Sensory profile and its relation with psychic risk, prematurity and motor and language development by infants of 12 months

Perfil sensorial e sua relação com risco psíquico, prematuridade e desenvolvimento motor e de linguagem por bebês de 12 meses

ORIGINAL ARTICLE

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ABSTRACT: *Objective*: To analyze the correlation between sensory profile of the infant, gestational age and psychic risk and its effects on motor and language assessment. *Method*: the sample consisted of 40 infants (20 preterm and 20 full-term). Each group had 10 infants with psychic risk and 10 without risk. The risks were identified according to the Prevention of Autism (PREAUT) signs and to the Clinical Indicators of Reference for Child Development, and evaluated by the DENVER II within the age group from 12 months to 12 months and 29 days. Statistical analysis was conducted by the programs STATISTICA 9.1 and PASW 17.0. *Results*: Statistical significance was identified in the correlations between the sensory tests and the psychic risk protocol, as well as in the risk factor for prematurity. Results showed no statistical significance with the results for motor skills and language in the DENVER II test. *Conclusion*: Alterations in the sensory profile were related to the psychic risk and lower gestational age, but were not correlated with motor and language development.

KEYWORDS: Child development; Sensation; Infant, premature; Psychic symptoms.

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RESUMO: *Objetivo*: Analisar a correlação entre perfil sensorial do bebê, idade gestacional e risco psíquico e seus efeitos na avaliação motora e de linguagem. *Método*: a amostra foi composta por 40 bebês, 20 prematuros e 20 nascidos a termo, com 10 bebês com risco psíquico e 10 sem risco em cada grupo, identificados a partir dos sinais PREAUT e dos Indicadores Clínicos de Referência ao Desenvolvimento Infantil e avaliados pelo DENVER II, na faixa etária de 12 meses a 12 meses e 29 dias. A análise estatística foi realizada pelos programas STATISTICA 9.1 e PASW 17.0. *Resultados*: Foi identificada significância estatística nas correlações entre testes sensoriais e protocolo de risco psíquico, bem como no fator de risco prematuridade. Os resultados não demonstraram significância estatística com os resultados em motricidade e linguagem no teste DENVER II**.** *Conclusão*: Alterações no perfil sensorial estiveram relacionadas a risco psíquico e idade gestacional menor, mas não se correlacionaram ao desenvolvimento motor e linguístico.

DESCRITORES: Desenvolvimento infantil; Sensação; Recém-nascido-prematuro; Sintomas psíquico.

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INTRODUCTION

Currently, studies on child development investigate, in addition to motor aspects, the psychomotor development and the importance of sensory systems (visual, auditory, gustatory, tactile, vestibular and proprioceptive) for the full development of the child[1,2,3]. The experiences provided by the child's interaction with the family and with the world will influence how their sensory systems will integrate to generate adequate responses to the environment[1,4]. To this end, the infant needs to have his/her attention hooked[1]. To be "hooked," according to a Freudian and Lacanian perspective, is part of the alienation process that occurs at the beginning of the infant's psychic constitution. If the infant presents maladjusted sensory flows or other biological factors that prevent the attention to be hooked[4], or if the adult does not present a wish directed to hook it, the child may have difficulties in the sensory[4], motor and language[5] developments[6,7,8].

One of the risk factors that cause delays in the sensory development of infants[9] is the prematurity. This occurs due to the aggressiveness of procedures conducted in neonatal intensive care units (NICU). Although necessary for the continuity of life, these procedures may cause iatrogenic effect[1,10], given that the ripening of the preterm infant's sensory system and central nervous system in the NICU occurs without the protection that the full-term infant has within the uterus[1].

Considering the psychic aspect of the structuring of a child[11], the exercise of parental duties is crucial for the infant to access the symbolic project that the family has for him/her. According to Bullinger[4], we can establish a connection between some psychic symptoms and alterations in the processing of sensory flows (gravitational, tactile, olfactory, auditory, visual) that can produce or not the sensory and motor integration. Gathering these characteristics, the author states that these flows are processed in social interactions, i.e., the body, in interaction with the environment, forms the raw material for the psychic constitution. Thus, studies relating psychic risk, prematurity and sensory integration begin to emerge currently[1,9,10,11]. Given this, this article aims to investigate the relations between sensory profile, psychic risk and prematurity and their effects on language and motor development of infants at 12 months, as well as contributes to the studies based on this theme, qualifying the clinical practice and research for occupational therapists and other health professionals.

METHODOLOGY

Participants

The sample consisted of 40 infants (20 preterm and 20 full-term), all monitored in the Hospital Universitário de Santa Maria (HUSM). From the preterm infants, 10 showed having psychic risk and 10 showed having no psychic risk at any phase of the study, same number observed among full-term infants. The psychic risk was considered when infants scored less than 5 in the Prevention of Autism (PREAUT)[12,13] signs in any of the two phases of the test.

The number of 40 infants was defined based on the larger research sample inserted in this study: *Comparative analysis of the development of preterm and full-term infants and its relations with psychic risk: from detection to intervention*. The predominant factor for construction of the sample was the presence or absence of psychic risk. This factor was evaluated by Roth[13] in a previous study, which identified at least 17 infants with psychic risk in the larger research sample. In our study, the addition of 3 infants who had not yet been evaluated through psychic protocols increased the sample size from 17 to 20 infants with psychic risk. After identification of the 20 infants with psychic risk, more 20 infants without psychic risk were selected, including preterm and full-term infants. The selection of 40 infants was conducted as the age cited as inclusion criteria (12 months to 12 months and 29 days) was completed. Those who had already completed 13 months were excluded. This initial identification of psychic risk, the need for balance between preterm and full-term infants, the age group and any faults to the assessment resulted in 40 infants.

Therefore, this research gives continuity to the study of Roth[13] in the monitoring of infants with psychic risk and in their comparison with infants without risk. The motivation is to investigate possible sensory alterations in preterm infants and in infants with risk of autism. The research is within a cohort study in a research group in which several master's theses and doctoral dissertations were conducted. The National Council for Scientific and Technological Development (CNPq) financed partially the study through scientific productivity scholarship.

As for the inclusion criteria, infants must have been aged between 12 months and 12 months and 29 days. In addition, the mother must have accepted to participate in the research and signed the Informed Consent Form (ICF). In both groups, the infants must have had normal or typical development in medical and audiological exams. The results

of medical exams were collected in the medical records of the hospital where infants were born.

As for the exclusion criteria, the infants must have not had genetic (such as Down or fragile X syndromes) or neurological (such as chronic non-progressive encephalopathy) syndromes and sensory deficits (such as deafness or visual deficit). These aspects on the medical records or vaccination cards were assessed by the reference teams of each infant.

All parents or guardians of participants signed the ICF. This study was approved in May, 2014 by the Research Ethics Committee of the Universidade Federal de Santa Maria (UFSM) under no. 28586914.0.0000.5346.

Collection instruments

Psychic risk analysis

The PREAUT Questionnaire, whose epistemological base is the notion of circuit of the drive[13,14], analyzes flaws in the initial interactions between the infant and the mother based on two signs, identified at 4 and 9 months, allowing the early detection of the risk of autism. In the score of PREAUT signs, 0 to 5 represents high risk for autism, 6 to 14 states of intermediary risk[13], and when the score reaches 15, we understand that the communication and interaction are within standards expected for the age group. The questionnaire was validated in French territory and has proven to be as effective in detecting risk for autism in the first year of life as the Modified Checklist for Autism in Toddlers (M-CHAT) scale for the second year of life[15].

The PREAUT questionnaire is based on the notion of the circuit of the drive, which defines three times in the relationship of the infant with his/her insurer, or with the one who exercises the maternal function and investigates the symbolical inclination. In a first time, the infant seeks the other (looks, invokes, sucks); in a second time, he/she is interpreted in his/her search (is looked at, is spoken to, is object of maternal jouissance in body games); and, finally, in a third time, the infant makes him/herself the object of jouissance of the other, offering him/herself to be looked at, heard, for body exchanges that involve pleasure and love. These three times are arranged in the PREAUT signs in the form of the infants' spontaneous search for the mother and for the examiner, or in the infant's response to the call of the mother and of the examiner. The third time is verified when, after some stimulation and exchange, the infant calls upon the mother or the examiner, even if they do give him/her attention — that is, the infant seeks to have attention to him/herself. In the PREAUT validation, this behavior with both the mother and the examiner is a sign of psychic health. When the infant shows these conditions with the examiner but not with the mother, or with the mother but not with the examiner, his/her score can be in the intermediary states (between 5 and 14), which indicates psychic risk of non-autistic nature, according to Roth[13]. On the other hand, when the infant reacts only after the stimulation of the mother or of the examiner, or does not react, his/her score is below five, which indicates risk of autism.

The application of this protocol depends, therefore, on the infant's interaction with the mother and the evaluator. Resulting from the sum of all responses to every question, a total score is generated based on the evaluator's observations. If the values assigned are less than 5, the second part of the questionnaire is applied.

For clinical indicators of risk/reference for the child development (IRDI)[14], two or more absent indicators were considered for identification of the risk group, pointed based on ordinal analyses. The absent and present indicators computed specifically for each phase (first, second and third phases) were analyzed ordinally and the infants' ages in this research were used.

Sensory Integration Analysis

Test of Sensory Functions in Infants (TSFI)

The Test of Sensory Functions in Infants (TSFI)[16] was developed for application in infants between 4 and 18 months. Although the test has not been validated for the Brazilian population, there are studies which used it[3]. The instrument provides the general measure of the sensory processing and reactivity of infants from 4 to 18 months of life. The test contains five subdomains: reactivity to tactile deep pressure, adaptive motor functions, visual tactile integration, ocular motor control and reactivity to vestibular stimulation.

The protocol has 24 items evaluated individually. According to the information originated, the total scores are produced considering three types of response – normal, at risk and deficient – that refer to both the partial classification of subdomains and the final result.

Sensory Profile of the Infant and Small Child

The Sensory Profile of the Infant and Toddler was developed for application with parents or caregivers of infants between 7 and 36 months. Developed based on the translated version of the Infant/Toddler Sensory Profile (ITSP)[17], the profile has been validated only for the American

population. Its objective is to outline the infants' sensory profile, covering their responses to stimulations of everyday life based on the view of caregivers responsible.

The test is composed of six categories, subdivided into 48 items that reflect the abilities of sensory modulation of the toddler. The six types of processing assessed are: (1) general processing; (2) auditory processing; (3) visual processing; (4) tactile processing; (5) vestibular processing (6) and oral sensory processing. We highlight that, in this research, we only used the categories 2 to 6, which measure the sensory responses focused on every type of processing. In addition, the protocol does not establish the total gross score for the general processing.

Assessment of Language and Motor Skills

The Denver II screening test[18] was developed in 1967 in the United States, at the Medical Center of the University of Colorado. Its purpose is to detect delays in the neuropsychomotor development in children aged from 15 days until 6 years. The test consists of 125 items, separated into 4 major development areas: (1) personal-social; (2) fine motor and adaptive; (3) language; and (4) gross motor. For this article, we analyzed the results on language and fine and gross motor. The version used was adapted to the Brazilian Portuguese language.

The test classifies the level of abilities according to what the child is able to do, considering the age group stipulated in the protocol. When the child accomplishes what is being asked, we mark "PASSED;" when the child does not accomplish what is being asked, he/she is classified into "FAILED." A percentage score greater than 90% was considered normal. Smaller percentages were considered abnormal, comprising the classification of abnormal and suspicious/questionable development.

Procedures

Data were collected from December 2015 to May 2016, in the HUSM, linked to the UFSM. In the process of inclusion of infants in the research, in addition to the ethical procedures, an initial interview and continuous interviews were carried out. In the larger research, full-term and preterm infants in the following age groups were analyzed: 3 months to 4 months and 29 days; 8 months to 9 months and 29 days; and 11 months to 12 months and 29 days.

The PREAUT signs were collected in two moments, with analysis by the evaluator of the relation between the dyad. In the first moment of assessment, the infants were aged between 3 months to 4 months and 29 days. As for the second moment of risk detection, the infants were aged between 8 months and 9 months and 29 days. Based on the signs identified in this protocol, the infants were classified into the risk or control groups. For the IRDI, infants were assessed in the three age groups in four different moments from the moment they were born until completion of 12 months and 29 days of age (in the case of preterm infants, this age was corrected), based on the short version of 18 risk indicators. The Denver II Protocol was used in the third assessment phase, when infants were aged from 11 months to 12 months and 29 days.

The TSFI protocols and the Sensory Profile of the Infant and Toddler, for identification of the sensory performance, were collected by the researcher only for the age groups from 11 months to 12 months and 29 days. On this assessment day, other tests were not applied so there was no interference of stimulations from other protocols. Infants entered the room accompanied by the parents, who were asked to take off the clothes of their children. During the application of the test, the infants remained on the laps of their parents, who remained silent. The parents received explanations about the tests and, during the application, the infants' responses were filmed for later analysis.

The collected data were stored in spreadsheet of the Excel type and later converted to the computer applications STATISTICA 9.1 and PASW 17.0, according to the analysis required. The Spearman's rank-order correlation test and the Mann-Whitney U test were used, since the variables analyzed are classified as non-parametric. For the interpretation of the level of correlations, the following classification of correlation coefficients was adopted: correlation coefficients <0.4 (correlation of weak magnitude), > 0.4 to <0.5 (correlation of moderate magnitude) and >0.5 (correlation of strong magnitude). The significance level considered was 5% ($p<0.05$).

RESULTS

Considering the final sample, from the preterm infants, 32.5% were late preterm, 15% were moderate preterm and only 2.5% were extremely preterm; 70% of the infants were not hospitalized in the NICU, and from the 30% who were, 27.5% had a preterm birth and only 2.5% had a full-term birth. Figure 1 shows the total values and per subdomains of the TSFI protocol.

Analyzing separately each section of the two protocols, we perceived that only one infant scored below the expected for all sections of both tests, and that, for all the other infants with alterations, at least one section proved to be adequate. It is important to emphasize that the five

full-term infants who had scores with alterations in the adaptive motor functions also had problems in the visual tactile integration. As for the ocular motor control, only two infants had scores below the expected; all the others achieved the maximum score for this section.

We highlight that only one infant had sensory alteration in only one processing (oral sensory), as all other infants with sensory deficits had alterations in two or more types of processing. However, no infant showed alteration in all sections of the sensory profile.

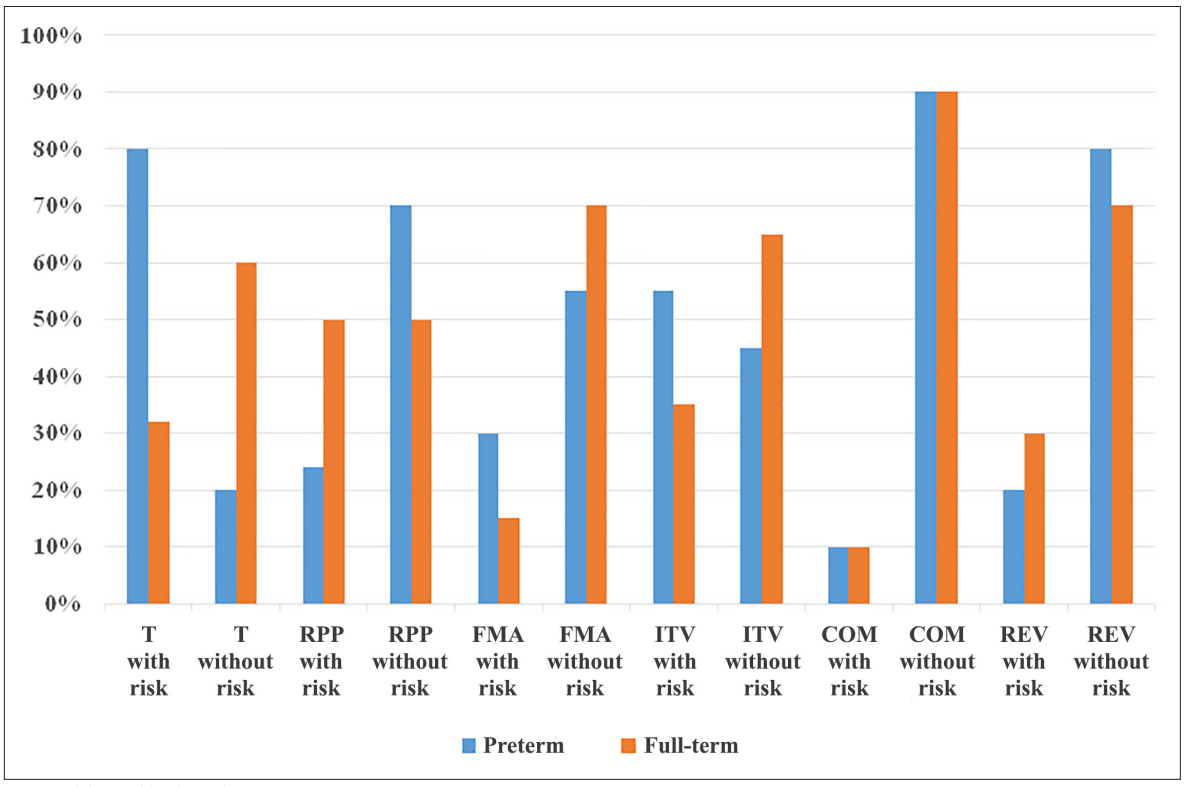
Both protocols had more infants with alterations in reactivity to tactile stimulation (in their most, preterm infants). In addition, the preterm infants had more bad scores for the vestibular stimulations compared to the full-term ones.

Figure 3 shows the graph with results of the assessment protocols of psychic risk.

Except for two infants, all others with adequate performance in the sensory protocols had good results for PREAUT signs. The three infants with the lowest scores (0.5 and 5) in the first phase of the PREAUT signs, with significant risk of progression to autism, were also classified as infants at risk in the sensory protocols.

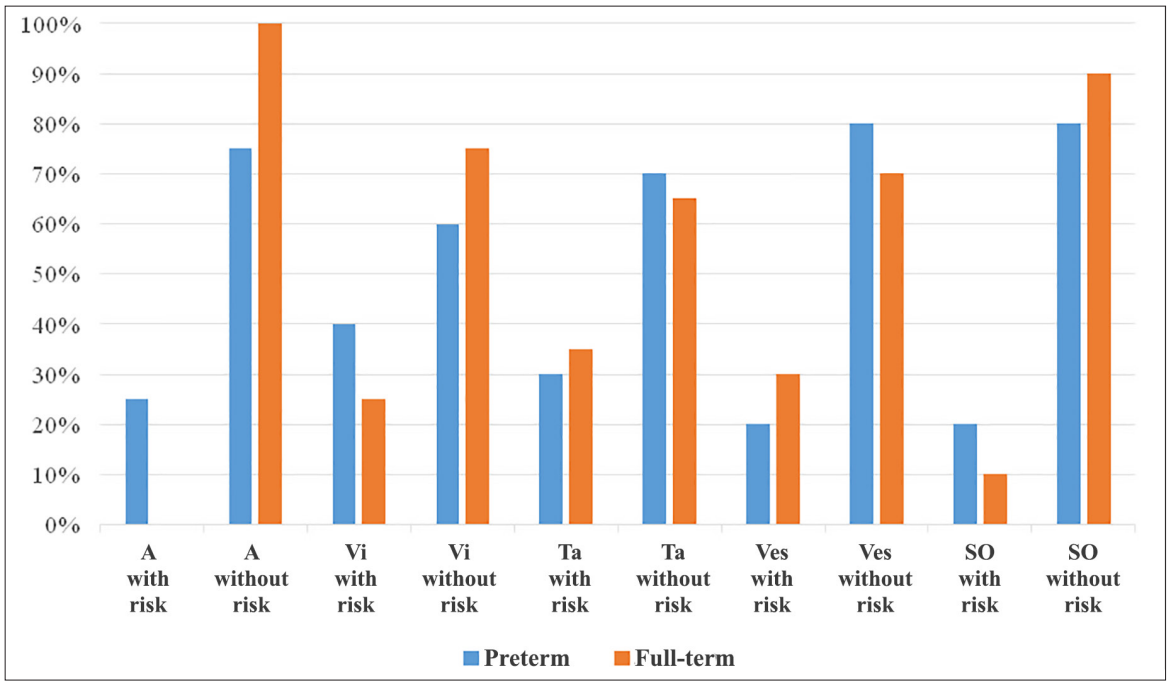
From the 20 infants who demonstrated alterations in sensory assessments, seven also had bad scores in the PREAUT signs, i.e., the scores announced indicated a progression to autism or other psychopathology considering the first and second assessment phases of the protocol.

We can affirm that, descriptively, there were more infants with sensory alterations without necessary association with risk for autism (although with psychic risk) than infants with sensory alterations associated with risk for autism. On the other hand, the two cases with risk for autism (PREAUT signs lower than 5) had a large number of sensory alterations. The only infant that showed no risk in the first phase the PREAUT sign, but showed symptoms that indicated risk in the second phase of the protocol, was also one of the infants considered at risk by the sensory assessments applied with both parents and researcher.



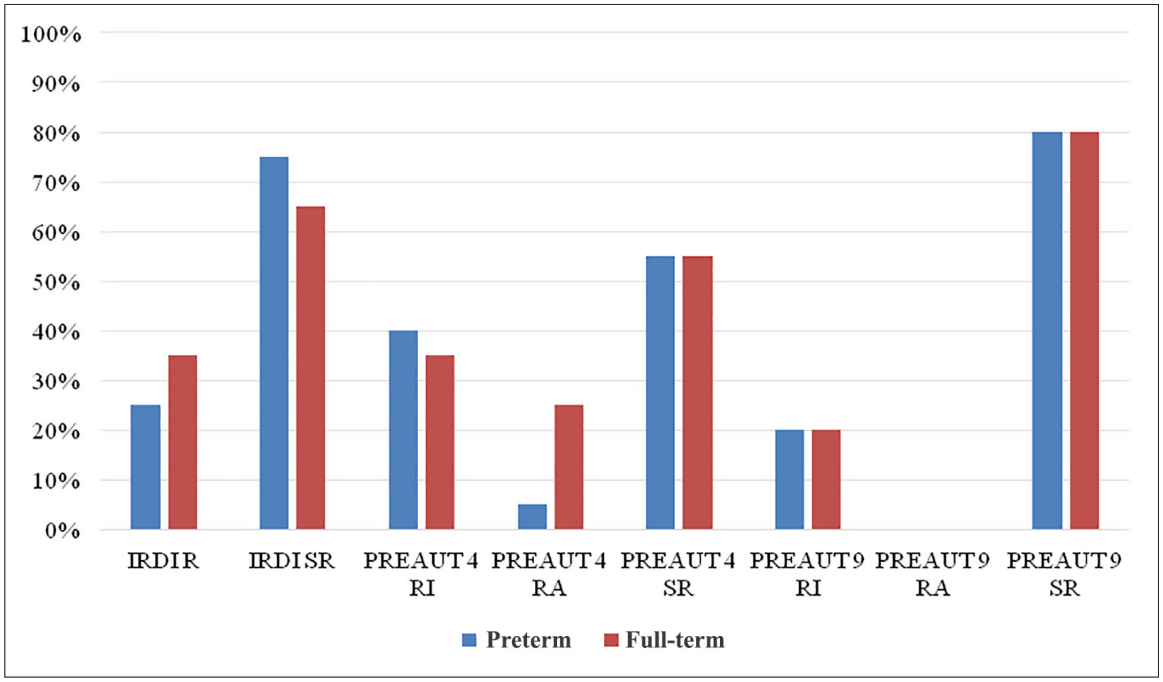
Source: elaborated by the authors
Caption: T: total; RTDP: reactivity to tactile deep pressure; AMF: adaptive motor function; VTI: visual tactile integration; OMC: ocular motor control; RVS: reactivity to vestibular stimulation.

Figure 1 – TSFI results: preterm and full-term infants (n=40)



Source: elaborated by the authors
Caption: Au: auditory; Vi: visual; Ta: tactile; Ve: vestibular; Or: oral sensory

Figure 2 – Sensory profile results: preterm and full-term infants (n=40)



Source: elaborated by the authors
Caption: PREAUT 4: PREAUT at four months; PREAUT 9: PREAUT at nine months; R: risk; WR: without risk; IR: intermediary risk; RA: risk for autism

Figure 3 – Results of assessment protocols for psychic risk identification.

As for the assessment of the IRDI protocol, the majority of infants who had good results in the test also had adequate results in sensory assessments. Only two subjects with alterations in the IRDI had good results in sensory protocols; all others demonstrated alteration in some sensory processing. We emphasize that two infants were not assessed according to the IRDI because they did not attend in the period predicted in the research.

Table 1 shows the results of correlation analysis, considering the protocols indicating psychic risk in relation to the sensory protocols investigated. The focus is on the results that showed significant correlation.

Table 1 – Correlation between psychic risk and sensory protocols of full-term and preterm infants

	Full-term infants			Preterm infants		
	No.	**R**	**p-value**	**No.**	**R**	**p-value**
AP, PS and PREAUT signs – 4th month	20	−0.30	0.196	**20**	**0.57***	**0.008**
AP, PS and PREAUT signs – 9th month	20	−0.34	0.130	20	−0.01	0.936
AP, SP and IRDI	20	−0.08	0.734	18	−0.30	0.215
VP, SP and PREAUT – 4th month	20	0.24	0.307	20	0.24	0.305
VP, SP and PREAUT – 9th month	**20**	**0.45***	**0.044**	20	−0.04	0.848
VP, SP and IRDI	**20**	**0.63***	**0.002**	**18**	**0.65***	**0.003**
TP, SP and PREAUT signs – 4th month	20	0.41	0.066	20	0.11	0.628
TP, SP and PREAUT signs – 9th month	20	0.02	0.927	20	−0.04	0.836
TP, SP and IRDI	20	0.27	0.234	18	−0.36	0.139
VestP, SP and PREAUT signs – 4th month	20	0.03	0.896	20	0.31	0.171
VestP, SP and PREAUT signs – 9th month	20	0.24	0.304	20	0.04	0.862
VestP, SP and IRDI	20	0.11	0.631	18	−0.15	0.539
OSP, SP and PREAUT signs – 4th month	20	0.05	0.827	20	0.35	0.128
OSP, SP and PREAUT signs – 9th month	20	−0.09	0.675	20	0.19	0.402
OSP, SP and IRDI	20	0.16	0.491	18	−0.03	0.878
Total TSFI and PREAUT signs – 4th month	20	0.14	0.547	20	0.36	0.114
Total TSFI and PREAUT signs – 9th month	20	0.30	0.191	20	0.26	0.249
Total TSFI and IRDI	**20**	**0.34***	**0.132**	18	0.24	0.332
TSFI (RTDP) and PREAUT signs – 4th month	20	0.10	0.667	20	0.24	0.293
TSFI (RTDP) and PREAUT signs – 9th month	20	−0.11	0.643	20	0.17	0.471
TSFI (RTDP) and IRDI	20	0.05	0.813	18	0.01	0.957
TSFI (AMF) and PREAUT signs – 4th month	20	0.20	0.376	20	0.44	0.050
TSFI (AMF) and PREAUT signs – 9th month	20	0.19	0.421	20	0.35	0.119
TSFI (AMF) and IRDI	20	0.52	0.017	18	0.10	0.666
TSFI (TVI) and PREAUT signs – 9th month	20	0.11	0.616	20	0.44	0.050
TSFI (TVI) and PREAUT signs – 9th month	20	0.13	0.558	20	0.28	0.230
TSFI (TVI) and IRDI	20	0.27	0.244	18	0.06	0.799

Continues...

Table 1 – Correlation between psychic risk and sensory protocols of full-term and preterm infants

	Full-term infants			Preterm infants		
	No.	**R**	**p-value**	**No.**	**R**	**p-value**
TSFI (OMC) and PREAUT signs – 4th month	20	0.09	0.704	20	0.01	0.946
TSFI (OMC) and PREAUT signs – 9th month	20	−0.16	0.482	**20**	**0.68***	**0.0009**
TSFI (OMC) and IRDI	20	0.27	0.241	18	0.35	0.150
TSFI (RVS) and PREAUT signs – 4th month	20	−0.05	0.820	20	0.37	0.105
TSFI (RVS) and PREAUT signs – 9th month	20	0.21	0.365	20	0.06	0.792
TSFI (RVS) and IRDI	20	−0.00	0.978	18	0.29	0.241

Source: research data.
Caption**:** IRDI: Risk indicators for the Child Development; TSFI: Test of Sensory Functions in Infants; SP: Sensory Profile; RTDP: reactivity to tactile deep pressure; AMF: adaptive motor functions; VTI: visual tactile integration; OMC: ocular motor control; RVS: reactivity to vestibular stimulation; AP: auditory processing; VisP: visual processing; TP: tactile processing; VestP: vestibular processing; OSP: oral sensory processing; No.: number; R: Spearman's rank correlation coefficient; *statistical significance p≤0.05;

In Table 1, for full-term infants, we could perceive that there was significant correlation between the visual processing and the score of PREAUT signs at nine months. The correlation was also significant in intersections between the visual processing of Sensory Profile and IRDI protocol, as well as at intersections made between the TSFI test and the IRDI protocol. Given this, one might think that the way infants behave before visual stimulations of everyday life can be risk indicators to the development and be related to their psychic constitution.

For preterm infants (Table 1), the results indicate significant correlation in intersections between "auditory processing," of the sensory profile, and PREAUT signs, at four months, and in the intersections of the variables "visual processing" of the sensory profile and IRDI protocol. The results of the section "ocular motor control" of the TSFI, when correlated with the PREAUT signs at nine months, indicated statistical significance. Even with the weak correlation, as shown by the table, there is a tendency that infants with greater risk indication in the PREAUT signs also show more sensory difficulties, primarily visual and auditory.

We must emphasize that there was significant correlation between the visual processing of the Sensory Profile and the IRDI, in both preterm and full-term infants. In addition, the relation of the auditory processing with PREAUT signs at four months shows that preterm infants, different from full-term infants, may have some auditory immaturity, which is at the basis of the alterations of their response to PREAUT signs.

Table 2 shows the results considering the gestational age and the time through which the infants was hospitalized in the NICU with the sensory protocols.

Table 2 – Comparison analysis of the sensory performance of pre-term infants who were hospitalized in the NICU (n=11) in relation to those who were not in the NICU (n=9)

	p-value
AP	**0.023***
VP	0.720
TP	0.646
VestP	0.392
OSP	0.788
TSFI – Total	0.208
RTDP	0.720
AMF	0.121
VTI	0.416
OMC	0.883
RVS	0.447

Source: research data.
Caption: TSFI – Total: total result of the Test of Sensory Functions in Infants; SP: Sensory Profile; RTDP: reactivity to tactile deep pressure; AMF: adaptive motor functions; VTI: visual tactile integration; OMC: ocular motor control; RVS: reactivity to vestibular stimulation; AP: auditory processing; OSP: oral sensory processing; VisP: visual processing; TP: tactile processing; VestP: vestibular processing. Mann-Whitney U test; *statistical significance p≤0.05;

Through Table 2, which compares the sensory performance of preterm infants who were hospitalized in the NICU with those who were not, we perceive that those who were hospitalized showed worse performance in the section "auditory processing." From the 11 preterm infants

who were hospitalized in the NICU, 8 had bad scores for the sensory development.

The data obtained through the Denver II Test were intersected with the results of the sensory protocols, but there was no significant correlation between the variables.

We must emphasize that 4 from the full-term infants had concomitant alterations, considering sensory protocols and psychomotor development. The delay of these infants in the Denver II Test was due to aspects related to the language, which indicates a possible connection between sensory contributions and the language evolution in infants.

DISCUSSION

The results of the study showed a tendency of more alterations in preterm infants than in full-term infants, although a significant correlation was not indicated.

Abnormal sensory reactivity is common in preterm infants, since it is associated with factors as brain immaturity at birth and white matter injury, which cause delay in the neurological evolution[9].

The literature states that conditions of biological risk, such as prematurity and invasive procedures (though necessary) conducted in the NICU, can increase the susceptibility to alterations in the neurodevelopment[10,11]. Studies as Cabral's[1] show the impact of procedures conducted in the NICU, emphasizing that the immaturity of the nervous and sensory systems of a preterm infant predisposes him/her to suffer with iatrogenic actions necessary to his/her life[1,10,11].

The procedures conducted in the NICU influence the overall development, determining factors such as the higher or lower activity of the infants and his/her potential of response to stimulations of the environment[1,19]. This may explain the greater number of cases of preterm infants who were hospitalized and showed alterations related to auditory sensory processing, compared to infants who did not need invasive procedures.

A study[20] held in the HUSM, with 1,889 children, pointed the prematurity as Risk Indicator for Hearing Loss (IRDA) of greater occurrence in 30.76% of neonates that had faults in the newborn hearing screening (TAN). In this research, only the infants who passed TAN were included, which does not mean that they did not have alterations in the auditory quality. The characterization of infants' auditory quality was conducted electrophysiological exams, which assessed the central auditory processing, and was subject of another article. Therefore, prematurity as the most important factor for auditory fragility is confirmed in this research, demonstrating that, in addition to hearing assessments, the sensory profile of these infants must be monitored, since the association between obstetrical variables and sensory dysfunctions has been considered relevant in several studies, especially among preterm infants.

The proposal of reflecting on sensory aspects, based on the understanding that an infant is physically constituted in the first years of life, refers to an approach that includes both the assessment of the sensory processing and the motor response, considering the psychic structuring[4]. The infants' ability in organizing their sensory flows when performing motor, cognitive and psychic actions are directly connected to the infants' relationship with the parents and with the environment that surrounds them, considering cultural and social aspects[4].

Infants, in their first years of life, experience a tangle of sensory experiences that must be presented carefully and on a daily basis, taking into account especially the relations established with the mother[21,22] and with the environment of which they are part of[1,12].

In cases of infants with risk for autism, one can formulate the hypothesis that the limitations in the sensory integration complicate the exchanges due to the effort made by the infant, in his/her everyday life, to manage body support, which can complicate the multimodal processing[4]. This fact was proven by studies in which the psychic or development risk was associated with psychomotor alterations[23], acquisition of language and obstetric, socio-demographic and psychosocial variables[13].

Thus, we must consider that the infants' sensory difficulties can be obstacles for interaction when more than one task is required at the same time[4] – for example, to play with a rattle with the mediation of an adult. The infant may not be able to handle the toy while offering it to the mother, for example, since he/she must focus all the attention in performing the action with the object.

These notes, in addition to the correlation between aspects of the visual processing and psychic risk, suppose that autistic children have the so-called "connectivity disorders," whereas the sense organs do not show alterations when performing their function – i.e., sending information from the outside world to the brain[21].

This, together with the effects of prematurity on the auditory pathways, can indicate that the sensory records performed by the infant until four months either were not powerful enough or appeared in excess, to the extent of the infant avoiding the other. As for infants at nine months, since several had already shown no psychic risk of evolution for autism (score less than 5 in PREAUT signs), but rather psychic risk of *non-autistic* type (score between 6 and 14

in PREAUT signs), one might think that several sensory and motor aspects were compensated in five months of experience.

This idea briefly mentioned proposes the reflection on how the sensory integration may unleash not only positive actions, but also negative actions of the mother before the infant's responses, since an inadequate integration on the part of the infant can define altered processing responses of adaptive visual, hearing and motor stimulations. These alterations may undermine the parents to the extent of discrediting the affective investment they offer the child, thus decreasing the pleasurable moments of the everyday relational exchanges[10].

Therefore, the singular assessment of each case is required, and not only the application of protocols on motor and sensory responses and on psychic risk identification. The subjects' uniqueness[23], in addition to the parents' position – who need to find particular sensory ways for early interactions with their infants, especially when there is psychic risk –, indicates the need of thinking on a hypothesis of sensory functioning.

CONCLUSION

Because they are harmful factors to sensory integration, the iatrogenic effects of hospitalization in NICU were pointed as important factors for the assessment of preterm infants.

The identification of sensory deficits has been associated with psychic risk. Significant correlations were found in the comparison of the PREAUT sings and IRDI Protocol with sensory tests, suggesting that both aspects of development should be considered in the early assessment of infants.

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