Analysis of Laterality and Manual Dexterity in Children with Autistic Spectrum Disorder[1]

Análise da Lateralidade e Destreza Manual em Crianças com Transtorno do Espectro Autista

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ABSTRACT: This study aimed to analyze laterality and manual dexterity in children with Autism Spectrum Disorder (ASD). From the point of view of human motor skills, laterality contributes to the motor maturation process. Among the main characteristics of autism is the delay in gross and fine motor skills, with progressive worsening in the condition. Analyzing the level of laterality of the individual with ASD becomes important because it allows a direction in the motor intervention in order to improve the functionality and quality of life of the autistic person. The sample of this study was composed of eight children, students of a public education institution, male, with an average age of 8.75 ± 1.83 years old and diagnosed with ASD based on the DSM-V. The results showed that the study participants seem to have right handedness and also better performance with the preferred hand in a manual dexterity task. It was observed that, in the task that demanded more attention and dexterity, the difference in hand performance was significant. In the task with the lowest attentional demand and manual dexterity, the performance between the hands was not significant; however, it was at that moment that the biggest mistakes in execution were observed. Motivation can be a fundamental variable for motor performance in tasks that assess execution time. It is important to emphasize the development of the motor skills of these individuals during the school phase to reduce motor difficulties and, consequently, improve quality of life, sense of well-being, autonomy and social interaction.

KEYWORDS: Laterality. Visual-motor coordination. Autism.

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RESUMO: Este estudo teve como objetivo analisar a lateralidade e a destreza manual em crianças com Transtorno do Espectro Autista (TEA). Do ponto de vista da motricidade humana, a lateralidade contribui para o processo de maturação motora. Figura-se entre as principais características do autismo o atraso nas habilidades motoras grossas e finas, com piora progressiva no quadro. Analisar o nível de lateralidade do indivíduo com TEA torna-se importante por possibilitar uma direção na intervenção motora com o intuito de melhorar a funcionalidade do autista e sua qualidade de vida. A amostra deste estudo foi composta por oito crianças, alunos de uma instituição de ensino pública, do sexo masculino, com idade média de 8,75±1,83 anos e diagnosticadas com TEA com base no DSM-V. Os resultados mostraram que os participantes do estudo parecem apresentar lateralidade destra e, também, melhor desempenho com a mão preferida em uma tarefa de destreza manual. Observou-se que, na tarefa que exigiu maior atenção e destreza, a diferença no desempenho das mãos foi significativa. Já na tarefa com menor demanda atencional e de destreza manual, o desempenho entre as mãos não foi significante, porém foi nesse momento que foram observados os maiores erros na execução. A motivação pode ser uma variável fundamental para o desempenho motor em tarefas que avaliam o tempo de execução. É importante uma maior ênfase no desenvolvimento da motricidade desses indivíduos durante a fase escolar para diminuir as dificuldades motoras e, consequentemente, melhorar a qualidade de vida, sensação de bem-estar, autonomia e interação social.

PALAVRAS-CHAVE: Lateralidade. Coordenação viso-motora. Autismo.

1 Introduction

Autistic Spectrum Disorder (ASD) is a neurodevelopmental disorder that is characterized by changes present from a very early age, typically before the age of three, with impairment in three areas: social interaction, communication and restricted and repetitive behavior (Caetano, 1993; Catelli, D'Antino, & Assis 2016; Günal, Bumin, & Huri 2019). Due to the great variation in degree and intensity of its manifestations, the Diagnostic and Statistical Manual of Mental Disorders 5th edition - DSM-V (American Psychiatric Association [APA], 2013), categorized all phenotypic presentations of autism as ASD, which includes autistic disorder (autism), Asperger's syndrome, childhood disintegrative disorder and global or invasive developmental disorder not otherwise specified (Vitorino, 2014).

Historically, the first time that ASD was reported in scientific studies was in 1943 by Dr. Leo Kanner, when he observed 11 children who had peculiar behaviors of social interaction, communication and stereotypes (Chukoskie, Townsend, & Westerfield, 2013; Pereira, Riesgo, & Wagner, 2008). When extrapolating the causes of the disorder, Pereira, Riesgo e Wagner (2008) related the social withdrawal of children to the highly intellectual character of the parents, giving a psychosocial condition to the disease. However, this relationship was practically discarded, since subsequent studies clarified that ASD is a brain disorder with a strong genetic component (Rutter & Thapar, 2014).

From then on, the convictions of the neurobiological factor for the etiology of ASD gained strength and research began to be more directed to the brain bases of the disorder, suggesting that some brain regions would be altered. Although the main characteristics of ASD are social isolation, lack of eye contact and deficits in language ability, motor functions are typically altered (Kummer & Teixeira, 2007). Authors who assessed motor skills in autistic individuals, such as Lloyd, MacDonald and Lord (2013), state that gross and fine motor skills of children with ASD are delayed and become progressively more delayed with age.

One of the possible explanations for the motor delay found in ASD may be related to the variability of hemispheric specialization in this population, with the right hemisphere being more developed than the left, changing some capacities, such as motor, auditory and visual (Molfese & Segalowitz, 1988; Zilbovicius, Meresse, & Boddaert, 2006). Hemispheric specialization is a biological explanation for the development of laterality. In addition, the difference in the development of the cerebral hemispheres (Molfese & Segalowitz, 1988) can result in different patterns of laterality development.

Due to the great variability of hemispheric specialization found in ASD, few studies on this topic are found in the literature (Aram et al., 1988; Floris & Henrietta, 2018; Paquet, Golse, Girard, Olliac, & Vaivre-Douret, 2017; Zilbovicius, Meresse, & Boddaert, 2006). Laterality as an element of human motricity is directly related to precision, preference, speed and coordination of movement, contributing to the process of motor maturation (Velasco, 1996). The late establishment of laterality in children with ASD can have a significant impact on the development of certain acquisitions, such as writing, visual-motor coordination, manual dexterity and language (Paquet et al., 2017). In this regard, the earlier the development of laterality, which in autistic individuals is less developed compared to typical groups (Thompson et al., 2017), the better the child's development will be (Hauck & Dewey, 2001; Romero, 1988).

This dimension of the human movement, the laterality, is essential for the global development of the child, since it directly interferes in the way he/she will socialize with the world. According to Hauck and Dewey (2001), autistic children who are more lateralized manually have better motor, verbal and cognitive performance compared to those less lateralized. Laterality impacts the social interactions of children with ASD, such as how they throw a ball or open a door using a key (Paquet et al., 2017). In addition, manual laterality in ASD impacts the development of the acquisition of writing, manual dexterity and language and can act as a behavioral marker that concerns the brain functioning of children with ASD, being associated with lower cognitive ability (Forrester, Ruth, Thomas, & Mareschal 2017). As an example, children with ASD who have more defined laterality tend to have more developed language skills than children who are less lateralized (Rodriguez et al., 2010). From this, knowing the level of laterality of the individual with ASD becomes important because it has implications for future diagnoses and for enabling a direction in motor intervention in order to improve the functionality of autistic people and, consequently, their quality of life (Preslar, Kushner, Marino, & Pearce 2013).

Assessing laterality seems, at first glance, a very simple task, but the results can vary substantially, especially in individuals with ASD, due to their motor difficulties and the variation in the levels of impairment. The studies that establish the standard results for this group are scarce and have restrictions on their power of generalization. In addition, it is worth emphasizing the importance of using appropriate tests, as they are useful in identifying changes in motor patterns, especially during the school phase (Rosa Neto, 2002), helping to target specific interventions for each autistic person in an attempt to improve their quality of life through movement.

The assessment of lateral preference can be performed using some instruments, such as: questionnaires, the performance of usual praxis and the execution of tasks that require manual dexterity. In the literature review studies conducted by Catelli, D'Antino, & Assis (2016) and Soares and Cavalcante Neto (2015), a mapping of the motor assessment instruments in individuals with ASD was performed. In both studies, it was possible to conclude that there is a shortage of literature related to this topic, mainly in Brazil. Regarding the credibility of the instruments found, the authors question whether they are really suitable for the population with ASD.

In this study, we chose to use the Nine Hole Pegboard Test (9-HPT), as it is a test of easy and quick administration. In addition, it works as a reliable and valid measure of manual dexterity (Poole et al., 2005; Smith, Hong, & Presson 2000). In several populations, the ability to assess manual dexterity using 9-HPT has been demonstrated, such as stroke, chronic non-progressive childhood encephalopathy, cerebellar impairment, Parkinson's disease and multiple sclerosis (Wang, Bohannon, Kapellusch, Garg, & Gershon, 2015). However, research using 9-HPT in the atypical population, as in ASD, is scarce and did not seek to investigate laterality (Huri, Şahin, & Kayıhan 2016; Lidstone, Miah, Poston, & Beasley, 2020).

Considering that laterality is an important domain of the movement, being an integral part of the child's global development, and that there is a precarious work in the literature that sought to relate laterality and manual dexterity in children with ASD, this study is justified by the need of investigations in the area of Motor Behavior with individuals with ASD, mainly with regard to the observation and description of laterality. Thus, the aim of this study was to analyze the laterality and manual dexterity of children with ASD.

2 Method

In this section, we address the research participants, the instruments and the task used with the subjects, the procedures and the paths for data analysis.

2.1 Participants

Eleven children initially participated in this study, but three of them were excluded from the final analysis, as they were unable to perform the motor task. Thus, the final sample consisted of eight male participating children, with an average age of 8.75 ± 1.83 years and diagnosed with ASD based on the DSM-V. The characterization of the sample can be seen in Table 1.

Parents or guardians authorized their children's participation by signing the Free and Informed Consent Term and the children, by signing the Minor Informed Consent Term agreeing to voluntary participation in the research. As the Institution where the data collection was carried out had a larger number of students with ASD, the study was limited to this sample. The prevalence of ASD found in males is corroborated by the literature (Fombonne, 2009).

2.2 Instruments and task

An anamnesis was prepared to characterize the sample, containing the following elements: a) Name; b) Age; c) Sex; d) School year; e) Takes medication, if so, which; f) Has some striking characteristic; g) Practices any leisure activity; and h) Already had hand injury (Table 1). To determine the laterality index, parents/guardians were asked to respond to the Edinburgh Handedness Inventory (Oldfield, 1971), considering their children's manual preference.

Participants	Age (years old)	Age when Diagnosed (years old)	School grade	Use of medicine	Practices activities*	Injury in hands	Striking characteristic
1	6	4	1st	No	Yes	No	Unsteady gait, Opposing behavior
2	7	3	2nd	Homeopathy	Yes	No	**
3	8	2	3rd	Risperidone	Yes	No	**
4	8	3	3rd	No	Yes	No	Echolalia
5	9	3	4th	Risperidone / Carbamazepine	Yes	No	Communicative
6	10	4	5th	Risperidone / Ritalin	Yes	No	Hyperactive
7	11	3	6th	Ritalin / Imipramine	Yes	No	Hyperactive
8	11	2	6th	Risperidone / Depakene/ Mellaril	Yes	No	Musicalized Hyperactive

Table 1. Sample characterization.
Source: Elaborated by the authors.
* The sports practices performed by the sample are swimming and futsal.
** For individuals 2 and 3, the parents/guardians did not report striking characteristics or/and did not know how to respond.

The instrument used for the manual dexterity task was the 9-HPT. This task is commonly used by occupational therapists as a quick measure to assess manual dexterity because it is an accurate and low-cost instrument. The 9-HPT consists of two square plates and nine wooden pins (Figure 1). One of the plates contains the container for the pins; and the other, nine holes in which the pins fit. The task is realized under two conditions to be performed as quickly as possible. The first condition of the task is to insert the pins in each hole, one at a time. The second condition is to remove the pins and reposition them in the original container. Both the "insert condition" and the "remove condition" did not have a prescribed order; thus, the participant could place and remove the pins from right to left, from top to bottom and vice versa. To measure the movement time in the task, a cell phone stopwatch was used. The task was performed with both hands. The order in which the task started was balanced among the participants to eliminate any effect that the order of execution could have on motor performance.

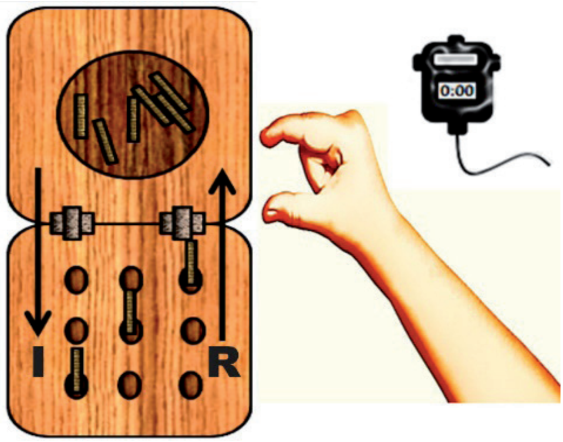

Figure 1. 9-Hole Peg Test.
Source: Elaborated by the authors.
Legend: I – Insert; R – Remove.

2.3 Procedures

Data collections were carried out with students from a public education institution in the city of Belo Horizonte, Minas Gerais, with authorization from the coordination to carry out the study. Then, we started collecting data. Parents or guardians signed the consent form, attesting to their agreement with the child's voluntary participation in the study, and the participants signed the Minor Term. Initially, data collection consisted of explaining to parents in detail the Edinburgh Handedness Inventory and parents were asked to complete the questionnaire. Then, the parents or guardians answered the anamnesis to characterize the sample.

For the manual dexterity task, the participant was instructed to sit comfortably, with the midline of the body aligned with the 9-HPT that was on a table. With the help of the Specialized Educational Service (SES) teachers for the application of the manual dexterity task, all participants received standardized verbal instructions and a demonstration of the task to be performed. During the instructions, it was emphasized that for the task to be performed, it should be used only by the hand designated during the attempt. It was not allowed to reposition the pin using the body, tray or table to help. If the participant took more than one pin at a time, changed hands or used both hands, positioned the pin on the body, on the board or on the table, they were immediately alerted to the task's goal and the initial instructions were revisited.

The standard task consists of a practice for setting and, subsequently, two attempts for each hand. However, difficulties were found for participants to make more than one attempt with each hand, as they were shown to be restless, impatient, resistant and with difficulty in engaging in the task. Thus, it was not possible to set the ambience of all participants. Thus, only one attempt was timed with each hand.

The movement time comprised the time interval between the moment when the participant took the first pin and positioned the last pin (Mathiowetz, Weber, Kashman, & Volland, 1985). Time was not taken during the entire task, as it was necessary to stop between the conditions of placing and removing pins, unlike the standard protocol of the task. These adaptations were necessary because it is a sample that has a complex disorder with varying degrees of severity. Taking into account that most autistic children have difficulties in dealing with complex sequences of instructions, it is necessary that the sequences be decomposed into smaller units (Bosa, 2006).

2.4 Data analysis

The principle of data normality was verified using the Shapiro-Wilk test ($p > 0.05$). To compare the performance of the hands, as well as the total execution time, paired t-tests were performed. The total time of the hands was calculated, which corresponds to the sum of the values of the hand for the conditions of inserting and removing the pins. The execution errors were registered in a binary way, that is, it presented or did not present an error during the execution of the movement. The significance value adopted was $\alpha \leq 0.05$. To calculate the laterality quotient, the following equation was used: LQ= (R-L/R+L) X 100 (Teixeira & Paroli, 2000), in which LQ = laterality quotient, R = values for right hand, L = values for left hand. Execution errors were analyzed descriptively.

3 Results

In this section, we initially deal with the results related to lateral preference; then, on motor dexterity; and finally, on errors in execution.

3.1 lateral preference

Lateral preference was calculated from the responses to the Edinburgh Handedness Inventory (Oldfield, 1971). The results can be seen in Table 2. From the results, we noticed that the sample in its entirety showed right hand preference and has an average laterality index of 83.68 points.

Participants	Laterality Quotient (%)
1	64
2	100
3	100
4	60
5	100
6	63.63
7	100
8	81.81
Mean (SD)	83.68 (±18.59)

Table 2. Results of the Edimburgo Handedness Inventory.
Source: Elaborated by the authors.

3.2 Motor dexterity

To assess motor dexterity, performance on the 9-HPT was analyzed through the time spent during the conditions of inserting and removing the pins, as well as the total time of each hand (sum of the times of inserting and removing conditions). The t-test detected significant differences between the hands in the condition of inserting the pins [t (df = 14) = -2.55, p = 0.03] (Figure 2). The preferred hand performed better, with an average time of 20.03 seconds, than the non-preferred hand, 24.91 seconds. For the condition of removing the pins, the t test did not detect a significant difference between the hands [t (df = 14) = -1.44, p = 0.19] (Figure 3). The preferred hand had an average time of 9.91 seconds; while the non-preferred hand, 12, 06 seconds.

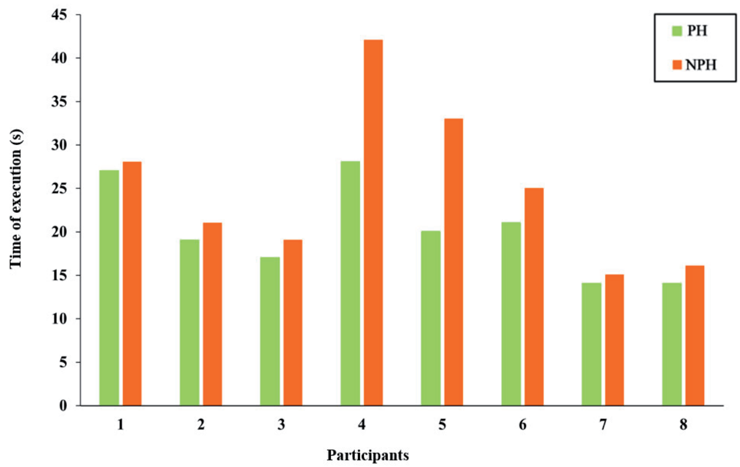

Figure 2. Execution time during the task of inserting the pins.
Source: Elaborated by the authors.
* **PH** = preferred hand; **NPH** = non-preferred hand.

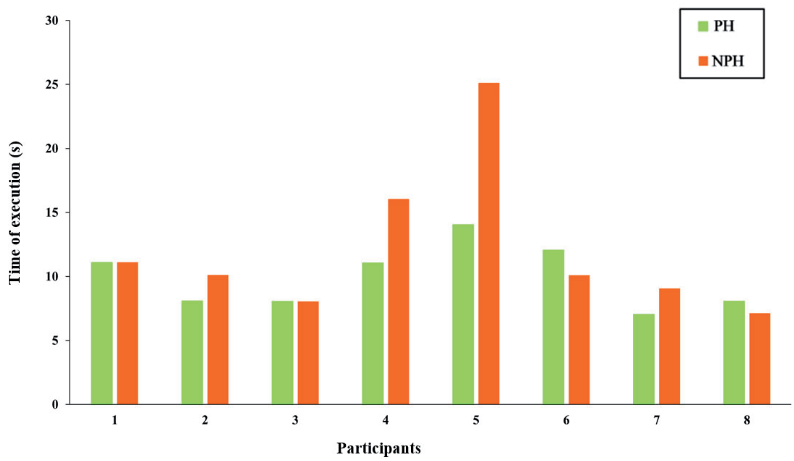

Figure 3. Execution time during the task of removing the pins.
Source: Elaborated by the authors.
* **PH** = preferred hand; **NPH** = non-preferred hand.

For the analysis of the total execution time of the hands, the t test showed a marginal difference in performance [t (df = 14) = -2.18, p = 0.06] (Figure 4). The preferred hand performed better when compared to the non-preferred hand.

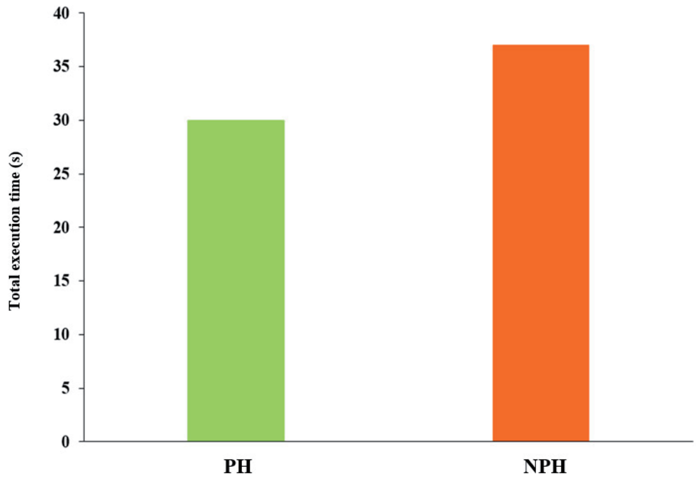

Figure 4. Total hand execution time.
Source: Elaborated by the authors.
* **PH** = preferred hand; **NPH** = non-preferred hand.

3.3 Errors in execution

In order to better analyze the manual dexterity in the applied task, the errors recurrently made by the participants were analyzed. The observed errors were: a) used another hand; b) took more than one pin; and c) dropped a pin. The errors were computed in a binary way, that is, yes or no, to account for how many participants made mistakes and what mistakes were made.

Used other hand: the use of the other hand was considered when the participant used the hand that was not intended to perform the task to assist or took a pin with the hand that was not being evaluated at the time. Errors in the conditions for inserting and removing the pins were accounted for separately. In general, the preferred hand had a higher number of errors compared to the non-preferred hand; in addition, the condition of removing showed the highest number of errors when compared to the condition of inserting (Figure 5).

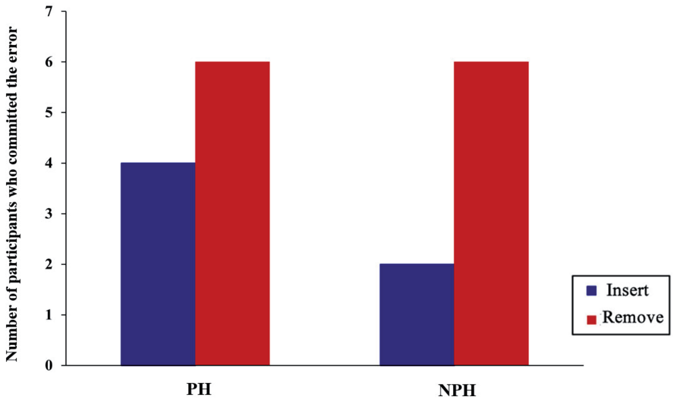

Figure 5. Execution error used other hand.
Source: Elaborated by the authors.
* **PH** = preferred hand; **NPH** = non-preferred hand.

Took more than one pin: it was considered to take more than one pin when the participant held two or more pins with the hand that performed the task. Errors in the conditions for inserting and removing the pins were accounted for separately. When analyzing the data, we noticed that in general there were a greater number of mistakes made by the non-preferred hand, compared to the preferred hand. In addition, the condition of removing showed the greatest number of errors when compared to the condition of inserting (Figure 6).

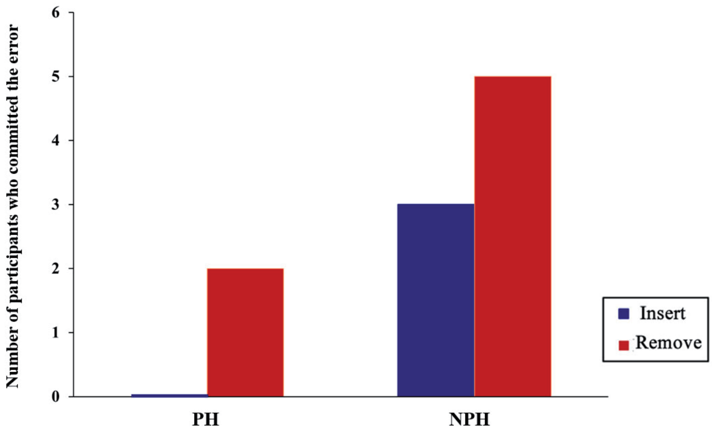

Figure 6. Execution error picking up more than one pin.
Source: Elaborated by the authors.
* **PH** = preferred hand; **NPH** = non-preferred hand.

Dropped a pin: it was considered to drop a pin when the participant lost control of the pin and consequently dropped it. Errors in the conditions for inserting and removing the pins were accounted for separately. It was observed that, unlike the error "used other hand" and "took more than one pin", the greatest number of errors occurred in the condition of inserting the pins. In general, the non-preferred hand had a greater number of errors compared to the preferred hand (Figure 7).

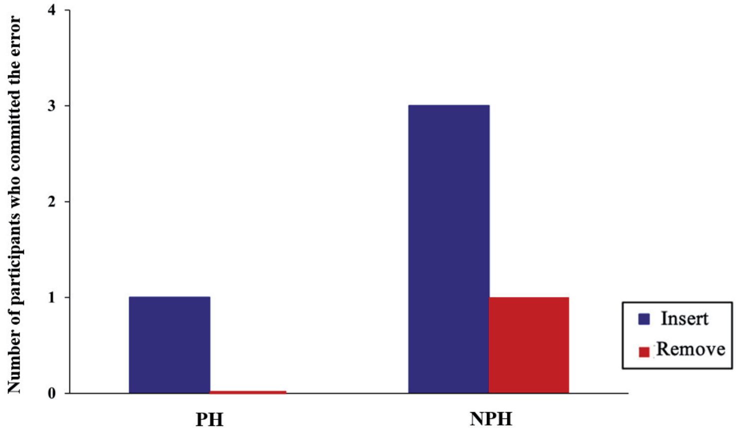

Figure 7. Average execution error of dropping a pin.
Source: Elaborated by the authors.
* **PH** = preferred hand; **NPH** = non-preferred hand.

4 Discussion

Considering laterality as an important domain of human behavior, this study aimed to analyze laterality and manual dexterity in children with ASD. The results indicated an average of 83.68% for the laterality index, confirming the direction of laterality for the right hand for the study sample. This result corroborates the majority distribution of right-handed people (Annett, 1967). When observing the performance in the manual dexterity motor task, a superior performance was registered in the total execution time for the movements performed with the preferred hand.

Although the majority of the participants performed better with the preferred hand, some participants did not show this pattern among the different conditions of the task. According to McManus, Murray, Doyle and Baron-Cohen (1992) and Paquet et al. (2017), autistic children show disagreement between the preferred hand and the most skilled one. The choice between hands begins to be determined at around two years of age, but is not fully established until the age of three or four (Gesell & Ames, 1947). However, there is a tendency for this lateralization to be strengthened throughout life.

Regarding the motor task, a significant difference was observed in the performance of the hands in the condition of inserting the pins, as well as an indication of the total execution time. We consider that the preferred hand performed better, albeit marginal ($p = 0.06$), in relation to the performance of the total execution time of the non-preferred hand. In both, the preferred hand performed better. Descriptively, we also observed that the preferred hand had a lower number of total errors compared to the non-preferred hand. These results show that the preferred hand seems to have better manual dexterity. Motor skills are understood as the ability to produce the expected results with maximum success and with the minimum cost of time, energy or both (Knapp, 1963). In autistic people, it is common to find deficits in motor performance such as strength control, space-time orientation, balance and laterality itself (Vasconcelos, Rodrigues, Barreiros, & Jacobsohn, 2009), which are necessary skills for manual dexterity.

The errors were analyzed: "used the other hand", "took more than one pin" and "dropped a pin". There was a higher incidence of errors made by the non-preferred hand, suggesting a possible explanation for the significant difference in the total time of the task between the hands, whose preferred hand obtained less execution time. Another point to be discussed is that most of the errors occurred in the condition of removing the pins, a possible explanation for this result occurs through Fitts' Law, of 1959: the higher the speed, the lower the precision. Thus, due to the task requiring less attention because it offers less difficulty to perform, the time spent on the task was less, but the possibility of error became greater, compared to the condition of inserting the pins. Following this logic, the significant difference in the total time of the task and the non-difference in the time of withdrawal can also be explained by the difficulty of the task. Placing the pins requires greater dexterity and attention to execution, resulting in a longer duration of the task and highlighting the differences between the hands. However, removing the pins seems to require less motor and cognitive abilities, thus resulting in slight differences in hand performance.

It is important to report a factor that may have interfered with the study, motivation. Despite not being the focus of this study and also not being directly evaluated with appropriate instruments, some information can complement the understanding of the results found. After demonstrating the task, when participants were asked to perform it, some did not want to, and it was necessary to insist that the task be performed. In addition, some participants showed resistance to making the attempt with the contralateral hand of the hand that started the task. According to the study conducted by Cornish and McManus (1996), motivation can be an important variable for motor performance in tasks that assess movement time, as evidence indicates that low motor performance may be related to low engagement in the task, since unmotivating tasks may not encourage the focus of attention for quick execution.

9-HPT presents evidence of a good degree of reliability (Smith, Hong, & Presson, 2000) for all ages within its normative sample. However, there is no published research on the reliability of this motor task with children with ASD. In addition, research on the topic is scarce, which makes it difficult to compare our results with those of other authors, to verify whether the scores obtained are within the expected standard for this population. For example, the study conducted by Smith, Hong and Presson (2000) compared the performance of children who attended Special Education with children of regular education, the results of the study showed that children from Special Education had a longer time to complete the task; in addition, for both groups, the preferred hand performed better. However, the method used by Smith, Hong and Presson (2000) was different from that used in this study and, in the sample of children enrolled in Special Education, there is no characterization of these participants, a fact that makes it difficult to make comparisons with our results. What can be compared are the average times of children with typical development with our sample. This comparison allows us to identify that children with ASD appear to be slower in performing the task (Smith, Hong, & Presson, 2000). Furthermore, it corroborates with other studies that applied different tests and that show the poorer performance of autistic people in a fine motor skill compared to typical children (Leal, 2011; Provost, Heimerl, & Lopez, 2007).

Since laterality can act as a behavioral marker, these results can guide the interventional practice of health professionals such as teachers, physiotherapists and occupational therapists. From the understanding of the relationship between laterality and the development of the acquisition of writing, manual dexterity and language, professionals can adopt bilateral motor intervention strategies, developing not only the motor domain of laterality, but also auditory and visual. In addition, from these results, we can pay attention to the use of tests that contemplate the playful side of motor tasks in order to motivate their execution. In view of the different forms of presentation of the Disorder, it is challenging to establish methods of analysis of the movement that guide the intervention, but it is possible to guide on general aspects of this practice.

Due to the characteristics of the evaluated group associated with questions related to motivation to practice, it was not possible to perform the task more than once. It is recommended that at least three attempts of the task be carried out, as Davis, Fenlon, Proctor and Watson (1997) demonstrated in their study, pointing out that the average of the three attempts produces greater reliability of the results. Therefore, this aspect can be considered a limitation of the study. Thus, we suggest that future studies seek strategies to ensure the engagement of children in an attempt to perform the task as recommended. In addition, during the application of the anamnesis, the delimitation of children's characteristics can help in understanding the results. In this study, the parents pointed out distinct characteristics, such as emotional, physical and behavioral characteristics. This delimitation can increase the understanding of the motor behavior of these individuals. Thus, considering the spectrum of characteristics present in the TEA, the results presented are considered exploratory and their generalizations should be made with caution.

Another aspect to be considered as a limitation of the study refers to the sample size. Despite being a specific population, future studies may perform the analysis with a larger sample and in different age groups and genders to increase the power of generalizing the results. The present sample consisted of children aged 6 to 11 years, who practice physical activities, students of public regular education, with systematic use of medication. These characteristics must be considered. In short, motor skills are reported as an important predictor of performance in activities of daily living, such as handwriting and school function (Kopp, Beckug, & Gillberg, 2010). Therefore, its relevance for the integral development of children with ASD should be taken into account.

5 Conclusion

This study showed that autistic participants in the study appear to have right handedness and also better performance with the preferred hand in a manual dexterity task. We observed that, in the condition of inserting the pins that required more attention and dexterity, the difference in hand performance was significant. In the condition of removing the pins, which requires less attention and manual dexterity, the performance of the hands was not significant; moreover, at that time, major errors in execution were observed. Since laterality is an important domain of the individual's global development, it is important to identify deficits in this dimension to guide motor intervention in order to reduce the motor difficulties that children with ASD have and, thus, improve the quality of life, feeling of well-being and autonomy of this population.

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