

Behaviour and Social Skills in Children Aged 3-5: Relationship with Sensory Processing

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Abstract: Children with difficulties in sensory regulation show challenges in many areas, including externalized and internalized behaviour problems.

Methods: This study intended to determine the implications of sensory processing in the behaviour and in the social skills of 100 children, aged from 3-5, with typical development, through *Sensory Processing Measure* and *Preschool and Kindergarten Behaviour Scales*.

Results: Significant associations were found between sensory processing difficulties and behaviour problems, between the total of the spm-p scale and internalized behaviour problems ($p = .000$); and the total of the spm-p scale and externalized behaviour problems ($p = .000$). The study showed a high prevalence of difficulties in sensory processing, not only in the home context but also in kindergarten, in undiagnosed children, with impact on multiple sensory systems. In children with dysfunction in sensory processing, it was possible to detect that hyporesponsive children have greater problems in terms of autonomy and the hyper-responsive ones have more difficulties in behaviour regulation.

Conclusion: It can be concluded that the higher difficulties in sensory processing the higher problems in the behavior are manifested in preschool children.

Keywords: Behaviour, Social skills, Preschool, Sensory processing.

INTRODUCTION

It is in the relation with the social environment that the child starts to find and experience new sensations; senses are the main tool to build sensorimotor development and perceptions, besides providing a solid base for the acquisition of intellectual knowledge, improving sensitivity and harmony with the first contacts with the outside world, that is, the environment in which the child is inserted. The practice of activities related to the sense organs, in addition to developing stimulation on the intellectual, psychological, cognitive and motor fields, addresses the children's emotional and social aspect, where they will learn how to socialize with the environment where they are inserted. [1].

Children who attend preschool should be able to coordinate the seven senses in order to learn about their world and act adequately. If the child does not correctly process the vestibular and proprioceptive information, they will have postural difficulties and fear when interacting with the challenges of the environment [2]. Therefore, school should offer a large

and wide range of stimulations, because the environment contributes to the development of the child. Furthermore, the child's living conditions outside school should also be considered, for contributing to changes in the development [2, 3].

All individuals need a good ability to process sensory information for a good performance in the environment and an effective participation in daily activities. However, behavioural functions can be affected by problems with sensory processing [4-6]. Children who have difficulties in sensory regulation show difficulties in many areas, including problems with externalized behaviour, internalizing behaviour problems, difficulties in emotional and attention regulation, as well as difficulties in many daily life activities and poorly developed adaptive social behaviours. The quality of interpersonal relationships may influence the social development of children of younger ages. Children who are not accepted by their peers are more lonely and more vulnerable to mental health problems in the future [4-10].

Gourley and his collaborators (2012) suggest that the functioning of sensory processing worsens the gravity of behaviour problems [4]. It should be highlighted that, even though there is comorbidity, sensory dysfunction exists regardless of the presence

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of internalizing and externalizing psychiatric disorders [4, 10].

The nosology proposed to characterize the Sensory Processing Dysfunction includes three categories. The first category is the dysfunction of sensory modulation, where hyperresponsiveness, hyporesponsiveness and sensory seeking are inserted. In the second category are included the dysfunctions of sensory discrimination, which may include deficiency in the ability to discriminate sensations in any sensory system, or across sensory systems, in a way that impairs occupational performance. In the third category, it is included the sensory-based motor dysfunction, where dyspraxia and postural dysfunctions are described [11].

The sensory processing dysfunction is also related to emotional development and social problems, such as: fear, low self-esteem, isolation, among other factors. These conditions imply the loss of social and cognitive interaction necessary for healthy development. These difficulties in sensory processing cause impairments both in the motor and behavioural development, as well as in learning [12, 13].

The child's integration in to kindergarten has a significant impact on socio-emotional behaviour. Children may feel discomfort with new experiences, changing from the family context to the educational context, and behavioural changes, such as tantrums, refusal, isolation or avoidance of new situations may occur [14]. Preschool environments are richer in physical and social stimuli which frequently cause significant stress to the child [15].

Parents tend to identify more behaviour problems and higher results for social skills in children in comparison with the results obtained by kindergarten teachers [12-14]. However, although parents may identify and face problems at home long before children enter kindergarten, sensory issues can become much more evident when the child enters the preschool environment [15].

The main problems currently mentioned in clinical practice with children reflect concerns about adapting to different contexts, the refusal to take part in certain activities and situations, difficulties in interactions, social isolation, among others. These factors often trigger referencing for evaluation in the context of occupational therapy, at younger ages.

It should be mentioned that many studies show that difficulties in sensory processing are associated with behaviour problems in children with autism spectrum

disorders, attention deficit and hyperactivity [6, 16]; but literature is scarce regarding the association of sensory processing with behaviour problems in the absence of developmental disorders. Considering the limitations of the subject in Portugal, the intention is to contribute to a better understanding of these difficulties in children without any diagnosis.

Given the above, the general goal of this study is to verify the relation between sensory processing and behaviour problems and social skills in children of preschool age in the absence of developmental disorders. It is also intended to identify the measure of sensory processing in children of preschool age, comparing the results obtained in the home context (by parents) with the kindergarten context (by teachers); to identify behaviour problems and social skills in children of preschool age; and to verify the relation between the sensory processing measure, behaviour problems and social skills in children of preschool age.

METHODS

Sample

The sample was made of children of preschool age, from 3 to 5 years old, who attended three kindergartens in the north of Portugal (one was private and two were Public Institutions of Social Solidarity-PISS), without previous diagnosis of any disorder that affects development. This is characterized as a non-probabilistic, of convenience in relation to the choice of institutions, due to the contact and professional articulation previously established, which facilitated access to children. The 100 caregivers of the children that made up the sample and their respective kindergarten teachers (19 teachers: 11 from PISS, 8 from a private institution) also participated.

The sample consisted of 100 children from 37 to 71 months of age (average = 50.96, SD = 9.418), attending kindergarten for a period between three to 61 months (average = 26.75, SD = 14.80). Most of these attended a PISS (61%), were of Caucasian ethnicity (93.8%) and males (53%). As for the kindergarten teachers, they were mostly females (88%) and aged from 34 to 47 years old (average = 40.35, SD = 2.865).

Data Collection Tools

The data collection was made with two assessment tools, namely the Preschool and Kindergarten Behaviour Scale – 2nd edition (PKBS-2), which is divided into two subscales (Social Skills and Behaviour Problems), validated for the Portuguese population;

and *Sensory Processing Measure – Preschool* (SPM-P), home form and school form, whose semantic, conceptual, experimental and idiomatic equivalence has already been made [17].

The **PKBS-2** was validated by kindergarten teachers and it is considered a clinically relevant tool for screening and assessing social skills and behaviour problems in children of preschool age, from 3 to 6 years old [9, 18, 19]. This scale was validated by kindergarten teachers who carry out teaching activity in kindergartens, consisting of 67 items, evaluated by a *likert* scale, with four levels of response, ranging from 0 (never), 1 (rarely), 2 (sometimes) and 3 (often). 0 means low social skills and low behaviour problems and 3 high social skills and high behaviour problems. The values are summed for each subscale, thus obtaining values that range from 13 to 87 points on social skills and values that range from 0 to 74 points, on behaviour problems. It consists of two subscales: the Scale of Social Skills (SSS), with 29 items, wherein the higher the values, the better social skills; and the Scale of Behaviour Problems (SBP), with 38 items, wherein the higher the values, the greater behaviour problems. The SSS consists of the dimensions: Social Cooperation, Social Interaction and Social Autonomy; the SBP is subdivided into the Externalized Behaviour Problems subscale (EBPS), (which includes the Self-centered/Explosive, Excessive Attention/Activity Problems and Antisocial/Aggressive dimensions); and also the subscale of Internalized Behaviour Problems (SIBP) (consisting of the Social Avoidance and Anxiety/Somatic Problems dimensions). As for reliability, all scales of this tool showed robust values for internal consistency – *Cronbach's alpha* between 0,76 and 0,93 [9].

The **SPM-P** is meant for children aged from 2 to 5 and it is distributed in 75 items for each version (home form, which should be filled-in by parents/caretakers, and the school form, to be filled-in by kindergarten teachers), with four levels of response that vary according to the level of frequency with which the behaviours occur (between 1 meaning “Never”, 2 meaning “Occasionally”, 3 meaning “Often” and 4 meaning “Always”), and for some demographic issues [9, 20, 21]. Higher scores indicate greater difficulties at the sensory processing. This aims to determine whether the child's difficulties, together with sensory processing, harm the educational performance, also providing information related to praxis [22]. Both versions (home and school) are multidimensional and are composed of seven dimensions each: Vision,

Hearing, Touch, Body Awareness, Balance and Motion, Planning and Ideas, and Social Participation, with a total of 75 items evaluated on each version. The scale's items are also sensitive to significant vulnerabilities in sensory integration, namely hyper-responsiveness, hyporesponsiveness, perception, sensory seeking, postural control, motor planning and ideation. Hyperreactivity usually manifests itself through fear, or aggressive behaviour or avoidance of certain sensory experiences; whereas hyporeactivity is the absence of expectable answers, apathy or indifference to sensory experience. “Sensory Seeking” is considered a hyporesponsiveness. According to Jean Ayres's theory, the child may seek stronger levels of sensory input in order to obtain a higher consciousness of the environment or this “Seeking” may also be the outcome of sensory deprivation. “Perception” is the ability to interpret the meaning of the sensory input and it is necessary to an effective and refined use of the feedback from the environment or from the internal sensory information. Praxis is the ability to idealize, plan and organise movements in order to do unknown motor tasks, and is divided into ideation (the ability to create a mental or conceptual image of a new task) and motor planning (the capacity to organise and plan new actions) [21]. The psychometric proprieties of the SPM-P indicate that the tool is able to distinguish children with typical development and children with sensory processing dysfunction [22].

Procedures

An authorization request was submitted to the previously selected kindergarten institutions, explaining the intended study, and it was requested permission from the authors for using the behaviour scales for preschool-aged children. Both requests were granted by the responsables. Simultaneously, authorization was requested from the *Western Psychological Services* (WPS) for a possible use of the Portuguese version of the SPM-P. The authorization was approved with the right to use 100 copies through a contract signed between the investigator and WPS. Afterwards, a chart for demographic data collection was sent to kindergarten teachers; the informed consent, the SPM-P questionnaires – school form and behaviour scales. The documents sent to parents (informed consent and SPM-P home form) were made by the kindergarten teachers who, after meeting with parents, placed all the documentation inside the respective children's schoolbags.

The questionnaires were randomly distributed to all children aged from 3 to 5 from the referred kindergartens, without any sort of diagnosis, and the sample was collected in order of participation, consent and completion by parents.

RESULTS

Table 1 demonstrates the comparison of the results obtained by the SPM-P home form (by parents) and the SPM-P school form (by kindergarten teachers).

The descriptive analysis of the sample's SPM-P in both contexts indicated that the problems of sensory processing are more common in the kindergarten context; and considering the total of the scale, 22% of the sample shows some *problems/definite dysfunction* in the home context, and 32% in the kindergarten context. It was observed that the problems on the *Touch* and *Balance* level were more frequent at home; whereas in kindergarten, the most frequent problems were on the *Social participation* and *Vision* levels. The Wilcoxon test found statistically significant differences in both contexts in these dimensions: *Social*

Table 1: Wilcoxon Difference Test between Home Form and School Form results, and the Respective Percentages of Children with Typical Development, Some Problems and Definite Dysfunction

	HOME				School				wilcoxon
	Typical Development	Some Problems	Definite Dysfunction	Miss	Typical Development	Probable dysfunction	Definite Dysfunction	Miss.	
Social Participation	75% (75)	16% (16)	4% (4)	5% (5)	48% (48)	37% (37)	14% (14)	1% (1)	School < home- n = 12 School > home n=40 School = home n= 42 Z = -4,170, p = 0,000
Vision	67% (67)	20% (20)	4% (4)	9% (9)	48% (48)	33% (33)	16% (16)	3% (3)	School < home- n = 11 School > home n=32 School = home n= 46 Z = -3,234, p = 0,001
Hearing	66% (66)	21% (21)	2% (2)	11% (2)	56% (56)	34% (34)	5% (5)	5% (5)	School < home- n = 16 School > home n=24 School = home n= 45 Z = -1,479, p = 0,139
Touch	61% (61)	27% (27)	2% (2)	5% (5)	59% (59)	28% (28)	8% (8)	5% (5)	School < home- n = 12 School > home n=16 School = home n= 58 Z = -1,100, p = 0,271
Body Awareness	69% (69)	24% (24)	2% (2)	5% (5)	63% (63)	26% (26)	9% (9)	2% (2)	School < home- n = 12 School > home n=23 School = home n= 58 Z = -2,468, p = 0,014*
Balance	53% (53)	19% (19)	18% (18)	10% (10)	62% (62)	21% (21)	15% (15)	2% (2)	School < home- n = 24 School > home n=22 School = home n= 43 Z = -0,685, p = 0,493
Planning and Ideas	81% (81)	10% (10)	4% (4)	5% (5)	58% (58)	27% (27)	12% (12)	3% (3)	School < home- n = 6 School > home n=30 School = home n= 56 Z = -3,508, p = 0,000
Total	56% (56)	19% (19)	3% (3)	22% (22)	55% (55)	27% (27)	5% (5)	13% (13)	School < home- n = 11 School > home n=14 School = home n= 43 Z = -0,536, p = 0,592

School < Home – Number of subjects who have a higher rating in kindergarten than at home / **School > Home** – Number of subjects with a lower rating in kindergarten than at home / **School = Home** – Number of subjects with equal rating both at home and in kindergarten.

participation ($Z = -4.170$, $p = .000$), Vision ($Z = -3.234$, $p = .001$), Body Awareness ($Z = -2.468$, $p = .014$) and Planning and Ideas ($Z = -3.508$, $p = .000$), and it became perceptible that the worst results, in these dimensions, occur more in the kindergarten context than in the home context (see Table 1).

After selecting, in the sample, only children who showed some problems of definite dysfunction (according to the total of the home form and school form of SPM-P), it was possible to verify that, both at home and in school, the sample shows greater *Hyperresponsiveness* (school: 75%; home: 81,8%) than *Hyporesponsiveness* (school: 34,4%; home: 31,8%), and that the problems of *Perception* (school: 62,5%; home: 63,6%) and *Ideation* (school: 71,9%; home: 68,2%) and rather frequent. It should be noted that problems of *Motor Planning* are very prevalent in school (78,1%); and that children with "Sensory

Seeking" at home (77,3%) show high thresholds (Table 2).

Table 3 shows the results of the descriptive analysis of preschool-aged children's behaviour problems.

With regard to social skills, it was noted that most of the sample shows good social skills, with inferior percentages in the *Low* category (Table 3) being found in the *Social Interaction* (12%) and *Social Cooperation* (14%) dimensions.

As far as behaviour problems, considering the percentage of cases in the *Low* category, it was observed that, with the exception of the *SBP Excessive Attention / Activity Problems* (5%), more than 50% of the sample shows *moderate* or *high* behaviour problems, in all the dimensions analysed by the scale. Nonetheless, it is in the *SBP Anxiety Somatic Problems* dimension (69%) where the greater number of

Table 2: Descriptive Analysis of the Number of Children with Some Problems or Definite Dysfunction Distributed by each System

Sensory integration vulnerability	School		Home	
	Above average N (%)	Below average N (%)	Above average N (%)	Below average N (%)
Hyperresponsive	24 (75%)	8 (25%)	18 (81.8%)	4 (18.2%)
Hyporesponsive	11 (34.4%)	21 (65.5%)	7 (31.8%)	15 (68.2%)
Perception	20 (62.5%)	12 (37.5%)	14 (63.6%)	8 (36.4%)
Seeking	9 (28.1%)	23 (71.9%)	17 (77.3%)	5 (22.7%)
Postural Control	14 (43.8%)	18 (56.3%)	7 (31.8%)	15 (68.2%)
Motor Planning	25 (78.1%)	7 (21.9%)	9 (40.9%)	13 (59.1%)
Ideation	23 (71.9%)	9 (28.1%)	15 (68.2%)	(27.3%)

Table 3: Results of the Descriptive Analysis for Behaviour Problems of Preschool-Aged Children

	Low	Moderate	High	Missing
SSS Social Cooperation	14% (14)	44% (44)	40% (40)	2% (2)
SSS Social Autonomy	20% (20)	35% (42)	44% (44)	1% (1)
SSS Social Interaction	12% (12)	42% (42)	44% (44)	2% (2)
SBP Explosive Self-centred	36% (36)	38% (38)	25% (25)	1% (1)
SBP Excessive Attention / Activity problems	95% (95)	0% (0)	5% (5)	0% (0)
SBP Antisocial Aggressive	45% (45)	36% (36)	17% (17)	2% (2)
SBP Social Avoidance	38% (38)	30% (30)	29% (29)	3% (3)
SBP Anxiety Somatic Problems	27% (27)	41% (41)	28% (28)	4% (4)
SBP Interiorizing	33% (33)	39% (39)	23% (23)	5% (5)
SBP Externalizing	39% (39)	41% (41)	18% (18)	2% (2)

moderate or high problems can be found; the internalizing behaviour problems (*SBP Internalized*) are more evident (62%) than the externalizing (59%) (Table 3).

In order to verify the relation between the measure of preschool sensory processing, behaviour problems and social skills, a Pearson correlation of the Score-T was made, targeting the dimensions of the measure of preschool sensory processing (in school context), with the results of the scale of behaviour problems and social skills being completed by kindergarten teachers (Table 4).

Statistically significant positive correlations were found between all the SPM-P dimensions (*Social Participation, Vision, Hearing, Touch, Body Awareness, Balance, Planning and Ideas and Total*) and all dimensions related to behaviour problems; revealing that the greater the sensory difficulties, the greater the behaviour problems (*Self-centred/Explosive, Excessive Attention/Activity Problems; Antisocial/Aggressive; Social Avoidance; Anxiety / Somatic Problems; Internalized Problems; and Externalized Problems*).

Regarding the association between the measure of preschool sensory processing and social skills in preschool context, statistically significant negative correlations were found between all dimensions of the measure of preschool sensory processing and all social skills under analysis (*Social cooperation, Autonomy and Social interaction*); that is, the greater the sensory problems, the lower the social skills. The strongest correlations ($r \geq 60$) were found between *Social Participation* and *Social Cooperation* ($r = -.805, p =$

.000), *Autonomy* ($r = -.602, p = .000$) and *Social Interaction* ($r = -.679, p = .000$).

When analysing the correlations between the vulnerability systems in sensory integration in kindergarten (*Hyperresponsive, Hyporesponsive, Perception, Seeking, Postural control, Motor planning and Ideation*) and Skills and Behaviour Problems of the sample, with *some problems or definite dysfunction*, it was found that the more *Hyperresponsive* ones show less *Autonomy* ($r = -.418, p = .019$), are more *Antisocial/Aggressive* ($r = .459, p = .009$), show more *Social Avoidance* ($r = .505, p = .004$), more *Anxiety/Somatic Problems* ($r = .427, p = .019$) and more *Internalization* ($r = .571, p = .001$) and *Externalization problems* ($r = .364, p = .044$). The *Hyporesponsive* ones show less *Social cooperation* ($r = -.630, p = .000$), less *Social Autonomy* ($r = -.547, p = .000$), less *Social interaction* ($r = -.416, p = .022$) and more *Social Avoidance* ($r = .448, p = .013$).

The *Perception* problems are more frequent in the *Antisocial/Aggressive* ones ($r = .527, p = .002$) and in those who show *Social Avoidance* ($r = .401, p = .028$) and *Exteriorized Problems* ($r = .389, p = .031$). Problems on the *Seeking* level are more prevalent in the *Self-centred/Explosive* ones ($r = .498, p = .004$), in the *Antisocial/Aggressive* ones ($r = .546, p = .002$) and in those who have *Excessive Attention/Activity Problems* ($r = .567, p = .001$) and *Exteriorized Problems* ($r = .580, p = .001$).

In the sample under study, it was observed that those who have problems of *Planning and Ideas* show less *Social Cooperation* ($r = -.383, p = .033$), less

Table 4: Pearson Correlation: Relation between dimensions of Sensory Processing Measure – School form VS Behaviour Problems

		Self-centred Explosive	Excessive Attention/Activity problems	Antisocial Aggressive	Social Avoidance	Anxiety Somatic Problems	Internalized	Externalized
Social participation	R	,566**	,680**	,571**	,623**	,465**	,594**	,650**
Vision	R	,510**	,689**	,580**	,600**	,502**	,607**	,646**
Hearing	R	,540**	,712**	,615**	,626**	,632**	,698**	,671**
Touch	R	,478**	,470**	,450**	,665**	,634**	,711**	,489**
Body Consciousness	R	,620**	,696**	,671**	,400**	,391**	,431**	,706**
Balance	R	,264**	,374**	,350**	,587**	,532**	,613**	,354**
Planning and Ideas	R	,384**	,517**	,500**	,680**	,495**	,644**	,503**
Total	R	,590**	,713**	,622**	,730**	,635**	,751**	,687**

** . Significant correlation for $p < 0,01$

Social Autonomy ($r = -.537, p = .002$), less *Social Interaction* ($r = -.402, p = .028$) and more *Social Avoidance* ($r = .515, p = .004$); and that the problems on the level of *Ideation* are associated with less *Social Autonomy* ($r = -.402, p = .025$) and more *Social Avoidance* ($r = .372, p = .043$). No significant correlations were found between *Postural Control* and skills and behaviour problems.

DISCUSSION

The analysis of the results indicated that sensory processing problems are more frequent in the kindergarten context and, although literature about the prevalence of sensory dysfunction in both contexts is scarce, Ahn, Miller, Milberger and McIntosh (2004) estimated that, according to parent's reports, 5,3% of the children in a suburban public school's kindergarten matched the criteria for sensory processing dysfunction [15].

The results also pointed out that, in the home context, problems at the *Touch* and *Balance* level were the most frequent, which can be sustained by the fact that difficulties in sensory processing in children have a significant impact in the family relationships and in the parent/child relationship patterns [8], and they may also contribute to a greater inhibition in the proximity and touch between them [23]. Furthermore, professionals and parents have realized that these sensory difficulties can also affect cognitive and sensorimotor development [12, 13, 24], which can explain why balance is affected. In kindergarten, problems at the level of *Social participation* and *Vision* were more frequent. In fact, the school context enables and increases social development and it is therefore easy to predict that any sensory change existing in the child may have implications for the level of interaction with peers. This fact is evidenced by several researchers of the area [5, 12, 13, 24], who demonstrated that difficulties in sensory processing affect the child's ability of engaging in social interaction, communication and daily life skills. The analysis of the differences between both contexts showed that the problems with *Social participation*, *Vision*, *Body Awareness* and *Planning and Ideas* are more common in the kindergarten context than in the home context. These differences can be explained by the discrepancy between the adults' expectations towards daily routines at home and in the kindergarten [25].

When analysing social skills, it was noted that most of the sample has good social skills, specially in *Social Interaction* and *Social Cooperation*. However, it is

important to refer that a good range of social skills does not ensure a socially competent performance, although the quality of interpersonal relationships may influence the social development of children at an early age [9]. With regard to behaviour problems, with the exception of the *SBP Excessive Attention/Activity Problems* dimension, most of the sample has moderate or high behaviour problems, in all dimensions analysed. However, it is in the *SBP Anxiety Somatic Problems* dimension where the biggest problems are; internalized behaviour problems are more evident than externalized ones. The relation between sensory problems and behaviour problems is documented [4-6]; being also proven in this study, with the presence of behaviour problems accompanying the high prevalence of sensory problems in this sample.

The analysis of the correlations of the SPM-P dimensions (*Social participation, Vision, Hearing, Touch, Body Awareness, Balance, Planning and Ideas* and *Total*) and the dimensions related to behaviour problems revealed that the greater the sensory difficulties, the greater the behaviour problems.

It has also been confirmed that the greater the sensory problems, the lower the social skills. The stronger correlations were seen between *Social Participation* and *Social cooperation*, and *Autonomy* and *Social interaction*. The quality of the interpersonal relationships influences social development of children of younger ages. These results are consistent with the study carried out by Ben-Avi, Almagor and Engel-Yeger (2012), by also finding a positive association between sensory processing disorders and interpersonal relationships in adults [26].

The correlations between the vulnerability systems in sensory integration in kindergarten and Social Skills and Behaviour Problems of the sample with Some Problems and definite dysfunction, indicated that the most *Hyperresponsive* ones show less *Autonomy*, are more *Antisocial/Aggressive*, show more *Social Avoidance*, more *Anxiety/Somatic Problems* and more *Internalization* and *Externalization Problems*. These results corroborate the literature, in as much as sensory hyperresponsiveness is highly associated with early internalization and exteriorization behaviour problems and poorly developed adaptative social behaviours [27]. In the area of internalization, socioemotional problems are expressed through symptoms of anxiety and depression [7, 28]. Hyperreactivity often manifests through aggressive behaviours or social avoidance [21, 28].

As for the Hyporesponsive ones, they show less *Social Cooperation*, less *Social Autonomy*, less *Social Interaction* and more *Social Avoidance*. Hyporesponsiveness is characterized by the lack of an expectable response or apathy/indifference to sensory experience [21, 29, 30]. Some researchers also found an association between hyporesponsiveness and poor academic performance and social functioning [31, 32, 33].

The *Perception* problems prevail in the *Antisocial/Aggressive* ones and in those who show *Social Avoidance* and *Exteriorized Problems*. Perception is the ability to interpret the meaning of sensory input and the need for an effective use of the feedback from internal and environmental sensory information. Perception problems may also be connected with modulation problems [21].

As for Seeking problems, they are more frequent in the *Self-centred/Explosive* ones, in the *Antisocial/Aggressive* ones and in those who show more *Excessive Attention/Activity Problems* and *Externalized Problems*. Sensory seeking may co-occur with hyporesponsiveness and hyperresponsiveness; the vulnerability of the items of the measure of sensory processing should be taken into account [21].

Poor motor planning can limit the ability to expand play repertoires or involvement with other people [21]. The present study corroborates these arguments, considering that it was observed that those with problems in *Planning and Ideias* show less *Social Cooperation*, less *Social Autonomy*, less *Social Interaction* and more *Social Avoidance*; and that the problems related to *Ideation* are associated with lower *Social Autonomy* and greater *Social Avoidance*.

CONCLUSION

In this study, a high prevalence of sensory processing issues was observed, both in the home and kindergarten contexts, although these results are more evident in kindergarten.

The existence of a positive relation between behaviour problems and sensory processing issues was noted; hyporesponsive children show greater problems in terms of autonomy and hyperresponsive children have greater difficulties in behaviour regulation.

This study intended to improve the understanding of how difficulties in behaviour and social skills, observed

by kindergarten teachers and parents, can be based on difficulties in sensory processing.

In another perspective, the identification and respective intervention in these problems at an early age aims to prevent later problems, which may affect development in general and preschool learnings.

This study demonstrated the importance of detecting sensory processing problems early, allowing parents and educators to better understand the child's performance and thus define, in joint collaboration, strategies and intervention programmes more and more adjusted to the real needs of the children and their families.

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