3	8
Reading	4263	1822	67	44
Attention	1144	227	17	8
Working Memory	388	58	8	1

The Pubmed database allow us to search articles by country of origin, therefore, we used this resource to identify how many Brazilian studies were associated to indexed journals in this search instrument. Thus, it was possible to discuss the production of knowledge on this subject in the country. This search could only be conducted in the Pubmed database, since this resource was not available at the Eric database.

With the result of this procedure, we came to a total of 20 articles by Brazilian researchers, developed at research institutions in our country. In order to geographically situate the origin of such studies, Figure 1 below indicates the respective higher education institutions that promote these studies. It can be noticed that University of Campinas has the largest number of researches on dyslexia found in this database, while all institutions where these studies were developed are located in the Southeast region of the country. Considering that this university has a School of Physical Education,

where this study was conceived, it may be inferred that partnerships between the medical and educational areas and this particular area could be satisfactorily established. The same could occur for the other universities mentioned, which face the same academic reality.

In addition, it was relevant to show the education background of the researchers responsible for the articles obtained. It can be seen below, in Figure 2, that most researchers investigated belong to the area of Medicine and Speech and Language Therapy, although we found an article from the area of Physical Education, which shows that the assumed convergence that this study intended to verify does occur, despite the fact that it still encompasses a reduced number of researches. The Neurology category was analyzed separately in the area of Medicine only to highlight that this study area prevails in relation to the others comprised by Medicine; however, we understand that they may be joined to count the researches on dyslexia.

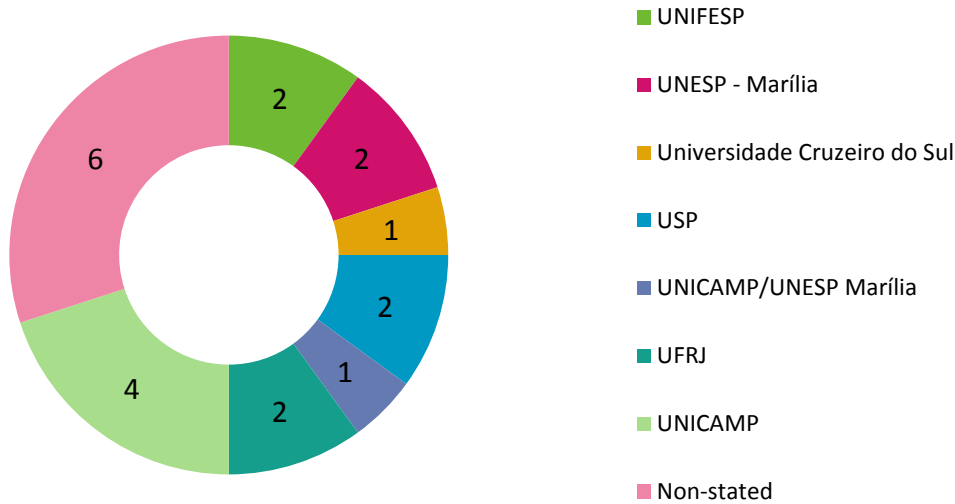


Figure 1 – Number of articles found by the Pubmed database per university

Therefore, it is possible to notice that in the Physical Education area there is already a movement towards studies about this theme, although this number is not meaningful yet.

To establish the relationship between dyslexia and physical activity or the specific field of Physical Education, we searched for the term “dyslexia” combined with other descriptors related to movement. Table 3 below indicates the results obtained by this strategy. This table shows that although much has been researched in relation to the convergence between dyslexia and movement, and its different expressions, the relationship with Physical Education is still incipient. Although 434 articles with the term “movement” and 584 with the descriptor “motor” have been found, when

the expressions refer to guided forms of driving work, such as “motor activity” or “motor learning”, the results are drastically reduced to 28 and 18 studies found, respectively. For the term “Physical Education” itself, the result is even lower, with only 12 studies obtained. Thus, it may be inferred that despite the fact that the literature indicates a strong relationship between the study themes in the area of Physical Education and dyslexia, the specific convergence with this science is still reduced, despite the supposed convergence proclaimed in this research. In addition, the results indicate that the area of health relates in a more remarkable way the terms dyslexia with the ones related to the movement.

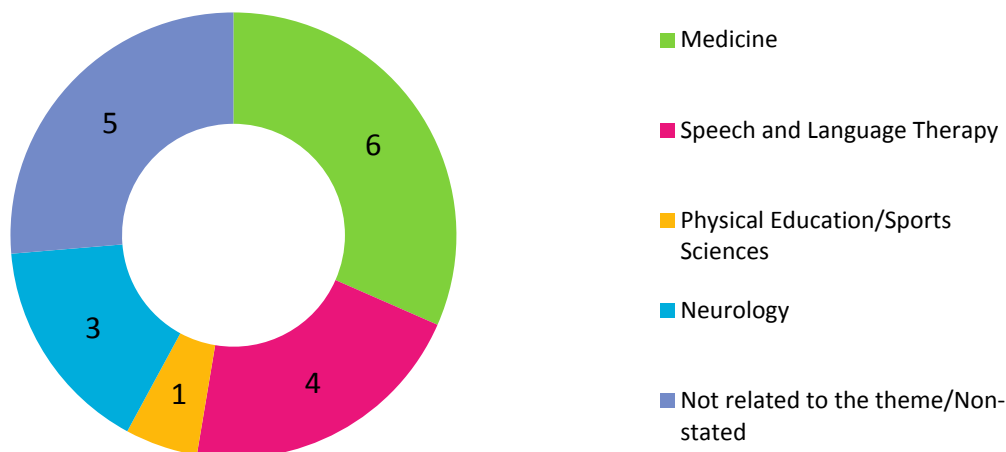


Figure 2 - Area in which the researchers who conducted the Brazilian studies found have graduated

Table 3 – Results of the combined terms “*dyslexia*” and other terms associated to movement

Terms	Pubmed – Up to 2011	Eric – Up to 2011	Pubmed – 2012 only	Eric – 2012 only	Total
Movement	376	57	1	0	434
“Physical Education”	5	6	0	1	12
Motor	445	130	6	3	584
“Motor Skills”	179	25	1	0	205
“Motor Activity”	27	1	0	0	28
“Motor Ability”	9	4	0	0	13
“Motor Learning”	7	11	0	0	18
Total	1048	234	8	4	1294

Below, in Table 4, we highlight the year of publication of the studies that related Physical Education and dyslexia.

The reading of the results allows us to infer that the distribution of publications occurred unevenly throughout the 47 years comprised by the research, although in the 1960s there was a greater manifestation of the articulation of the researched themes. This phenomenon repeated only after the 2000s, which means, in a recent period.

Figure 3 below sums up the classification of the articles selected to be more deeply analyzed in relation to this area of knowledge, based on their objectives. The results obtained indicate that half of them (six) are directed towards intervention in the cases of dyslexia; two are directed towards its diagnosis; and four of them are a review on the theme. From these studies, one was published as a book and one constituted a pedagogical material

for teachers (from North America), eight are articles from journals, and two could not be identified. In relation to the discussed subject, two of the articles study the motor proficiency of children with dyslexia; one of them relates motor performance and bodily composition, and two relate it to perceptive stimuli; two are specifically related to interventions from the area of Physical Education (one of them referring to swimming); two depict models of activity programs for children with learning difficulties; another one makes predictions related to the multidisciplinary diagnosis, including the Physical Education professional; and, finally, one of the articles could not be detailed. We did not have full access to all of the studies, since the databases consulted contain non-scientific texts, which, therefore, are not published in full in Internet, or are old articles that have not been digitalized yet.

Table 4 – Distribution of the articles by year of publication for the descriptors dyslexia and Physical Education

	1965 - 1970	1971-1980	1981-1990	1991-2000	2001-2010	2011-2012	Total
Number of Studies	5	2	0	1	2	2	12

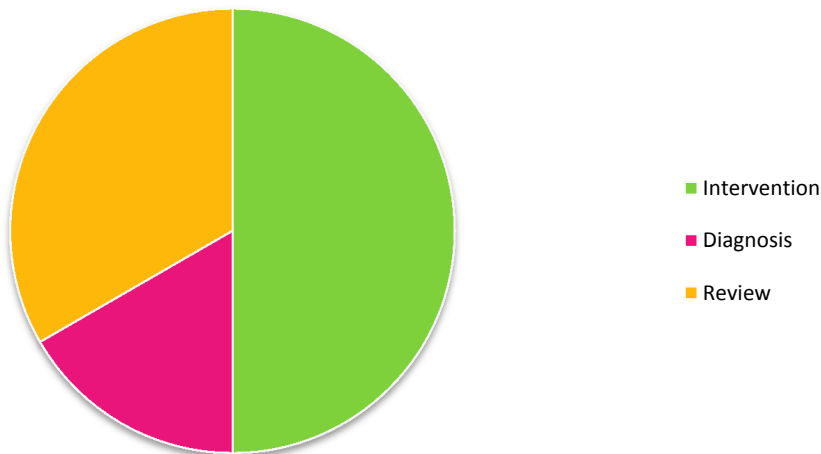


Figure 3 – Objective of the articles found when searching for the descriptors dyslexia and Physical Education

In addition, deeper investigations were conducted for the descriptor motor learning, which characterizes an important field of Physical Education, as it has already been explained in this study's methodology.

Table 5 below shows the time distribution of the articles obtained when combining the terms dyslexia and motor learning.

Table 5 shows a higher concentration of studies on the theme during the 2000s, with eight studies published on the theme, similarly to what happened for the search indicated by Table 4. The number of articles found is also similar to the previous search, although no study in this search has coincided with the one shown in the previous table.

Regarding the focus of the studies found, however, by analyzing Figure 4, we can see that most of the articles are related to the diagnosis of dyslexia and/or of the related motor problems (eight studies), while the other part was equally divided into intervention and review studies, with five publications each. Among these selections, fourteen articles, one book and three non-identified papers were obtained. The specificities of each production consist in the evaluation of the motor performance and the diagnosis of motor problems, with three incidences each; five review articles; two related to visual or binocular coordination; one to reaction time; one to percepto-motor aspects; and three were not directly related to motor learning.

Table 5 – Distribution of the articles by year of publication for the descriptors dyslexia and motor learning

	1967-1970	1971-1980	1981-1990	1991-2000	2001-2010	2011-2012	Total
Number of Studies	3	1	2	2	8	2	18

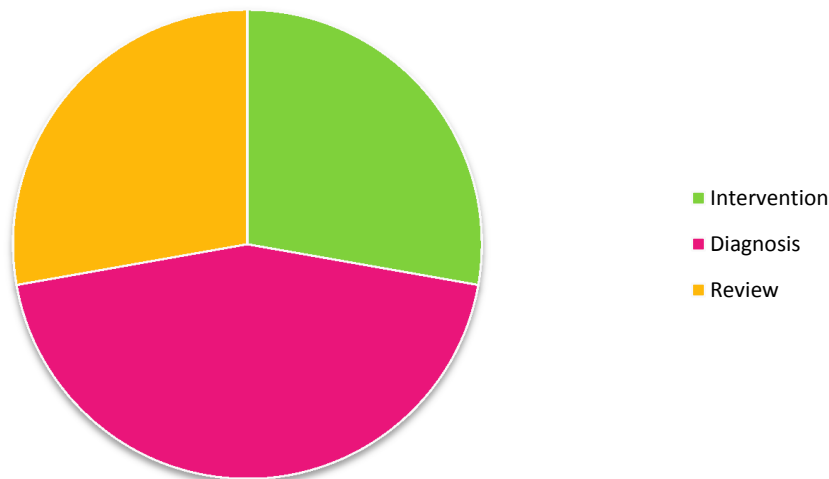


Figure 4 – Objective of the articles found when searching for the descriptors dyslexia and motor learning

■ FINAL CONSIDERATIONS

The evidences found until now reinforce the existence of a relationship between low motor indexes and dyslexia, suggesting that this lack of ability may negatively contribute for the development of the written language. In addition, the motor inability influences several aspects of a child's life, going beyond the difficulties in reading. The Physical Education professional may give a contribution to these children, whether with the early evaluation of these inabilities or also with interventions based on theory and methodology to stimulate the motor development.

According to Medina-Papst, Marques (2010, page 37)¹²,

We emphasize the importance of developing the motor abilities and the aspects related to their application in school activities, since the deficiencies in certain developmental fields may lead to delays and influence the advance in activities from other areas related to learning in general. Therefore, Physical Education has an important role, since it may structure the adequate environment for the child to think about his/her actions and practical experiences, working as a great aid and promoter of the human development, and, specially, of the motor development.

Motor abilities may be widely explored in Physical Education classes in school and in sports initiation

programs, stimulating children's full development, representing a preventive measure for motor problems, which may be connected to dyslexia. These motor programs elaborated by Physical Education professionals and based on this area's rich content enable previously planned interventions to be developed with dyslexic children. This fact allows us to infer that programs from this discipline may represent, to a certain extent, a basis for the full development of these students, comprising the physical, social, affective, cognitive, and motor aspects.

In that sense, it can be evaluated that the role of the Physical Education teacher may also focus on the diagnosis, which may use the simple observation of the student's motor performance as a methodological resource during the classes, comparing it to what is estimated for the age range or even to motor evaluations, based on specific protocols, activities, games and recreational activities that are part of the programmatic content routinely developed in the classes. Therefore, starting from the premise that dyslexia may be followed by motor changes, the role of the Physical Education teacher gains more relevance.

This research opens possibilities for new studies to be developed with the purpose of investigating the influence of this professional's performance in the treatment of this disorder, based on a new form of approach of these issues. Thus, new perspectives of work may be found, so that strategies are developed to promote the welfare and quality of life for children and young people with this condition.

RESUMO

A dislexia de desenvolvimento é um transtorno de aprendizagem da linguagem, em áreas como a leitura, soletração, escrita, expressão, matemática, corporal e social. Na literatura consultada constam pesquisas que relacionam a área da Educação Física com este transtorno, tanto em âmbito nacional como internacional, embora não seja explicitada a relevância destes estudos. Esta investigação consistiu numa pesquisa bibliográfica, de cunho qualitativo, priorizando a busca por obras publicadas que exploraram a aproximação entre assuntos relacionados à Educação Física e à dislexia. Pelos dados obtidos foi possível inferir que a pesquisa relacionada com essas áreas é uma possibilidade já considerada pela literatura, embora ainda de maneira escassa. As pesquisas encontradas demonstram que há na literatura articulação entre os temas investigados, embora ainda existam poucas inferências sobre a área específica da Educação Física. No entanto, se coloca em pauta a discussão sobre as possíveis contribuições da ação deste profissional, pois o movimento constitui recurso para a intervenção nos quadros de dislexia.

DESCRIPTORIOS: Dislexia; Educação Física e Treinamento; Deficiências do Desenvolvimento

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