Teachers' Perception in Relation to the Sensory Processing of Students with Autism Spectrum Disorder[1]

Percepção de Professores em Relação ao Processamento Sensorial de Estudantes com Transtorno do Espectro Autista

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ABSTRACT: This study aimed to identify the perception of teachers in relation to the sensory processing of students with Autism Spectrum Disorder (ASD). Nineteen teachers of Early Childhood Education and early grades of Elementary Education from public schools in a municipality in the state of São Paulo, Brazil, participated in the research, as well as their 62 students. Data collection was carried out between the months of September 2018 and May 2019. A scale assessment of the Sensory Profile 2 of School Monitoring was used, which evaluates children and adolescents from the perspective of the teachers. The analysis of the results occurred through the categories of the instrument. In all categories, Quadrants (Sensory seeking, Sensory Avoiding, Sensory Sensitivity And Low Registration), Sensory and Behavioral Sections (Auditory, Visual, Tactile, Vestibular and Behavioral) and School Factors (School Factor 1, School Factor 2, School Factor 3 and School Factor 4), the classification of "More and Much More than the Majority of the Others" expressed the highest percentage, totaling, in all aspects assessed by the instrument 62.9%. The study identified that students with ASD, who have a characteristic profile of Sensory Integration dysfunctions are impacted by the condition of body structure and function in the teaching and learning processes and the participation in activities within the classroom. The results point to the importance of the occupational therapist's actions in the school environment through collaborative work with the teacher, since the results in relation to the sensory profile directly interfere with the performance of students with ASD in view of the demands of activities in the school context.

KEYWORDS: Special Education. Sensory Processing. School. Occupational Therapy. Autism Spectrum Disorder.

RESUMO: Este estudo objetivou identificar a percepção dos professores em relação ao processamento sensorial de estudantes com Transtorno do Espectro Autista (TEA). Participaram da pesquisa 19 professores de Educação Infantil e Ensino Fundamental I de escolas públicas de um município do interior do estado de São Paulo, bem como seus 62 estudantes. A coleta de dados foi realizada entre os meses de setembro de 2018 e maio de 2019. Foi utilizada a avaliação escalar Perfil Sensorial 2 de Acompanhamento Escolar, que avalia crianças e adolescentes a partir da perspectiva dos professores. A análise dos resultados ocorreu mediante categorias do instrumento. Em todas as categorias, Quadrantes (Exploração, Esquiva, Sensibilidade, Observação), Seções Sensoriais e Comportamentais (Auditivo, Visual, Tato, Movimentos e Comportamental) e Fatores Escolares (Fator Escolar 1, Fator Escolar 2, Fator Escolar 3 e Fator Escolar 4), a classificação de "Mais e Muito Mais que a Maioria dos Outros (as)" expressou a maior

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porcentagem, totalizando, em todos os aspectos avaliados pelo instrumento, 62,9%. O estudo identificou que estudantes com TEA que apresentam um perfil caraterístico de disfunções de Integração Sensorial sofrem impacto da condição de estrutura e função corporal nos processos de ensino e de aprendizagem e na participação em atividades dentro da sala de aula. Os resultados apontam para a importância das ações do terapeuta ocupacional no ambiente escolar por meio do trabalho colaborativo com o professor, visto que os resultados em relação ao perfil sensorial interferem diretamente no desempenho dos estudantes com TEA perante as demandas das atividades no contexto escolar.

PALAVRAS-CHAVE: Educação Especial. Processamento Sensorial. Escola. Terapia Ocupacional. Transtorno do Espectro Autista.

1 Introduction

Sensory Integration (SI) was a term first used in 1963 by Anna Jean Ayres, an occupational therapist. Ayres (1972) defined SI as a neurological process of organizing the sensations coming from the body (tactile, olfactory, auditory, visual, vestibular and proprioceptive) and the environment, making the correct use of the body in the environment possible. Thus, SI is characterized as a process of sensory input, followed by information processing in the Central Nervous System (CNS) and motor output (adaptive response) (Serrano, 2016).

The occupational therapist Winnie Dunn (1997), proposed the definition of sensory processing as a form of organization of the SI, which seeks the interaction between the neurological threshold and the self-regulation of the individual's conduct. Dunn (1997) indicates four quadrants models for sensory processing, namely: Sensory Seeking, Sensory Avoiding, Sensory Sensitivity and Low Registration (Dunn, 1997, 2017; Metz et al., 2019).

The quadrants proposed by Dunn (1997) are related to the amount of sensory stimuli required for a neuronal response (neurological threshold) and the way in which individuals behave to control their needs (self-regulation). However, in each quadrant there are different behavioral characteristics (Dunn, 1997, 2017).

The child or adolescent found in the Sensory seeking quadrant has a high neurological threshold but has active self-regulation strategies, representing the degree that a child obtains sensory stimulus generating new ideas. In contrast to this fact, the individual who falls under the Low registration quadrant has a high neurological threshold with passive self-regulation, the degree to which a child stops receiving a sensory stimulus.

For the Sensory Sensitivity quadrant, there are individuals with low neurological thresholds and a passive self-regulation strategy, being the degree in which a child detects a sensory stimulus. With regard to the sensory avoiding quadrant, the individuals who fit it have low neurological thresholds and an active self-regulation strategy, meaning the degree to which a child is bothered by a sensory stimulus (Dunn, 2017).

When the CNS is unable or has difficulty in processing the sensory information of the environment, something called SI dysfunctions emerge. These dysfunctions are divided into three categories: Sensory Modulation Dysfunctions, Sensory Processing Disorder and Sensory-Based Motor Disorder (Serrano, 2016).

Sensory Modulation Dysfunction is characterized when the individual shows an excess reactivity or an insufficient response to sensory stimuli, having difficulty in responding

appropriately to the intensity, nature and degree of the stimulus. Individuals with Sensory Modulation Dysfunction can be: 1) hyper-responsive, when they exhibit exaggerated reactions to stimuli; 2) hypo-responsive, when they do not respond or have less response to stimuli; 3) Sensory search behaviors, when they need a large amount of information to activate the sensory systems (Serrano, 2016).

On the one hand, individuals who have Sensory Processing Disorder have difficulty in interpreting the information correctly, thus having a failure in the ability to give meaning to the specific qualities of the stimuli. On the other hand, individuals who present with Sensory-Based Motor Disorder can be subdivided into individuals with Motor Disorder, characterized by difficulty in stabilizing the body during movement, and individuals with Dyspraxia characterized by difficulty in planning, sequencing and executing a new action or a series of motor actions (Serrano, 2016).

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder characterized by behavioral, communication and social interaction changes. Studies show that about 45% to 96% of individuals with ASD have some type of SI Dysfunction, these individuals have difficulty adapting to the sensory stimuli that involve the environment, having such changes has a direct impact on their social participation, for example in school activities (Guidelines for Attention to Rehabilitation of People with Autism Spectrum Disorders, 2013; Howe & Stagg, 2016; Metz et al., 2019).

School is characterized as a "natural environment", which provides different stimuli, with different frequencies and degrees of complexity, which is a favorable environment for the child's development. In the school period, children and adolescents with ASD or not, find in the school an environment conducive to the input of sensory information, and it is also in this environment that difficulties in sensory processing are evidenced, which can generate barriers for participation in activities that take place in the school context (Mills & Chapparo, 2017; Piller, Fletcher, Pfeiffer, Dunlap, & Pickens, 2017). Law no. 12,764, December 27, 2012, establishes the National Policy for the Protection of the rights of the person with ASD and guarantees the individual access to the common classroom of the regular education network and the right, if necessary, to a companion. Despite the existence of the law, the specificities of students with ASD, which are often accentuated by SI dysfunction, may provide deficits in participation and performance in the school context, requiring some adaptations in the environment that meet the demands presented by the subject (Law no. 12,764, 2012; Howe & Stagg, 2016).

In the school environment, the physical space and the people involved need to be prepared to receive an inclusion student. This theme should be addressed considering not only students and teachers but also those responsible for the children, in order to make them aware of how rewarding the inclusion process is for building their children's knowledge. For students with ASD, the school environment may contain many stimuli, especially visual and auditory ones, which can be disturbing, making it necessary to take care in relation to the sensory stimuli present in the context, so that they do not impair the student's participation in activities (Brito & Sales, 2014).

The occupational therapist, with a biopsychosociocultural look at the individual, when observing his/her occupational roles, considers the context and the environment and intervenes in order to adapt the relationship between the demands of the environment and the individual's functional capacity. In the case of students with ASD, barriers that prevent their participation in the school environment are identified and the importance of the occupational therapist stands out, especially in the implementation of SI strategies that aim to adapt the environment in order to enhance the skills of these individuals through actions performed with the teacher (Mills & Chapparo, 2017).

After searching for theoretical references for this research (Ashburner, Ziviani, & Rodger, 2008; Kasari & Smith, 2013; Weeks, Boshoff, & Stewart, 2012), it is evident that the child with ASD has difficulties in sensory processing; however, there is a lack of studies regarding the knowledge about the perception of teachers in relation to the sensory profile of students, as well as about the possible difficulties that these students may present during activities carried out in the school context. Scientific evidence is centered on SI studies outside the school context, with low scientific production showing the use of interventions based on SI strategies in the school context, especially with respect to students with ASD (Ashburner, Ziviani, & Rodger, 2008; Mills, Chapparo, & Hinitt, 2016; Case-Smith, Weaver, & Fristad, 2015). The scientific scenario is no different in Brazil, as no study was found on the subject, which highlights this proposal.

Thus, the relevance of this study is justified by the need to identify the perception of teachers in relation to the skills of children, aiming subsequently to present proposals for interventions based on collaborative work between professionals, occupational therapist and teacher, regarding SI in the school context, aimed at enhancing student access to teaching and learning processes. In this perspective, the objective of this research was, therefore, to identify the teachers' perception regarding the sensory processing of students with ASD.

2 Method

This study was submitted to the Research Ethics Committee of the Faculty of Philosophy and Sciences of the São Paulo State University "Júlio de Mesquita Filho" (UNESP) - Campus Marília, São Paulo, Brazil, respecting the prerogatives of Resolution no. 510, April 7, 2016, from the National Commission for Ethics in Research (*Comissão Nacional de Ética em Pesquisa* - CONEP), which deals with ethics in research with human beings, having received a favorable opinion, under Protocol no. 2,782,707 and CAAE: 91173018.2.0000.5406. Nineteen teachers[7] of Early Childhood Education and initial grades of Elementary School from public schools in a municipality in the hinterlands of the state of São Paulo participated in this research, as well as their students, 62 in total.

The inclusion criteria used were that the participating students should be aged between 3 years and 0 months to 14 years and 11 months, diagnosed with ASD, excluding those with physical, auditory and visual impairments associated with ASD. Data collection took place between the months of September 2018 and May 2019. For the data collection,

[7] Some of the teachers interviewed worked in the morning and in the afternoon, and were therefore responsible for more than one student.

the scale assessment Sensory Profile 2 proposed by Winnie Dunn was used, which aims to compare the performance of the child and /or adolescent in relation to others of the same age and identify their sensory behavior in different contexts.

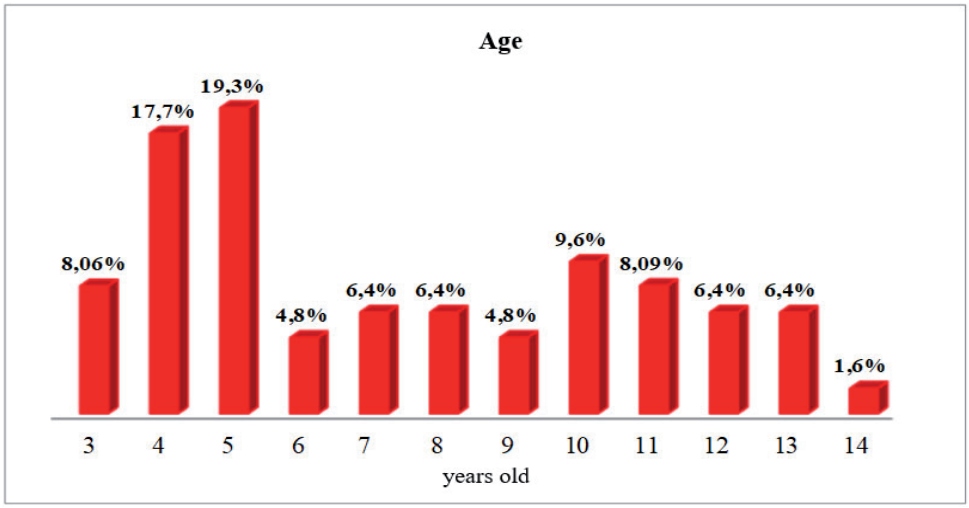
The evaluation used consists of five questionnaires (Infant Sensory Profile 2, Toddler Sensory Profile 2, Child Sensory Profile 2, Short Sensory Profile 2, School Companion Sensory Profile 2) and offered a set of standardized tools to identify the patterns of the child's sensory processing in the context of daily life. The information obtained provided a way to determine how sensory processing can interfere in relation to the child's participation in different aspects of his/her social life (Dunn, 2017).

In this study, we used the questionnaire School Companion Sensory Profile 2, which evaluates children and adolescents, from the perspective of teachers, composed of 44 items about students and their participation in the school context. The first part of each form contains items to describe the children's responses, a term used by the assessment, in relation to daily sensory experiences in the school context. The questions were filled out by the researcher, based on the teachers' perceptions that indicated the frequency of the student's responses to different sensory experiences, using a 5-point scale, varying the response pattern as follows: Almost always - 5 points; Usually - 4 points; About half the time - 3 points; Occasionally - 2 points; Almost never - 1 point; and Not applicable - 0 point.

The cutoff scores of the assessment are based on the averages and standard deviations for each summary score. These scores provide a rating system to categorize a child's tendency towards specific behavior. This classification system consists of five categories that reflect specific groups along the Bell curve: Much less than the Others; Less than the Others; Exactly like the majority of the Others; More than the Others, and Much more than the Others. In this study, data analysis occurred from the grouping of five categories into three groups: students classified as "Much less than the Others and Less than the Others"; students classified as "Exactly like the majority of the Others"; students classified as "More than the Others and Much more than the Others". For the organization of the results, the data were tabulated using Microsoft Office Excel. For the analysis of the results, descriptive statistics were used in order to characterize the sensory processing through the assessment of children with ASD.

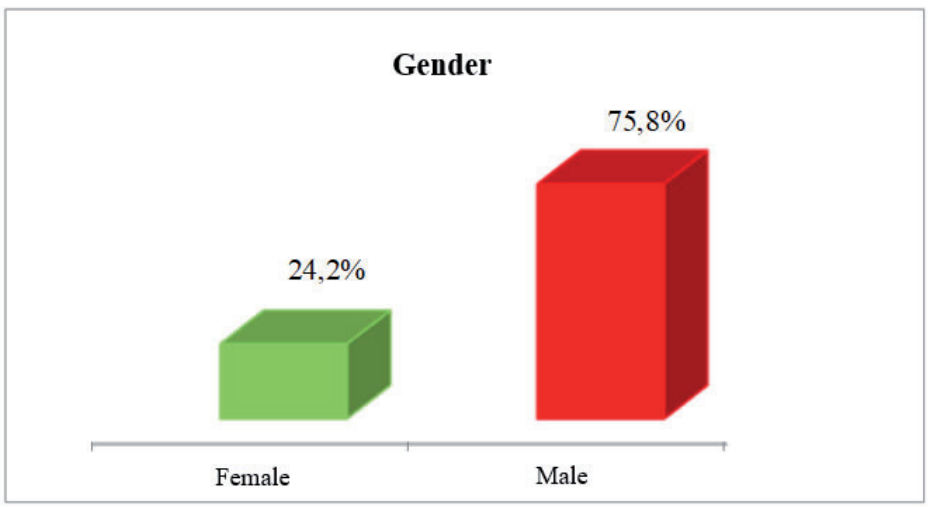
3 Results and discussion

The results presented refer to the sensory processing pattern of 62 students. Graph 1 and Graph 2 characterize the students in this study, containing the age and gender, respectively, of the participants.



Graph 1. Age of the research participants.
Source: Elaborated by the authors.

According to the Guidance Manual, developed by the Scientific Department of Pediatrics of Development and Behavior of the Brazilian Society of Pediatrics (*Sociedade Brasileira de Pediatria* [SBP], 2019), the diagnosis of ASD occurs, on average, at 4 and 5 years of age, a significant data for this study, since the majority of students are in this age group, representing together 37.09% of the participants (SBP, 2019).



Graph 2. Gender of research participants.
Source: Elaborated by the authors.

It is observed that, in this study, the majority of participants are male, a factor that converges with published research reporting the prevalence of ASD by gender, and, according

to the literature, the prevalence of male is four times higher than that of female (Christensen et al., 2016; Griesi-Oliveira & Sertié, 2017).

Regarding the patterns of sensory processing referring to the Quadrants (Low Registration, Sensory Seeking, Sensory Sensitivity, Sensory Avoiding), we can observe the results obtained in relation to the consideration of the teachers' perception in Figure 1.

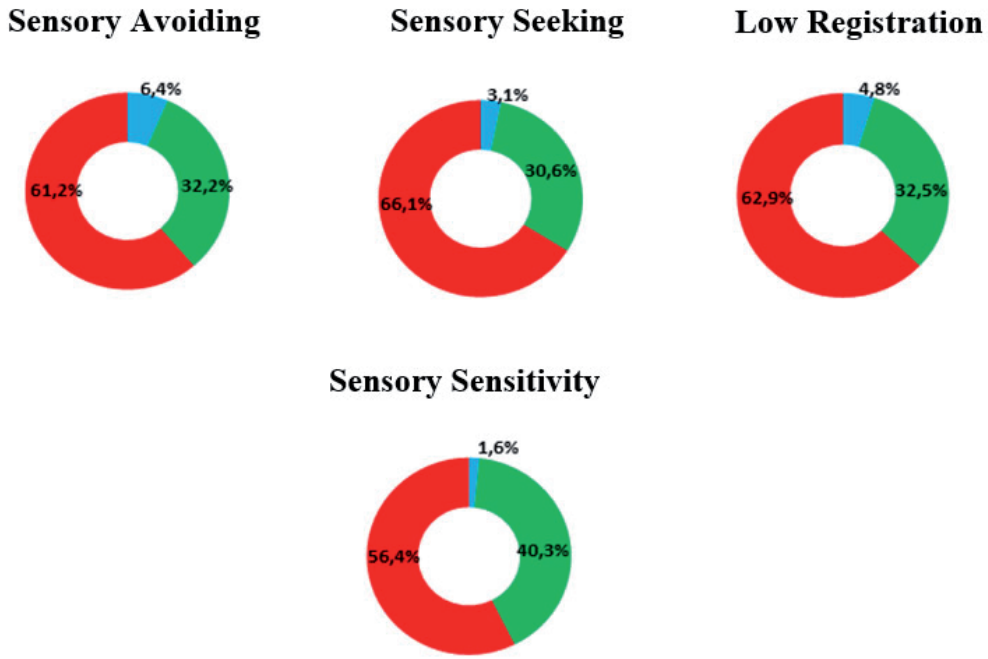


Figure 1. Quadrants: Low Registration, Sensory Seeking, Sensory Sensitivity, Sensory Avoiding. Source: Elaborated by the authors.

Legend:
- Less and Much Less than the Majority the Others
- Exactly like the Majority of the Others
- More and Much More than the Majority of the Others

We can observe that, in this research, the quadrant with the highest number of children classified in "More and Much More than the Majority of the Others" is Sensory Seeking (Figure 1), represented with 66.1% of students. Thus, students classified in such a score in the Sensory Seeking quadrant are interested in exploring the environment, looking for opportunities to increase the input of sensory stimuli in all activities. It is essential to consider that the constant search for stimuli can put the child at risk, since, during games in the school playground, for example, they cannot search strongly for certain stimuli without worrying about their safety (Dunn, 2017).

The study conducted by Mills and Chapparo (2017) aimed to capture teachers' perceptions regarding the use of a schedule of activities in the classroom. The researchers interviewed 19 teachers of students with ASD and report that the seeking behavior of students with ASD is aggravated by visual and auditory inputs, a fact that justifies the average of 67.1%

of the students in this study to be classified in "More and Much More than the Majority of the Others" in both the Sensory Seeking quadrant (Figure 1) and in the Auditory and Visual sensory sections (see Figure 3 further below).

In the Sensory Avoiding and Low Registration quadrants, the results for students who are classified in "Exactly as the Majority of the Others" are equal, representing 32.25%. Sensory Avoiding behavior is related to student participation in activities. The study performed by Piller and Pfeiffer (2016) aimed to explore the relationship between the sensory characteristics of the preschool environment from the perspective of 13 professionals among teachers and occupational therapists who worked with children with ASD, through the "Participation and Sensory Environment Questionnaire-Teacher Version" (PSEQ-TV). The results of Piller and Pfeiffer's (2016) study identified that children with behavior "more or much more than the majority" avoided activities that required greater sensory stimulation, such as activities that involved tactile input, with the participation of children in these tasks affected by sensory input. This data corroborates this study, in view of the sensory changes both in the avoidance behavior (Figure 1) and in tactile (see Figure 2 below).

Another study that identified the difficulties of children with ASD who exhibit avoidance behavior more evident than their peers was carried out by Ashburner, Ziviani and Rodger (2008), aiming to explore the associations between sensory, emotional, behavioral processing and the educational results of children with ASD. In that study, 28 children with ASD were compared to 51 children with the development of sensory processing without changes. The results related to the school context indicated that children with avoidance behaviors prefer sensory environments with few stimuli, and may have difficulties paying attention to verbal instructions when other auditory stimuli are present, which interferes with the student's academic performance, making it insufficient (Ashburner, Ziviani, & Rodger, 2008; Dunn, 2017).

The results of the study conducted by Ashburner, Ziviani and Rodger (2008) corroborate the results identified in this research, since, in the study of the authors, it was identified that 72% of children with ASD have the sensory pattern of Low Registration and, in this study, the percentage was 62.9%. Such a pattern can presuppose a worse academic performance, considering that observant students may take a long time to detect a stimulus, performing a constant search to increase their limits of sensory input. In this case, Ashburner, Ziviani and Rodger (2008) and Dunn (2017) indicate the use of clues as a strategy in order to keep the student involved in the activity proposed by the teacher.

In the Sensory Sensitivity quadrant, the percentage of students who had dysfunction in sensory processing, classified as "More and Much More than the Majority of the Others" represents 56.4%, data that corroborates the research carried out by Simpson, Adams, Alston-Knox, Heussler and Keen (2019), which identified sensory subtypes in children with ASD using the Sensory Profile 2, which was answered by the children's caregivers. The aforementioned study (Simpson et al., 2019) obtained a result similar to that of this study, considering that, from the parents' perspective, children with ASD presented a "More and Much More than the Majority of the Others" behavior in 65.7% of the cases, corroborating the perception of teachers analyzed in this research.

The results obtained in this research have implications for the school environment, which must be organized to favor the child's performance, since environmental stimuli can cause self-regulation in students with ASD, compromising teaching and learning (Dunn, 2017).

Figure 2 presents the results regarding the Sensory and Behavioral Sections (Auditory, Visual, Tactile, Vestibular and Behavioral) of the teachers' perception in relation to their students.

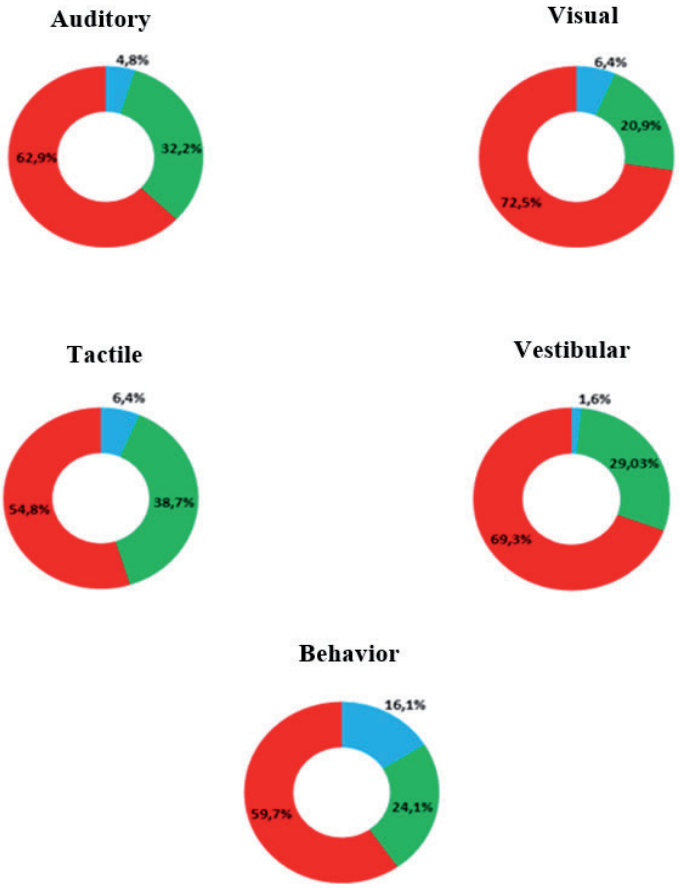


Figure 2. Sensory and behavioral sections: auditory, visual, tactile, vestibular and behavioral.
Source: Elaborated by the authors.
Legend: Less and Much Less than the Majority of the Others
Exactly like the Majority of the Others
More and Much More than the Majority of the Others

In relation to the Auditory sensory section (Figure 2), students who fall into the categories "More and Much More than the Others" may be disturbed by auditory stimuli commonly present in the school environment, resulting in the action of avoiding tasks required. In this study, 62.9% of the students were in this category.

Students classified as "More and Much More than the Majority of the Others", in the Auditory sensory section (Figure 2) and in the quadrants shown in Figure 2 of Behavior (59.67%) and Vestibular (69.35%) get close, a factor that corroborates the study conducted by Piller and Pfeiffer (2016), in which teachers reported that students with auditory sensitivity showed such an aversion to the echo in the classroom that the behavior in the environment changed, with the consequence a differentiated movement, being able, in some cases, to be in a fetal position on the floor whenever the teacher started to speak (Piller & Pfeiffer, 2016).

Howe and Stagg (2016) investigated the experiences of adolescents with ASD while in a classroom, using a qualitative technique to access participants' subjective experiences in sensory issues within that environment. For data collection, the authors used a structured questionnaire that required written answers. The results of the aforementioned study demonstrated that all participants had high thresholds in relation to the auditory pattern, which affects the student's learning with ASD in the school context, this being the only aspect considered by all students as bad in their school involvement (Howe & Stagg, 2016).

The study performed by Giacardy et al. (2018) examined the relationship between sensory modulation symptoms and maladaptive behaviors in a group of children with ASD. For data collection, the authors used cross-sectional observation as a methodological proposal, in which the sensory modulation characteristics were assessed using Dunn's Short Sensory Profile (2017), and the adaptive behaviors and the social quotient were assessed using the Adaptive Behavior Scale proposed by Vineland. It was identified that children who presented sensory dysfunctions interfered in their adaptive behaviors in activities of daily living, such as, for example, difficulties in dressing and going to the bathroom, tasks that are performed by the student in the school context and that probably needed prior planning and greater external support to be carried out (Giacardy et al., 2018).

In this study, it was identified that, in the Visual sensory section, there was a higher prevalence of students classified as "More and Much More than the Majority of the Others", with 72.5%, as can be seen in Figure 3. Both in the study conducted by Piller and Pfeiffer (2016) and in Ashburner, Ziviani and Rodger (2008), it was observed that 43% of the children had dysfunctions in visual processing. The teachers interviewed in the two studies identified some strategies to increase their students' classroom participation, one of the strategies described by these teachers is to change the lighting in the room, dimming or turning off the lights.

We can observe that the results obtained by the students in the Low Registration quadrant (Figure 1) and in the Auditory sensory section (Figure 2) are equal with respect to those classified in "More and Much More than the Majority of the Others", representing 62.9% of the participants. This data corroborates the study carried out by Ashburner et al. (2008) in which teachers identified that students with sensory observation patterns have a worse academic performance, in view of the possible difficulty of processing information that arrives through auditory stimuli. These students can present as a behavior the accentuated search for auditory stimuli that present predictable repetitions so that, in this way, they can interpret them (Ashburner, Ziviani, & Rodger, 2008).

The study conducted by Mills and Chapparo (2017) recognized that the use of the intervention through SI, implemented by occupational therapists, was efficient in reducing

the challenging behaviors presented by students with ASD during activities carried out in the school context (Mills & Chapparo, 2017).

School Factors allow the crossing of information from the student's sensory processing patterns with the efficient learning characteristics to be used in the school context, which are answered according to the teacher's perspective (Dunn, 2017). Figure 3 represents the answers related to School Factors (School Factor 1, School Factor 2, School Factor 3 and School Factor 4). Each result obtained takes into account the teachers' perception of their students, regardless of the child's gender.

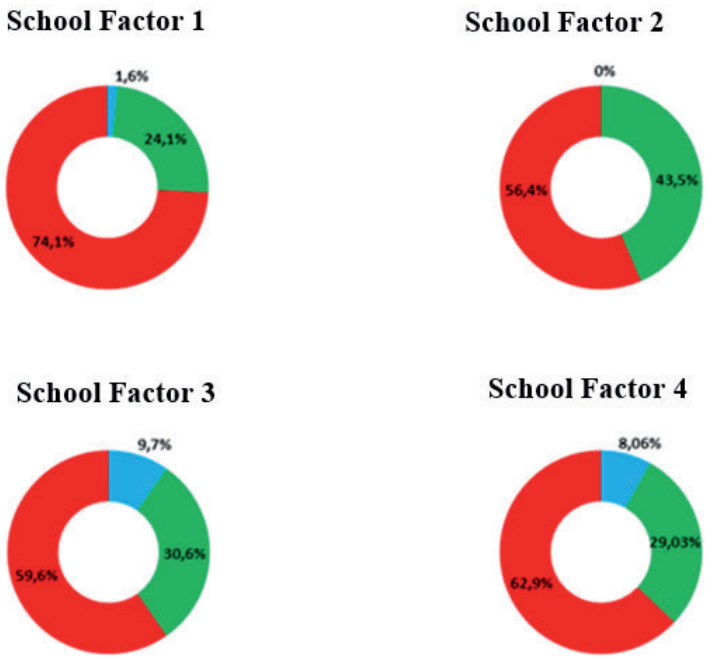


Figure 3. School Factors (School Factor 1, School Factor 2, School Factor 3 and School Factor 4)
Source: Elaborated by the authors.
Legend: Less and Much Less than the Majority of the Others
Exactly like the Majority of the Others
More and Much More than the Majority of the Others

In the category School Factor 1, which represents the need for the student to receive support from the teacher and/or school mediator to participate in classroom activities, the classification "More and Much More than the Majority of the Others" prevails with 79.1% of the participants. Students in this score need planning and adaptation of sensory stimuli to favor learning. According to Dunn (2017), teachers characterize children with these attitudes as those who need more attention to effectively perform the tasks proposed in the classroom, sometimes needing redirection, sometimes guidance for carrying out the proposed activities.

Mills and Chapparo (2017) describe that, although teachers identify the difficulties related to the sensory processing of students with ASD, teachers reported that they do not have the necessary knowledge to select resources that effectively promote student participation. The same authors highlighted the importance of establishing partnerships between occupational therapists and teachers for the evaluation and intervention of students with sensory processing dysfunction since this condition has an impact on specific learning activities in the school context (Mills & Chapparo, 2017).

School Factor 2 reflects the student's awareness and attention within the classroom. In this factor, no student was classified in the category "Less and Much Less than the Majority of the Others". Still in relation to School Factor 2, the classification "More and Much More than the Majority of the Others" represents 56.4% of students. From the teachers' point of view, such students are very attentive within the classroom, although sometimes their levels of attention interfere with their ability to adhere to the proposed learning activities (Dunn, 2017).

According to Grandin (2014), children with ASD have difficulties with the neurological mechanisms that control the ability to divide attention between different stimuli. Uncomfortable sensory stimuli can direct concentration away from the main elements of the environment, such as distracting attention during the presentation of the class. The teachers who participated in Mills and Chapparo's (2017) research reported believing that the use of SI interventions had a positive impact on the student's attention and concentration capacity during activities in the school context. In the aforementioned study, the activities performed with SI by the teachers occurred in the school environment and were adequate to the teacher's schedule of activities (Grandin, 2014; Howe & Stagg, 2016; Mills & Chapparo, 2017).

School Factor 3 concerns the student's tolerance within the learning environment. Of the students who participated in the survey, 59.67% of them were classified as "More and Much More than the Majority of the Others". Because it is a factor where low thresholds are expected, students with this score can quickly become overwhelmed in learning environments, displaying behavior that interferes with their ability to understand instructions, perform assignments independently or cooperate with other students in the class (Dunn, 2017).

Mills and Chapparo (2017) report that changes in the context and environment of the student with ASD interfere with the performance of the activities proposed in the classroom. The teachers in that study noted that there is a challenge to using strategies that facilitate students' skills, in order to complete the activities correctly and consistently. Piller and Pfeiffer (2016) corroborate Mills and Chapparo's (2017) findings as the participants in their study described that changes in the classroom routine often make the student look for more sensory stimuli, which happens with children classified as "More and Much More than the Majority of the Others", characterizing the higher prevalence of classification of students with ASD in this study.

Students with changes in School Factor 3 require a controlled learning environment, due to their reactivity and extreme demands. The participating teachers in the study conducted by Piller and Pfeiffer (2016) reported that adherence to structured routines are essential components to support children's participation, indicating different strategies, such as visual and verbal reminders of the change in routine. A classroom structured around students' sensory

needs is an important element for the successful participation of students with ASD in the learning environment (Dunn, 2017; Piller & Pfeiffer, 2016).

School Factor 4 represents the student's availability for learning, and, in this factor, students who fall into "Exactly like the Majority of the Others" represent 29.03% of the participants, and students classified in "More and Much More than the Majority of the Others" are 62.9% of the participants in this classification. Students with unexpected patterns in this factor lose opportunities to participate and appear disinterested during the learning tasks, needing to resume the instructions and the content of the proposed activity. It is essential that professionals working with this student identify the ideal amount of sensory stimulation to allow effective student participation in the school context (Dunn, 2017).

In this study, it is observed that, in all categories of the instrument - Quadrants (Figure 1), Sensory and Behavioral Sections (Figure 2) and School Factors (Figure 3) -, the classification of "More and Much More than the Majority of the Others" expresses the highest prevalence of classification, totaling, in all aspects evaluated by the instrument, 62.9%. This result corroborates the study carried out by Simpson et al. (2019), in which it was identified that the participants had a rating of "More and Much More than the Majority of the Others" in all categories of the instrument, with the highest score being obtained in both studies.

The results of this study demonstrate evidence regarding the likelihood that most students with ASD have dysfunctions of SI and, consequently, the need to refer these students for evaluation and possible intervention based on the SI theory proposed by Ayres (1972). Currently, in Brazil, the training of professionals for interventions that use the SI theory proposed by Ayres is offered to professionals in the area of occupational therapy, as proposed by the Brazilian Association for Sensory Integration (*Associação Brasileira de Integração Sensorial* [ABIS], 2013).

There is, however, a need for work aimed at using interventions based on SI strategies in the school context, in order to help students with ASD to have access to the teaching and learning processes, considering that environmental conditions directly affect the occupational performance of that student. Resolution no. 500, December 26, 2018, of the Federal Council of Physiotherapy and Occupational Therapy (*Conselho Federal de Fisioterapia e Terapia Ocupacional* - COFFITO), recognizes the specialty of Occupational Therapy in the School Context, and the collaborative work between occupational therapists and teachers is significant, since, through it, a beneficial relationship in order to seek strategies to reduce undesirable behaviors is established.

The results of this study as well as the other evidence in the literature (Ashburner, Ziviani, & Rodger, 2008; Dunn, 2017; Mills & Chapparo, 2017; Piller & Pfeiffer, 2016) allow the identification of three domains that justify and direct the proposal for collaborative work among therapists occupational and educational professionals involving SI interventions in the school context:

1. Understanding, analysis and intervention in the physical environment: it is essential to identify the sensory information that involves the school environment and propose environmental modifications appropriate to the student's skills with ASD. As an example,

it is possible to mention the care in relation to the level of noise, the lighting of the environment, the textures that involve the activity, the smell of the environment, the excess of visual stimuli, among other sensory characteristics that may be present.

2. Understanding, analyzing and intervening in the social environment: it involves paying attention to the relationships and expectations of the student with ASD in relation to the different people present in the school context. For this, there is a need to: a) identify the people who are references for the student; b) to train professionals to recognize the skills of students with ASD in different activities and the relationship of these skills with the SI (activities in the classroom, in the park, on the court, in the playground and in other school environments; c) to work on interactions between the student and his/her peers, considering the expectations for the age group, roles and routine and also taking into account the possible interferences in the student's performance with ASD related to the child's sensory processing.

3. The implementation of resources and strategies: it is up to the occupational therapist to carry out the analysis of the activities present in the school context and, later, together with the teacher to plan and implement resources and strategies based on the SI theory that can increase the student's performance. An example of this domain would be the use of headphones to reduce noise that involves the surrounding environment, the implementation of specific activities aimed at increasing or decreasing the student's level of alertness, the use of specific visual resources during activities, the need and use of Supplementary and Alternative Communication, among other proposals that meet the individual demands of each student.

4 Conclusion

This study aimed to identify the teachers' perception regarding the sensory processing of students with ASD. For this, the Sensory Profile 2 of School Monitoring was used as a research instrument, which assesses children and adolescents from the perspective of teachers. The results of this study demonstrated that, in the classification of students with ASD and the characteristic profile for SI dysfunctions, the indication of hyper-responsive prevailed. This result signals the importance of care regarding the adequacy of the environment for carrying out activities, through the implementation of interventions based on SI strategies for students, in order to improve the participation and performance of these students in school activities.

Therefore, we suggest that there is a collaborative work between the occupational therapist and education professionals to carry out the environmental and routine changes related to sensory processing, seeking to support self-regulation and the creation of opportunities to facilitate student participation with ASD in the school context. In addition, there is a need for public policies that guarantee the performance of the occupational therapist in the school context, thus ensuring not only interventions with a clinical focus, which already occur in the external environment, but also the collaborative work between the occupational therapist and the education professionals. In future studies, we suggest the implementation and analysis of interventions through collaborative work in the school context, based on SI strategies that consider the domains identified in this study.

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