

Original Article

Prevalence of children identified with motor difficulties¹

Prevalência de crianças identificadas com dificuldades motoras

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Abstract

Introduction: Motor coordination assessment enables to identify the motor difficulties in the skills of children. Through this identification, we discuss the impact of these difficulties on motor development and the factors that interfere in this process. **Objective:** To identify the prevalence of children with motor difficulties in a sample from Fortaleza/CE and to identify in which motor components these difficulties are more evident. **Method:** Four hundred and twenty-three children aged 7-10 years old, both genders and from elementary school were assessed by the Movement Assessment Battery for Children (MABC-2) and identified with Motor Difficulties, Risk at a motor difficulty and Typical Development. We used a Qui-square analysis to identify the differences between genders regarding the prevalence of children identified in these categories. We used Student's T and Mann-Whitney U test to analyze differences between genders regarding motor components scores (Manual Dexterity, Throw and Receive and Balance) and MABC-2 total score. **Results:** 11.6% of the children had Motor Difficulties and 25.8% had Risk for motor difficulty. Although there was no difference between the prevalence of girls and boys identified with Motor Difficulties, girls performed better than boys in the Manual dexterity and Balance components, while boys performed better than girls on the Throwing and Catching component. **Conclusion:** The prevalence of children identified with Motor Difficulties in the sample from Fortaleza is similar to other studies in Brazilian regions. This prevalence is worrisome, considering the consequences caused by the motor difficulties. Environmental factors, related to the socio-cultural context, can influence motor development.

Keywords: Child Development, Motor Skills Disorders, Brazil.

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Resumo

Introdução: Avaliação da coordenação motora possibilita identificar em quais habilidades crianças apresentam dificuldades. Por meio dessa identificação, é possível discutir o impacto dessas dificuldades no desenvolvimento motor e quais fatores interferem neste processo. **Objetivo:** Identificar a prevalência de crianças com dificuldades motoras em uma amostra da cidade de Fortaleza/CE e em quais componentes motores essas dificuldades são mais evidentes. **Método:** Quatrocentos e vinte e três crianças de 7-10 anos de idade, de ambos os sexos, foram avaliadas com a *Movement Assessment Battery for Children* (MABC-2) e identificadas com Dificuldades Motoras, Risco para Dificuldade Motora e Desenvolvimento Típico. Análise Quiquadrado foi utilizada para identificar as diferenças entre os sexos quanto à prevalência de crianças identificadas nessas categorias. Testes T de Student e U de Mann-Whitney foram utilizados para analisar diferenças entre os sexos quanto à pontuação nos componentes motores (Destreza Manual, Arremessar e Agarrar, e Equilíbrio) e à pontuação total na MABC-2. **Resultados:** 11,6% das crianças foram identificadas com Dificuldades Motoras e 25,8% com Risco para Dificuldade Motora. Apesar de não haver diferença entre as prevalências de meninas e meninos com Dificuldades Motoras, as meninas apresentaram desempenho superior aos meninos no componente Destreza Manual e Equilíbrio, enquanto os meninos apresentaram desempenho superior ao das meninas no componente Arremessar e Agarrar. **Conclusão:** A prevalência de crianças com Dificuldades Motoras na amostra de Fortaleza é semelhante à apontada em outras regiões brasileiras. Essa prevalência é preocupante, considerando as consequências decorrentes das dificuldades motoras. Fatores ambientais, relacionados ao contexto sociocultural, podem influenciar o desenvolvimento motor.

Palavras-chave: Desenvolvimento Infantil, Transtornos das Habilidades Motoras, Brasil.

1 Introduction

The motor development process is easily observed in human beings. If for example, we take the development of the walking skill, we observe the relationship of dependence between the individual's development and the need to interact with the environment and to reach and manipulate objects during this interaction. This process of exploring objects and the world can be interpreted as the child's search for actively understanding his environment (Gallahue et al., 2013). In this view, the interaction between human beings and the environment is central to the motor development process (Newell, 1986).

Usually, we observe the difficulties and obstacles to the development of the motor skills of individuals in the school environment (Valle & Capellini, 2009). For years, studies on motor coordination have classified certain children as clumsy, as they have difficulties in performing daily motor tasks. The American Psychiatric Association (APA) and the World Health Organization (WHO) recognized and classified the motor difficulties in these children as a Developmental Coordination Disorder (DCD) (Valle & Capellini, 2009; American Psychiatric Association, 2014). DCD is identified in children who have movement difficulties, resulting in lower performance than their

peers in carrying out common childhood tasks. These difficulties are not associated with medical problems or neurological diseases (Missiuna et al., 2011; American Psychiatric Association, 2014; Pulzi & Rodrigues, 2015).

As a consequence, children with DCD often develop emotional and social problems (Missiuna et al., 2011; Liberman et al., 2013). Due to the problems in dealing with ordinary activities and the need for greater effort to plan and perform a task, these children often have considerable levels of anxiety and stress (Pratt & Hill, 2011), and may seem disinterested in certain activities that together with shame or lack of motivation, they lead to a higher incidence of inactivity and low physical fitness (Cairney et al., 2010).

Thus, the identification of this disorder is necessary as soon as possible, considering the possibility of proposing motor intervention to help the child overcome his difficulties (Missiuna et al., 2011; Pulzi & Rodrigues, 2015). For the identification of children with motor difficulties, several countries have been frequently used the Movement Assessment Battery for Children (MABC-2) (Henderson et al., 2007; Toniolo & Capellini, 2010; Missiuna et al., 2011; Valentini et al., 2012, 2017) and scientific studies have been cited extensively the assessment of motor coordination in children with DCD (Valentini et al., 2017). Also, MABC-2 evaluates the child by observing the performance in the tasks and describes the motor profile, being referenced by rules (Blank et al., 2019). Thus, this battery is not enough to identify DCD, and besides the motor tests, we need to examine the individual's developmental history, medical history, clinical examination, to investigate involvement in recreational activities and participation in the school. MABC measures the performance of children aged 3 to 16 years old in fine and gross motor skills and different countries validated it as an accurate, consistent, stable and reliable assessment tool (Toniolo & Capellini, 2010; Fischer et al., 2013; Valentini et al., 2017).

Generally, the motor coordination characteristics identified in the studies that used MABC are associated with the development patterns of the age group, gender, culture and educational system of a specific place or region (Henderson et al., 2007; Fischer et al., 2013). According to Blank et al. (2019), the variability in the prevalence of children with motor difficulties shown in the literature is dependent on how the selection criteria are rigorously applied in the identification. Studies in Singapore, Greece, Canada, the Netherlands, Germany, England, and Switzerland, for example, have shown prevalence ranging from 2% to 19% of children with motor difficulties (Wright & Sugden, 1996; Kadesjö & Gillberg, 1998; Jongmans et al., 2003; Tsiotra et al., 2006; Lingam et al., 2009).

In Brazil, the prevalence of children with motor difficulties is similar to these countries. In the southern region of Brazil, the prevalence was 19.9% of children with motor difficulties (Valentini et al., 2012); in Maringá/PR, there was a prevalence of 11.4% of these children (Santos & Vieira, 2013); in São José/SC, the prevalence was 11.1% (Silva & Beltrame, 2013); in Florianópolis/SC, the prevalence was 7.1% (Beltrame et al., 2017). In the Southeast region, in Rio Claro/SP, the prevalence was 10.6% (Pellegrini et al., 2008); in Belo Horizonte/MG, the prevalence was approximately 23% of children aged 7-8 years old (Cardoso & Magalhães, 2012). In the North region, in Manaus/AM, there were 11.8% of children in the urban area and 4.4% in the rural area having motor difficulties (Souza et al., 2007). Specifically, in the Northeast region of Brazil, Franca et al. (2017) showed that the parents' responses to the Developmental Coordination Disorder

Questionnaire-Brazil pointed out that 47.2% of children aged 7-8 years old in the city of João Pessoa/PB have motor difficulties.

This dissonance needs further investigation into the motor development of children in different Brazilian regions. However, most studies on the prevalence of children with motor difficulties were carried out in the South and Southeast regions of the country. By this lack of studies related to motor difficulties in the Northeast region, the assessments of motor coordination carried out on children in the city of Fortaleza/CE will enable to identify which skills these children have the greatest difficulties in, and to discuss the role of factors that interfere in the motor profile of the evaluated children.

The city of Fortaleza/CE has certain peculiarities that can impact potential child development. Some of the characteristics that instigate this type of study in this context are that the city is one of the most populous capitals of the Northeast region, with high levels of violence, located in a region with a hot and humid climate, inducing physical practices only in an appropriate place, and determining only one school Physical Education class per week and not mandating that this class be taught by licensed Physical Education teachers before the 6th grade of Elementary School (public schools). Thus, the objective of this study was to identify the prevalence of children with motor difficulties in the city of Fortaleza/CE.

2 Method

This is a secondary analysis of the data of the research carried out at the Institute of Physical Education and Sports at the Federal University of Ceará, in Fortaleza - CE - Brazil, in 2016 and 2017 (HUWC/UFC n. 1,837,665; UFC/PROPESQ number 1,847,016).

2.1 Participants

Four hundred and twenty-three children from 7 to 10 years and 11 months old, both genders, enrolled in elementary school in the city of Fortaleza/CE participated in this study. The sample calculation was based on the total population of students in the initial grades of an elementary school in the city of Fortaleza/CE - 83452 students (Brasil, 2016), with a sampling error of 5% and a confidence level of 95% (Triola, 1999), totaling a minimum of 383 children. The parents or guardians of the students signed the Free and Informed Consent Form authorizing them to participate in the study. Children diagnosed with some neurological dysfunction and other disorders registered at school were excluded from the study.

2.2 Materials

We used the original materials of the Movement Assessment Battery for Children 2 (MABC-2) application manual to assess children's motor coordination (Henderson et al., 2007). MABC-2 is an auxiliary instrument in the DCD identification process that assesses the motor components Manual Dexterity, Throwing and Catching, and Static and Dynamic Balance in eight motor tasks. The eight tasks of the MABC-2 are specific to each age group: 3-6 years old, 7-10 years old and 11-16 years old. For the 7-10-year-old age group as the children in this study, the motor tasks performed were: Manual Dexterity - (i) placing the pins, (ii) passing the cord and (iii) walking the bicycle path; Throwing and Catching -

(i) throwing and catching the tennis ball with both hands and (ii) throwing a beanbag at the target; and Static and Dynamic Balance - (i) uni-foot support on the board, (ii) heel-toe walking on the line and (iii) hopping on the carpets. We used an evaluation form of the studied age group that came with the battery of tests, a clipboard, a pen, and a stopwatch to record the children's performance.

We converted the gross performance score obtained by the child in each motor task into a standardized score, according to the Manual of MABC-2, from 1 to 17 (higher scores represent better performances). The score for each motor component was obtained by adding the standardized scores of the tasks corresponding to the component. The total score in MABC-2 was obtained by adding the score of the motor components and was converted into a percentile (Henderson et al., 2007). The child was identified with Typical Development (TD) when his MABC-2 score was equal to or higher than the 16th percentile; with Motor Difficulty Risk (RISK) if his MABC-2 score was between the 6th and 15th percentile; or with Motor Difficulties (MD) if the MABC-2 score was equal to or less than the 5th percentile.

2.3 Procedures

We assessed children's motor coordination at the school where they were enrolled and individually, after the consent of those responsible for the child to participate in the study. Initially, the examiner took each child to the motor coordination assessment room and started the assessment in this closed environment, isolated from loud noises. The evaluators were six undergraduate students of the Physical Education course at the Institute of Physical Education and Sports who received standardized training for the application of MABC-2, for approximately one month, twice a week. The training took place under the coordination of a teacher, responsible for the Motor Evaluation and Intervention Laboratory of the aforementioned institute to standardize data collection procedures and reduce disparities between the evaluators, strictly following the instructions in the MABC-2 Manual. The evaluations lasted approximately 40 minutes and, in the end, they took the child to the classroom by the responsible evaluator.

We recorded the children's performance data in an electronic spreadsheet properly configured for data analysis. After converting performance data into standardized scores, we obtained the child's score and percentile of classification, according to the MABC-2 Manual (Henderson et al., 2007).

2.4 Statistical analysis

We used descriptive analysis to show the relative frequency of children identified with TD, RISK, and MD. We used Chi-square analysis to identify the differences between the genders regarding the prevalence of children who presented TD, RISK, and MD. The Kolmogorov-Smirnov test measured the normality of the MABC-2 score data. The Student's t-test analyzed the statistical differences between the gender for the scores on the Manual Dexterity and Throwing and Catching components (parametric data). The Mann-Whitney U test analyzed the statistical differences between the genders for the score on the Balance motor component and the total score on MABC-2

(non-parametric data). Statistical software 7.0 was used in all analyzes and the level of significance adopted was $p < 0.05$.

3 Results

The frequency of participants in the study by age and gender was: 74 children aged 7 years old, 47 girls and 27 boys; 136 8-year-old children, 67 girls and 69 boys; 150 children aged 9, 73 girls and 77 boys; and 63 10-year-old children, 32 girls, and 31 boys.

The results showed that 62.6% of the children evaluated had TD, 25.8% had RISK and 11.6% had MD. The results of the Chi-square analysis did not show significant differences between the genders in the prevalence of children who presented TD ($p = 0.57$), RISK ($p = 0.27$) and MD ($p = 0.84$) (Figure 1). Figure 2 shows the relative frequency of children who presented DT, RISK, and MD by age and Table 1 shows the results of the Chi-square analysis in the differences between the prevalence of female and male children identified with MD by age.

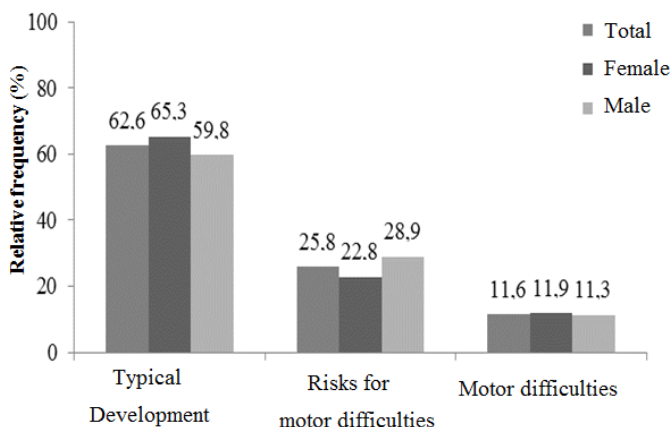


Figure 1. Prevalence (%) of children identified with Typical Development, Risk for motor difficulties and Motor difficulties, using MABC-2.

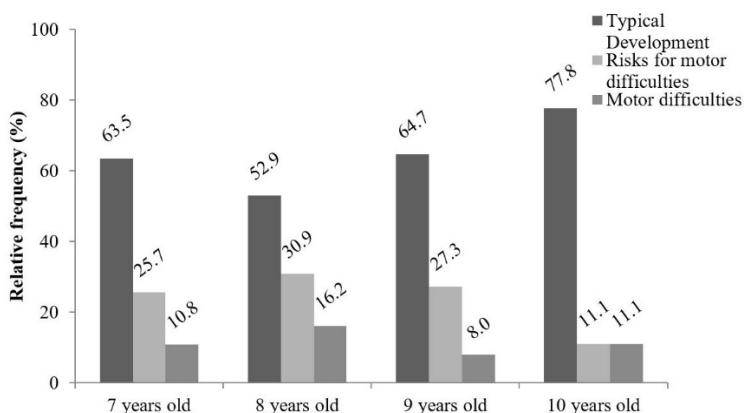


Figure 2. Prevalence (%) of children identified with typical development, the risk for motor difficulties and motor difficulties by age.

Table 1. Prevalence (%) of children identified with Motor Difficulties by age and gender.

	Male	Female	p-value
7 years old	3.7	14.9	0.13
8 years old	15.9	16.4	0.93
9 years old	10.4	5.5	0.26
10 years old	9.7	12.5	0.72
Total	11.3	11.9	0.84

P-value of the Chi-square test.

In the children identified with MD, 61.2% had a percentile less or equal to the 5th in the Manual Dexterity component, 55.1% in the Throwing and Catching component, 67.3% in the Balance component and 22.4% had a lower percentile or equal to the 5th in the three motor components of MABC-2. In the children identified with RISK, 13.7% had a percentile less or equal to the 5th in the Manual Dexterity component, 19.2% in the Throwing and Grasping component, 15.5% in the Balance component and 2.7% had a percentile less or equal to 5th in at least two of the MABC-2's motor components. Figure 3 shows the mean and standard deviation of the children's scores assessed by motor components and by gender. Significant differences were found between the scores of all participating females and the score of all participating males in the three motor components of MABC 2. Female children outperformed male children in the Manual Dexterity component ($p = 0.02$) and Static and Dynamic Balance ($p < 0.01$). However, males performed better than females in the Throwing and Catching component ($p < 0.001$).

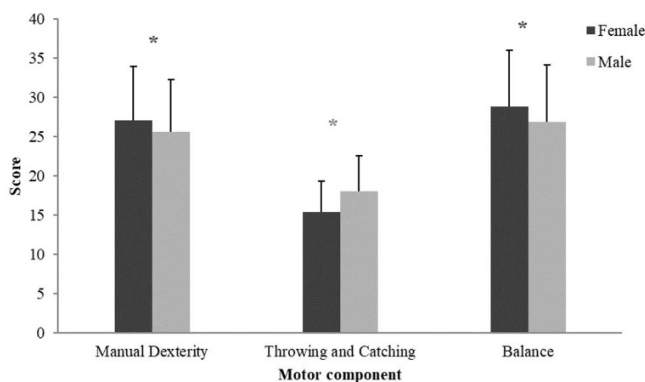


Figure 3. Mean and standard deviation of the score of all children participating in each MABC-2 motor component (*significant differences).

Table 2 shows the mean and standard deviation of the score by component and the total in the MABC-2 of the children at each age and by gender. The student's t-test showed significant differences between the score of female children and the score of male children in the Throwing and Catching component. At all ages, male children performed better than female children in this component. Specifically, 8-year-old female children outperformed male children in the Balance component and marginally superior performance in the

Manual Dexterity component ($p = 0.07$) and the total score ($p = 0.05$). Also, 9-year-old female children outperformed male children in the Manual Dexterity component.

Table 2. Scoring in the MABC-2 motor components by age and gender.

Age	MABC-2 Motor Components			
	Manual dexterity ^a	Throwing and Catching ^a	Balance ^b	Total ^b
7 years old				
Female	27.5 (7.7)	15.1 (4.0)	27.6 (7.9)	69.8 (14.9)
Male	27.7 (5.8)	17.3 (3.5)	26.4 (5.5)	71.4 (8.2)
p-value	0.90	0.01*	0.39	0.75
8 years old				
Female	26.4 (6.7)	14.3 (3.8)	29.0 (6.2)	69.8 (13.0)
Male	24.3 (7.0)	16.9 (5.0)	25.2 (7.2)	66.5 (13.4)
p-value	0.07**	<0.001*	<0.01	0.05**
9 years old				
Female	27.6 (6.1)	16.5 (3.9)	28.8 (7.2)	72.9 (13.0)
Male	25.3 (7.1)	19.2 (4.4)	28.1 (7.2)	72.6 (13.4)
p-value	0.03*	<0.001*	0.34	0.92
10 years old				
Female	27.0 (7.2)	15.6 (3.6)	30.4 (8.2)	73.0 (14.8)
Male	27.5 (4.8)	18.2 (3.9)	28.5 (7.9)	74.1 (12.8)
p-value	0.77	<0.01*	0.09	0.87

^aStudent t; ^bU of Mann-Whitney; *Significant differences; ** Marginally significant differences.

4 Discussion

This study aimed to identify the prevalence of children with motor difficulties, both genders, in a sample from the city of Fortaleza/CE. There were 423 children evaluated, in which 11.6% had motor difficulties. This result is similar to studies carried out in other Brazilian cities: Maringá/PR = 11.4% (Santos & Vieira, 2013); São José/SC = 11.1% (Silva & Beltrame, 2013); Florianópolis/SC = 7.1% (Beltrame et al., 2017); Rio Claro/SP = 10.6% (Pellegrini et al., 2008) and Manaus/AM = 11.8% (Souza et al., 2007). The American Psychiatric Association points out that the prevalence of school-age children with Developmental Coordination Disorder is approximately 6% (American Psychiatric Association, 2014). The international scenario points to higher rates in countries that conducted large-scale studies, ranging from 2% to 19% (Wright & Sugden, 1996; Kadesjö & Gillberg, 1998; Jongmans et al., 2003; Tsiotra et al., 2006; Lingam et al., 2009). This variability may be due to the criteria used to identify DCD (Blank et al., 2019) in the studies mentioned.

According to the DSM-V (American Psychiatric Association, 2014), the diagnosis of DVD must meet four criteria: presenting motor performance below expectations for the age; motor difficulties significantly interfering with activities of daily living and impacting academic and recreational activities; motor difficulties arise in the initial period of development; and motor difficulties not better explained by intellectual retardation, visual impairment or other conditions that affect movement. In this study, the prevalence of children with motor difficulties in Fortaleza/CE was estimated based only on the first criterion mentioned above. Despite this, we believe that this study advances in the knowledge of the motor profile of children in the Northeast region and, together with the data pointed out by other studies, it contributes to the understanding of the reality of the motor performance of Brazilian children. Research of this nature is important to raise awareness about DVD and to adopt measures for the care of such children (Valentini et al., 2012; Fischer et al., 2013).

Regarding the differences between the genders, the results showed that boys and girls had a similar prevalence of motor difficulties. These results are against the literature. The study by Valentini et al. (2012), for example, showed a higher prevalence of girls identified with motor difficulties than boys. The study by Beltrame et al. (2017) showed a higher prevalence of boys identified with motor difficulties compared to girls. The DSM-V (American Psychiatric Association, 2014) highlights that the prevalence of motor difficulties for boys is 2: 1, while for girls it is 7: 1. Despite these indications, the similarity in the prevalence of Motor Difficulties among boys and girls in this study may be because each gender presented better performances in different motor components. In this study, girls performed better in the Manual Dexterity and Balance components than boys, while boys performed better in the Throwing and Catching component than girls. Also, the Throwing and Catching component showed the greatest difference between genders at all ages analyzed. Thus, through the sum of the scores of the motor components, it may be that boys and girls have obtained similar total MABC-2 scores and, consequently, similar percentiles.

These differences in the test performance of each motor component bring a worrying analysis depending on the social and cultural context of the sample. Despite the discussions about deconstructing games and “own” activities for boys and girls, there is still the “ball culture” in the Brazilian context experienced mainly by male children, while girls are encouraged to experience activities less vigorous, such as drawing and playing with dolls (Pellegrini et al., 2008; Valentini et al., 2012). The motor tasks involving the ball have an important role in the development of spatial and temporal notions of individual-environment interaction (Gallahue et al., 2013). Thus, the specific difficulties for each gender deserve special attention from the movement professionals (physical education, physiotherapy, occupational therapy), parents and teachers.

Regardless of gender, we observed that children had more difficulties in performing Balance tasks, considering that 67.3% of children with Motor Difficulties obtained the percentile less or equal to the 5th in this component. In the tasks of Manual Dexterity, 61.2% of children with Motor Difficulties had the percentile less or equal to the 5th. These results are similar to those of

Valentini et al. (2012), although it deals with children from different Brazilian regions. The literature has pointed out that children with DCD often have difficulties in postural control, in maintaining balance (Przysucha et al., 2016) and in performing fine motor coordination tasks (Feder & Majnemer, 2007). This could be because of the perceptual-motor deficits, both in visual-motor perception and in spatial mentalization, which affects the ability to make fast motor adjustments in complex tasks (Ferracioli et al., 2014) that involve these motor components. Thus, the evaluation of the components Balance and Manual Dexterity can be used as a strong indication of the presence or not of DVD in the lives of the children evaluated. Once again, we also highlight the special attention from teachers, parents, and professionals of the movement for propitious and appropriate stimuli in motor interventions aimed at the general motor development of children.

Children aged 8 years old presented a higher prevalence of Motor Difficulties (16.2%), followed by children aged 10 years old (11.1%), children aged 7 years old (10.8%) and, finally, children aged 9 years old (8.0%). While some studies showed a tendency for younger children to have more motor difficulties than older children (Santos & Vieira, 2013; Beltrame et al., 2017), other studies showed the opposite (Valentini et al., 2012; Silva & Beltrame, 2013). Despite all these, the identification of possible DVD in the early ages helps to minimize the impact of motor difficulties in carrying out daily tasks, as well as reducing the physical consequences (for example inactivity and overweight - Cairney et al., 2010) and psychosocial (for example low self-esteem, depression, and anxiety - Pratt & Hill, 2011; Missiuna & Campbell, 2014) in children's lives.

The difficulties in executing precise, coordinated and age-appropriate movements increase the challenges to meet developmental goals and decrease opportunities for social engagement and physical practice (Cairney et al., 2013). Studies have shown that children with motor difficulties are less involved in recreational and moderate to vigorous physical activities than their peers without difficulties (Cairney et al., 2010; Kwan et al., 2016), further increasing the associated implications the physical and psychosocial consequences of motor difficulties.

Based on this general picture of a vicious circle between motor difficulties and their consequences, this study proposed to discuss the implication of a single Physical Education class per week for elementary school children, in the city of Fortaleza. Physical Education is important to bring mechanisms to improve skills and reduce the backwardness of children from their peers. Children between 7 and 10 years old are in the transition stage of the specialized motor phase (Gallahue et al., 2013), characterized by the use of fundamental movements and their combination in specific situations of sport, dance and recreational activities. In this way, Physical Education classes play an important role in this phase, as they can favor children to experience various stimuli and experiences to increase and maintain their motor repertoire (Gallahue et al., 2013). Also, as Physical Education is a mandatory curricular component, it becomes an opportunity for practical weekly experience for children with motor difficulties. Thus, with the results of this study, more Physical Education classes taught by Physical Education

teachers, and the monitoring of movement professionals (physical and occupational therapists), both in the school and social context, are essential to promote more varied stimuli and directed to the motor coordination components required for the child's motor development.

We believe that this study is an advance by highlighting the prevalence of children with Motor Difficulties in a region still little studied in this research area and by relating the observed motor behavior with the reduced amount of Physical Education classes, the current reality of the city of Fortaleza/CE. Also, this study reinforces the results found in the literature on the prevalence of Motor Difficulties in Brazilian children when using an adequate and reliable battery for assessing motor coordination. However, this study has limitations regarding the use of motor tests only (MABC-2), considering that it is increasingly necessary to have specific information regarding the child's development history, medical history, clinical examination, involvement in recreational activities and participation in school (Blank et al., 2019) to identify motor difficulties and their relationship with possible developmental disorders. This study also proposed further investigations to identify and ascertain the impact of socioeconomic characteristics on the motor development of the children evaluated so that the specificities of the Brazilian regions can be highlighted and, if possible, compared (Fischer et al., 2013).

5 Conclusion

The prevalence of children with motor difficulties in this study is similar to the values observed in the literature. These values are worrying, considering the losses and problems caused as a result of this situation. When children do not have the desired performance, they stay far from the practice of physical activities, worsening the situation. The Balance component was the most difficult of the children in the studied sample, requiring greater analysis and intervention in both genders. When compared to boys, girls' inferior performance was also observed in the Throwing and Catching component, suggesting that culturally, they are deprived of greater familiarization with the skills and practical experiences of this component, leading to thinking about the relationship of motor difficulties found with the context in which these children are inserted. The results of this study are important to know and deepen analyzes on the motor development of children in the Northeast region and to propose intervention strategies for the motor development of children.

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Author's Contributions

Letícia Rodrigues Vieira dos Santos participated in the project design, data collection, analysis, and text writing. Marcela de Castro Ferracioli participated in the project design, data analysis, writing, and text review. All authors approved the final version of the text.

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