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Original Article

Sensory processing and cognitive development of preterm and full term infants

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Abstract: Introduction: Current studies show the repercussion of sensory processing disorder in infant neurodevelopment. Little is known about the influence of these disorders in the infant's cognitive development, however, it is known that they negatively interfere on daily life activities and remain during life course. Objective: To evaluate the relationship between sensory processing and cognitive development in infants and the association between prematurity and sensory processing in this population. Method: This is a cross-sectional study conducted in the Childcare Outpatient Department of the Hospital das Clínicas, Federal Universidade de Pernambuco, from December 2009 to August 2010. The sample consisted of 182 infants from 8 to 15 months, of which 54 (29.7%) were born preterm with the prematurity age correction made to 40 weeks of gestational age. We used the Test of Sensory Functions in Infants (TSFI) to evaluate the sensory processing and the Bayley Scales of Infant and Toddler Development III to assess cognitive development. Results: There was a significantly higher frequency of at risk and deficient sensory processing among preterm infants (37%) when compared to term infants (21.9%). Cognitive delay was significantly higher (8.3%) in infants with at risk and deficient sensory processing when compared to those with normal sensory processing (1.5%). Conclusion: Prematurity was a risk factor for sensory processing disorder, and infants diagnosed with this disorder showed cognitive delay more frequently. Prematurity alone was not associated with cognitive delay.

Keywords: *Infant Development, Sensory Processing, Neonatology, Pediatrics, Preterm, Occupational Therapy.*

Processamento sensorial e desenvolvimento cognitivo de lactentes nascidos pré-termo e a termo

Resumo: Introdução: Estudos atuais apontam para as repercussões que as alterações de processamento sensorial trazem para o desenvolvimento neuropsicomotor infantil. Pouco se conhece sobre a influência dessas alterações no desenvolvimento cognitivo de lactentes, porém sabe-se que estas interferem negativamente no desempenho das atividades cotidianas e trazem prejuízos ao longo da vida do indivíduo. Objetivo: Avaliar a relação entre o processamento sensorial e o desenvolvimento cognitivo de lactentes, e a associação entre a prematuridade e o processamento sensorial dessa população. Método: Estudo de corte transversal realizado no Ambulatório de Puericultura do Hospital das Clínicas da UFPE, no período de dezembro de 2009 a agosto de 2010. A amostra consistiu de 182 lactentes de oito a 15 meses de idade, dos quais 54 (29,7%) nasceram prematuros, sendo feita a correção da prematuridade para 40 semanas de idade gestacional. Utilizou-se o *Test of Sensory Functions in Infants* (TSFI), para avaliar o processamento sensorial, e a *Bayley Scales of Infant and Toddler Development III*, na avaliação do desenvolvimento cognitivo. Resultados: Verificou-se uma frequência significantemente maior de processamento sensorial em risco e deficiente entre os lactentes nascidos pré-termo (37%) quando comparado ao

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processo sensorial dos nascidos a termo (21,9%). O atraso cognitivo foi significantemente maior (8,3%) entre os lactentes com processamento sensorial em risco e deficiente em relação aos com processamento sensorial normal (1,5%). Conclusão: A prematuridade foi considerada um fator de risco para distúrbio do processamento sensorial e os lactentes diagnosticados com este distúrbio apresentaram atraso cognitivo mais frequentemente. A prematuridade, isoladamente, não esteve associada ao atraso cognitivo.

Palavras-chave: *Desenvolvimento Infantil, Processamento Sensorial, Neonatologia, Pediatria, Prematuro, Terapia Ocupacional.*

1 Introduction

Studies point to the impact that the sensory processing changes bring to the psychomotor child development (BART et al., 2011; KOENIG; RUDNEY, 2010; MITCHELL et al., 2015; WICKREMASINGHE et al., 2013). There is a concern with the early detection of these problems, but little is known about the influence of these changes in cognitive performance of these children. It is known that in the first two years of life, the infant learns to detect and interpret sensory information of touch, position and body movement, hearing, sight, smell, and taste. This information is used for the acquisition of skills such as maintaining posture and body balance, gross and fine motor coordination, and development of the body schema (BRASIL, 2011; PEDROSA; CAÇOLA; CARVALHAL, 2015).

The psychomotor development is influenced by the combination of biological factors with the quality of environment stimulation. Among the biological factors there is the prematurity, considered as a risk factor for the changes in the development of cognitive, motor, behavioral and sensory processing, which can be caused by immaturity of neurological structure and influenced by aggressive sensory experiences in the environment, more specifically, in the intensive care unit (NICU) (BART et al., 2011; WICKREMASINGHE et al., 2013; MITCHELL et al., 2015).

The Initial symptoms of changes in the sensory processing observed in infants were studied by Degangi (2000), who found a possible link between them and the regulatory problems, characterized by a high irritability, difficulty of self-comfort, excessive crying, and difficulties with sleep and feeding. Later, children with sensory processing problems may have difficulty organizing intentional actions in the areas of communication, gross and fine motor skills, and playing, with also limited social participation. Difficulties with reading and writing are also common in these individuals, at older ages (WIENER et al., 1996; BART et al., 2011).

In addition to these difficulties, Koenig and Rudney (2010) show in their systematic review article that in the long term, the performance of daily life activities and practical life, social participation in playing and academic activities may also be compromised, data corroborated by Mitchell et al. (2015). Studies by Engel-Yeger (2008) Bundy et al. (2007) show that sensory modulation changes seem to have more influence on the choices for playing and leisure activities of children at school age. The difficulties found by children of the same age group in the performance of activities of daily living, such as bathing and feeding, have also been associated with sensory processing problems (WHITE et al., 2007). Later, the finding of Wickremasinghe et al. (2013) confirms that there is a tendency of the difficulties in sensory processing becoming more evident with advancing age in children. Blanche (2005) found that the sensory processing characteristics among adults remain throughout life, interfering with the choices of occupational and leisure activities.

Some perceptual-cognitive skills related to the somatosensory system such as the identification of the fingers and graphesthesia were measured at school age in children born with extremely low birth weight, through the Sensory Integration and Praxis Tests (AYRES, 1989; DEMAIO-FELDMAN, 1994). These children had worse results on these tests when compared with the population of appropriate birth weight, which could be justified by painful sensory experiences and the positioning and movement restriction experienced in the NICU.

In elementary school, the difficulties with school tend to become more evident. According to Reeves and Cermak (2002), the problems arising are more associated with the practice, and often the performance in tasks such as writing, cutting, and coloring, and art projects are lower than children without changing the sensory processing.

For parents, these students are characterized as distracted or careless, further strengthening the difficulties presented.

Case-Smith, Butcher and Reed (1998) found the effect of prematurity on temperament and

development of infants at 12 months old corrected for preterm and chronological for the term infants, and its association with sensory processing. The Bayley II scale was used to measure the mental and psychomotor development, and Sensory Rating Scale (SRS) was used to measure the response to touch and movement, the sound, the visual stimulus, and temperament. Premature infants showed more tactile defensiveness and hyperresponsiveness associated with temperament when compared to full-term infants. However, no difference was observed in the mental and psychomotor development of these babies.

Some authors sought to know the sensory processing characteristics even in the early years of the baby´s life. Thus, that sensory processing changes can be detected early and interventions can be initiated at the appropriate time, trying to prevent possible complications for the child´s future life (MITCHELL et al., 2015; WICKREMASINGHE et al., 2013).

There is still a lack of research in this area, indicating the need for further studies to evaluate possible associations of sensory processing with other neurodevelopmental components, for example, cognition. Therefore, this study aimed to evaluate the association between prematurity and sensory processing of infants, and the relationship between sensory processing and cognitive development of this population.

2 Method

2.1 Place and study sample

The sample was all premature infants (LNPT) who were attending the Outpatient Newborn Risk and Child Care Clinic Hospital of the Federal University of Pernambuco (HC-UFPE), from December 2009 to August 2010. For each LNPT, an average of two infants born at term (LNT) monitored on the Childcare Clinic of the same hospital was selected to form the control group. Of 182 infants enrolled in the study, 54 (30%) were preterm infants and 128 (70%), were infants born at term. At the time of the evaluation, all were aged between 8 and 15 months, and a chronological age corrected for 40 weeks was used for premature babies. The babies with cerebral palsy infants, hearing loss, low vision, deformities, congenital infections, bad multiple formations or genetic syndromes were excluded.

The study was approved by the Ethics Committee of the Health Sciences Center of UFPE (CAAE-0217.0.000.172-09) and mothers or caregivers of infants, who were within the inclusion criteria were invited to participate in the study signing the Consent Informed Form.

2.2 Collection instruments

The Test of Sensory Functions in Infants (TSFI) (DEGANGI; GREENSPAN, 2001) is a screening tool used to identify sensory processing problems in children and, when used in conjunction with other instruments, such as the Bayley Scale of Infant and Toddlers Development - 3rd Edition (Bayley-III) (BAYLEY, 2006), it traces the profile of the functional development of the baby.

The TSFI provides a general measure of sensory processing and reactivity of infants from four to 18 months of life, and it contains five subdomains: reaction to deep pressure; adaptive motor functions; visual-tactile integration; oculomotor control, and response to vestibular stimulation. Each of the subdomains has a specific score, which is added at the end to display the total result. The overall result has three cut points: normal sensory processing, at risk or deficient, according to the age range: four to six months, seven to nine months, ten to 12 months and 13 to 18 months.

Bayley Scales of Infant and Toddler Development - 3rd Edition (Bayley-III) (BAYLEY, 2006) is used to evaluate the development of children from one to 42 months of age, and it has the subtests: cognition, language (receptive and expressive communication) and motor (fine and coarse). For this study, only the cognitive subtest was used, which consists of 91 items. The child starts evaluating the corresponding item to his age, but if he misses any of the first three items, he returns to the corresponding item in the previous age. The evaluation is closed after five consecutive errors, as the manual indicates.

To interpret the results, the composite score was used, which has an average of 100 points and standard deviation of 15 points, and cognitive development considered appropriate when the results of composite score ranging from 85 to 115 points.

2.3 Evaluation procedures

All infants were evaluated at the Child Care Clinic or Speech Therapy Clinic of the HC-UFPE. A search form designed specifically for this study was used to reap the biological and socio-demographic variables. The chart records, hospital discharge summaries, and children's book were the source of information for the biological conditions of the infant, while sociodemographic conditions were recorded through interviews with mothers or caregivers.

A pilot study was conducted with ten infants to verify the standardization of reviews and the quality of survey forms so changes could be made promptly to improve the quality of data collection. The examiners were properly trained in the application of the instruments to minimize the test administration errors. The TSFI was applied for two occupational therapists with knowledge of sensory integration theory, and the Bayley III was applied by a speech therapist and an occupational therapist, both experts in child development.

The reliability of the evaluation of the cognitive development and the sensory processing was performed between two observers in approximately 10% of the sample. The intraclass correlation coefficient (ICC) was used to assess the reproducibility of the Bayley III scale, because it is a continuous variable, in which the level of agreement was 0.88 (95% CI 0.70 -0.95; p <0.001). Because it is a categorical variable, the Kappa index used for the TSFI, obtaining the result of 0.40 for the total score. The reproducibility of the test was considered excellent for Bayley III, and between regular and good for the TSFI.

2.4 Data analysis

To ensure the consistency of the results, the data were registered in forms with pre-coded issues and entered through a double entry in Epi Info software (version 6.04), using the validate subprogram, to minimize possible typing errors.

Cognitive development index is a continuous variable, and for its analysis, it was categorized as "normal" and "delay," according to the result of the composite score. Infants with composite score ≥85 were considered normal cognitive development and those who have obtained a score ≤84 were classified as having delay cognitive development. For the evaluation of the analysis of sensory processing (categorical variable), in which children can be classified as poor, at risk and normal, the category "poor" was grouped to "at risk" due to their small number.

The chi-square test with Yates correction was used to examine the association between dichotomous variables, using Fisher's exact test when indicated. The confidence interval of 95% and a statistical significance level of 5% ($p \leq 0.05$) were adopted.

3 Results

The characterization of the sample is shown in Table 1. Of the 182 infants studied, 91 (50%) were female, and 54 (30%) were preterm babies. The mean chronological age for term infants was 9.7 months (SD=2) and the average corrected age for preterm infants was 9.6 months (SD=2) at the time of the evaluation. The per capita family income and maternal education were not significantly different between groups.

Table 2 shows the association between gestational age at birth with sensory processing and cognition. In both groups, 48 infants (26.4%) had total TSFI at risk and deficient, and six (3.3%) had a cognitive delay. There was a significantly higher frequency of sensory processing at risk and poor among preterm infants (37%) when compared to term infants (21.9%). The delay of cognitive development was not associated with prematurity.

Table 1. Characterization of the sample with 182 infants.

Biological, socioeconomic and demographic variables	Pre-Term		On Term	
	Average	SD	Average	SD
Birthweight (g)	1832.3	755.5	3209.6	509.3
Gestational Age (weeks)	33	3	39	1
Age at the Evaluation (months)	9.5	1.8	9.7	2
	N	(%)	n	(%)
Gender				
Male	23	(42.6)	68	(53.1)
Female	31	(57.4)	60	(46.9)
Family income *per capita* (SM*)				
≤ half MW	40	(74.1)	87	(68.0)
> half MW	14	(25.9)	41	(32.0)
Mother education level				
Elementary	11	(20.4)	33	(26.2)
High School	41	(75.9)	82	(65.1)
Superior	2	(3.7)	11	(8.7)

*MW = minimum wage.

Table 2. Association of gestational age with sensory processing and cognitive development of preterm and on term infants.

Gestational age	Total		Sensory Processing (TSFI Total)				P
			At risk /Deficient		Normal		
	N	(%)	N	(%)	n	(%)	
Preterm	54	(29.7)	20	(37.0)	34	(63.0)	**0.05**
On term	128	(70.3)	28	(21.9)	100	(78.1)	
Total	182	(100)	48	(26.4)	134	(73.6)	
	Total		Cognition (Bayley-III)				P
			Delay (≤ 84)		Normal (≥ 85)		
	N	(%)	N	(%)	n	(%)	
Preterm	54	(29.7)	2	(3.7)	52	96.3	1.0*
On term	128	(70.3)	4	(3.1)	124	96.9	
Total	182	(100)	6	(3.3)	167	(91.7)	

*Fisher exact test.

Tables 3 and 4 show results of the whole sample. Table 3 shows associations between biological, family socioeconomic and demographic variables with sensory processing of infants (total TSFI). It appears that there were no statistically significant associations between variables. Only children who used mechanical ventilation and CPAP showed a higher frequency of sensory processing at risk or deficient, and these neighboring associations. This result may be due to the small number of infants who underwent intensive interventions. The percentage of children with sensory processing at risk or poor tended to increase progressively with increasing age that is the older child, the greater the occurrence of risk behavior or total deficient TSFI.

Table 4 shows the evaluation of the association between sensory processing (total TSFI) and its subtests with the cognition of the infants.

It is found that the occurrence of the cognitive delay was significantly higher in children with sensory processing at risk and poor to the total TSFI when compared with those who had normal sensory processing. Regarding the TSFI subtests, it is observed that infants with cognitive delay showed a significantly higher frequency change in sensory processing in the tests of motor function and adaptive tactile-visual integration when compared with those who had normal sensory processing.

4 Discussion

The systematic review by Mitchell et al. (2015) showed that, to date, only four articles on sensory processing in the population of premature infants were published. These studies show that prematurity has negative repercussions in different areas of processing, which affect the behavior of these children before the sensory information, most of them being hyper-reactive to stimuli, especially visual, tactile and auditory.

Due to the dearth of research examining the association of sensory processing in infants with prematurity and cognitive development, this research was carried out aiming to answer two questions: first, the influence of prematurity in sensory processing, and second, whether there is an association between sensory processing and cognitive development of infants.

In the first question, the study results suggest that prematurity is a factor in risk for changes in sensory processing, showing that premature infants have a higher frequency of behaviors considered at risk and poor, according to the TSFI. The literature states that biological risk conditions, such as prematurity and invasive procedures performed in the NICU, required for the maintenance of clinical stability of infants may increase their predisposition to changes in the neurodevelopment (WIENER et al., 1996; CASE-SMITH; BUTCHER; REED, 1998; ALS et al., 2004; AYRES, 2005; ZOMIGNANI; ZAMBELLI; ANTONIO, 2009; BART et al., 2011; WICKREMASINGHE et al., 2013).

Als et al. (2004) state that the care in the NICU influence the functions of motor systems and self-regulation, and other aspects associated with neurobehavioral as alertness and response threshold to sensory stimuli from the environment. This finding may justify a higher frequency of changes in sensory processing in premature infants.

Regarding the second question of the study, the association between sensory processing and cognitive development, the results showed a statistically significant association between the sensory processing of infants with the result of Bayley III cognitive

Table 3. Association between biological, socioeconomic and demographic family conditions with the sensory processing of infants.

Variables	Total		Sensory processing (Total TSFI)				P
			At risk/Deficient		Normal		
	N	(%)	N	(%)	n	(%)	
Birthweight (g)							
≤ 1500	24	(13.4)	7	(29.2)	17	70.8	0.97
> 1500	155	(86.6)	41	(26.5)	114	73.5	
Gender							
Male	91	(50)	26	(28.6)	65	(71.4)	0.61
Female	91	(50)	22	(24.2)	69	(75.8)	
Hypoxia							
Yes	17	(9.7)	5	(29.4)	12	(70.6)	0.78*
No	158	(90.3)	43	(27.2)	115	(72.8)	
Intracranial hemorrhage							
Yes	8	(4.5)	4	(50.0)	4	(50.0)	0.22*
No	169	(95.5)	44	(26.0)	125	(74.0)	
Hyaline membrane disease							
Yes	7	(4.0)	3	(42.8)	4	(57.2)	0.40*
No	167	(96.0)	45	(27.0)	122	(73.0)	
Assisted mechanical ventilation							
Yes	14	(8.0)	7	(50.0)	7	(50.0)	**0.06***
No	161	(92.0)	41	(25.5)	120	(74.5)	
CPAP							
Yes	35	(20.0)	14	(40.0)	21	(60.0)	*0.10**
No	140	(80.0)	34	(24.3)	106	(75.7)	
Seizure							
Yes	4	(2.3)	2	(50.0)	2	(50.0)	0.30*
No	172	(97.7)	46	(26.7)	126	(73.3)	
Probe Use							
Yes	40	(23.5)	14	(35.0)	26	(65.0)	0.28
No	130	(76.5)	32	(24.6)	98	(75.4)	
Age in the evaluation (months)							
8	81	(44.5)	16	(19.8)	65	(80.2)	**0.05****
9-11	62	(34.1)	18	(29.0)	44	(71.0)	
12-15	39	(21.4)	14	(35.9)	25	(64.1)	
***Per capita* Income (MW**)**							
≤ half MW	127	(69.8)	32	(25.0)	95	(75.0)	0.71
> half MW	55	(30.2)	16	(29.0)	39	(71.0)	
Mother education level							
Elemeary school	45	(25.0)	11	(22.9)	34	(25.8)	0.57
High School	122	(67.8)	35	(72.9)	87	(65.9)	
Superior	13	(7.2)	2	(4.2)	11	(8.3)	
Nursed							
No	6	(3.3)	3	(50.0)	3	(50.0)	0.19*
Yes	175	(96.7)	45	(25.7)	130	(74.3)	

*Fisher exact test; **SM = Minimum Wage; ***Trend chi-square.

scale. Infants with a cognitive score ≤ 84, considered as delay, showed a significantly higher frequency among those with sensory processing at risk or poor. This result differs from that found by Case-Smith, Butcher and Reed (1998), who observed independence between sensory responsiveness, using the Sensory Rating Scale (SRS) and the development indices measured by the Bayley II scale. This finding may be related to the use of different instruments, both to evaluate the sensory processing and to assess cognitive development.

From the sample of the preterm infants, only two (3.7%) experienced a cognitive delay by the Bayley III Scale. This result may be since when

Table 4. Association between sensory processing (total TFSI) and its subtests with the cognitive development of infants.

Sensory Processing	Total		Cognition (Bayley-III)				P
			Delay (≤ 84)		Normal (≥ 85)		
(TSFI Total)	N	(%)	n	(%)	n	(%)	
At risk and deficient	48	(26.4)	4	(8.3)	44	(91.7)	**0.04***
Normal	134	(73.6)	2	(1.5)	132	(98.5)	
TSFI Subtests							
Reaction to deep pressure							
At risk and deficient	47	(25.8)	2	(4.3)	45	(95.7)	0.65*
Normal	135	(74.2)	4	(3.0)	131	(97)	
Adaptive motor function							**0.04***
At risk and deficient	49	(26.9)	4	(8.2)	45	(91.8)	
Normal	133	(73.1)	2	(1.5)	131	(98.5)	
visual-tactile Integration							**0.009***
At risk and deficient	54	(29.7)	5	(9.3)	49	(90.7)	
Normal	128	(70.3)	1	(0.8)	127	(99.2)	
Oculomotor control							
At risk and deficient	5	(2.7)	0	(0.0)	5	(100)	1.0*
Normal	177	(97.3)	6	(3.4)	171	(96.6)	
Reaction to vestibular stimulation							
At risk and deficient	28	(15.4)	2	(7.1)	26	(92.9)	0.23*
Normal	154	(84.6)	4	(2.6)	150	(97.4)	

*Fisher exact test.

correcting the age of preterm infants, many of them reach adequate levels of development, offsetting some difficulties. Moreover, the majority (65%) had gestational age less risk (> 32 weeks - data not shown), which may also explain a lower frequency of neonatal complications and morbidities and consequently weak association between them and the indices the Bayley III.

By the study design is not possible to establish a causal relationship, that is, whether the early sensory processing changes, it would cause cognitive changes later, which is an important methodological limitation. Therefore, prospective studies are required to know both the predictive value of the TSFI as to monitor the effects of the medium and long-term sensory processing changes in the lives of children born prematurely. Also, there is a tendency of sensory processing disorders becoming more frequent with advancing age (authors).

The influence of prematurity in the development sensory processing of infants was also investigated by Wiener et al. (1996). They found a higher frequency of sensory processing at risk and deficient by the TSFI in preterm born infants, compared to the infants on a term from seven to 18 months. All infants had a brain and normal motor development according to the Bayley II scale, but statistical analysis was not performed to test the association between the indexes of Bayley and the result of the TSFI.

Analyzing the TSFI subtests separately and its association with cognitive delay, there was a statistically significant difference in the adaptive motor function and visual-tactile integration, presenting components of early cognitive development (BEE, 2003). These subtests directly involve the acquisition of mental and physical actions that go through the learning process; then when the children showed a cognitive delay in Bayley III scale, these TSFI subtests were more frequently changed. The remaining items of the TSFI that verify how the child perceives the intensity and nature of sensory stimulation showed no relationship to cognition.

Using the TSFI as a screening test, it is observed that only its total score is not sufficient to verify the association of risk factors and functions of sensory processing. A detailed analysis of the subtests allows establishing more cautiously associations and can verify specific features of sensory processing, such as modulation and praxis. Another important consideration of the test is the interpretive character that it has, since the interpretation of the child´s reaction to the presented sensory stimulus will depend on the experience and the examiner´s knowledge of sensory processing. A hypothesis with the analysis

of the subtests is that not all the functions displayed in the TSFI are related to cognition, as reported by Case-Smith, Butcher and Reed (1998), showing the need for further monitoring studies to confirm or not such relationship.

This study showed that the greater the age of the infant at the time of evaluation, the higher the frequency TSFI at risk and deficient, being a significant trend. Similar findings were found in studies by Bart et al. (2011) and Wickremasinghe et al. (2013). The relationship between sensory processing with the child´s age can be explained by the following fact: the older the child, the more tasks he must perform, leading to the perception of some behaviors associated with later changes in sensory processing.

Other research with older children showed the influence of the change in sensory processing in occupational activities such as feeding, sphincter and sleep and wakefulness control (FARROW; COULTHARD, 2012; POLLOCK; METZ; BARABASH, 2014; VASAK et al., 2015). At school age, children with processing problems and integration of sensory information tend to develop difficulties in writing, in maintaining attention to the academic learning and tendency to isolation, to avoid sports group (AYRES, 1972; DEMAIO-FELDMAN, 1994; BLANCHE, 2005). Bakker and Moulding (2012), Farrow and Coulthard (2012) and Nakagawa et al. (2016) showed in their studies that changes in sensory processing may still be associated with negative psychological symptoms and temperament problems in children and adults.

When evaluating a population of adults with impaired sensory signal processing in childhood, Blanche (2005) noted that these changes are maintained throughout life and influence occupational choices of individuals, who may have their activities limited, if not treated.

5 Conclusion

Premature infants showed more often signs of changes in sensory processing and those with altered sensory processing were more likely to have impaired cognitive development. However, prematurity alone does not seem to have the same influence on cognitive development. This result suggests an alert to the inclusion of screening for sensory processing in premature infants monitoring program and shows how occupational therapists, certified and experienced in the assessment of sensory processing, can be part of this team.

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Flávia Regina worked in the design of the research, collection, and processing of data, interpretation of results and text editing. Sophie Helena held the orientation of the whole process of research and development and revision of the text. Marilia participated in the analysis and interpretation of data and final revision of the text. All authors approved the final version of the text.