

Visual - Constructive Dyspraxia of Children with Cleft Lip and Palate

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Abstract

Recent scientific studies highlight the interrelation of craniofacial growth and cerebral development. The cerebral cortex, important for the cognition, is directly related to sensitivity, motricity, and associative areas that command the organization of visual-constructive praxis. The objective was evaluate the neuropsychologic visual-constructive praxis perceptual functions of children with repaired cleft and lip palate. The The method used was 77 subjects, of both genders, 7 to 12 years, with repaired cleft lip and palate participated in the study. The Neuropsychological Assessment - BANI-TS; the Bender Gestalt Test and Raven's Progressive Matrices were utilized. The results of the present study pointed difficulties in the accomplishment of the related neuropsychological tests related to the spatial orientation with a score of 72.7%; in the visual memory for reproduction of arbitrary symbols with 68.8% of correct answers; in the oculo-motor reproduction of structures in space with 66.2%; and, in tasks involving the acoustic-motor organization of rhythmic structures with 57.1%. The related perceptual-visual-motor abilities related to spatial orientation, relative position and construction of angles, had global performances below the average expected for the age, specially in praxis-constructive activities. The present study endorsed significant levels of deficit in the perceptual praxis-constructive neuropsychologic abilities, characteristic of specific cognitive dysfunctions.

Keywords: Neuropsychological; Cleft lip and palate; Children, Dyspraxia; Evaluation

1. Introduction

On the list of congenital defects, Cleft Lip and Palate (CLP) occupies the second position [1], with consequent morbidity and medical, social, psychological, and educational impacts, becoming a challenge for the understanding of aspects that correlated with the development of abilities, fundamental for the adjustment and quality of life of the individual.

The CLP occurs due to an alteration in the fusion of the embryonic face processes and are characterized by a congenital craniofacial malformation due to a partial or total interruption in the continuity of the tissues of the lip and, or palate. According to [2], in Brazil, it affects about one in each 650 living newborn babies.

The malformations are established from the intrauterine life, during the embryonic period and in the fetal period, that is, from the 4th to the 12th gestational week, period in which the palatine processes complete, with their coalescence, the anatomical division between the buccal and nasal cavities and the central nervous system. The etiology of the cleft lip and palate is multifactorial, including genetic and environmental factors [3,4,5].

According to the classification by Spina [2] which uses the incisive foramen as reference point, the CLPs are divided in pre-incisive foramen (they affect the superior lip and/or alveolar rim), post-foramen incisor (only the hard and/or soft palate), trans- incisive foramen (affect the nasal floor, superior lip, alveolar rim, hard and soft palate), and rare face ones.

Recent works described in scientific literature [6,7], highlight that craniofacial growth is directly related to the development of the brain. The interruption of the cellular migration process for the facial development suggests that abnormal cellular migrations can also occur in other areas of the brain development, and insults at early stages of the embryological development, could represent indicators of dysfunctional risks in the cortex.

The areas of the cortex, important for the development of cognition, movement and relations, are the so called projection areas, which are directly related to the sensitivity and motricity, and the association areas which establish connections with the other areas of the central nervous system. Praxis behaviors, resulting from the development of projective areas, involved in the voluntary motricity, without relation with the injuries of the independent system of execution [8]; they are, however, related to the maturation of the central nervous system in the programming, regulation, and verification of the conscious activity, that allows the individual to foresee, to establish plans and to program the execution of a motor activity [8,9].

The visual-constructive praxis terminology relates to the abilities of execution that involve the motor activity, being composed by planning and execution through the motor behavior, which includes from simpler to the most complex tasks [10]. Therefore, the constructive praxis are the gestural capacity to integrate parts that can be concrete or representative, to form significant totalities. They are involved in the notion of intentionality and the search for adequate resources in the spatial-temporal relationship. Its compromised development can cause important repercussions in the organization of the concrete and symbolic reality, including the processes of drawing and writing, which bring negative consequences to the infant development, in the social and academic performance [9]. The cited praxis abilities involve the capacity of topographical orientation, localization of points in space, perception of depth and distance, direction, association of colors, visual synthesis and recognition of faces and differentiation between picture and background [11].

Writing activities, in addition to the symbolic content, need the competency of the mentioned abilities. The school system is increasingly facing pupils who present difficulties in learning to write, which are commonly identified and badly defined in their condition, resulting in negligent attitudes, creating the inevitable stigma of failure. The child with CLP in the learning context, frequently faces prejudice due to their malformation, often times with distortions of the real potential. The identification of specific neuropsychological dysfunctions can contribute with the diagnosis of the affected modality and in procedures focused on rehabilitation, identifying the child's remaining preserved cognitive resources, with or without CLP, and can also make understanding happen in a more adequate and productive manner.

Considering the mentioned aspects, this study had as objective to evaluate the visual-constructive praxis perceptual neuropsychological functions of children with repaired transforamen cleft lip and palate, in a specialized hospital in XXXX

2. Materials and Method

77 subjects, (ethical research procedures, according to CNS 196/96 and CEP/HRAC n° 214/2010-SVAPEPE), of both genders, aged between 7 to 12 years, enrolled in public elementary schools, with repaired transforamen cleft lip and palate, from different regions of the country participated in this study. The inclusion criteria were limited to the participant having the type of clefting chosen, being in the age group of the study and obtaining the average classification (III) or above (II and I) in the mental level screening tool (Raven's Colored Progressive Matrices).

In the neuropsychological evaluation the instruments used were: Raven's Colored Progressive Matrices [12], Bender Visual-motor Gestalt Test [13] and the Neuropsychological Assessment - BANI-TS [14] that investigated the neuropsychological abilities related to the visual and auditory memory functions, visual-spatial perception, oculomotor organization and receptive language. In the analysis of the results, the criterion of 80% attainment on the tasks evaluated in the Neuropsychological Examination was adopted. Bender Gestalt Test was used according to the normative of the instrument and under the perspective of Santucci.

From the data obtained in the subtests of the neuropsychological examination and the visual-motor test, the percentage of correct answers, the group-average and the scores were calculated, which supplied information on the understanding of the resources of the studied population.

3. Results and Discussion

Based on Spearman's conception of intelligence, which used factor analysis and concluded that there was a general factor in the human mental capacity, the present study used an evaluation instrument to investigate the educative capacity in the establishment of visual-spatial relationships, in the resolution of the tasks proposed [15]. The individuals demonstrated analogical reasoning, concrete and abstract, perception of form and deduction, that is, ability to make comparisons and to develop a logical method of thinking, regardless of the information previously acquired, being in an average category with indexes expected for their age.

Alterations in the neuropsychomotor development associated to the maturation can affect the perceptive-motor functions, the psychomotor efficiency, the lateralization, the body schema and the graphical expression of language [16]. The results of the present study pointed difficulties in the accomplishment of the related neuropsychological tests related to spatial orientation (SOr) with a score of 72.7%; to visual memory for reproduction of arbitrary symbols (RAS) with 68.8% of correct answers; to the oculo-motor reproduction of structures in the space (OMS) with 66.2%; and, in tasks involving the motor-acoustic organization of rhythmic structures (MAORS) with 57.1%. The other evaluated functions had to present satisfactory scores in percentage (80% or more correct answers) to be considered as mastered by the child.

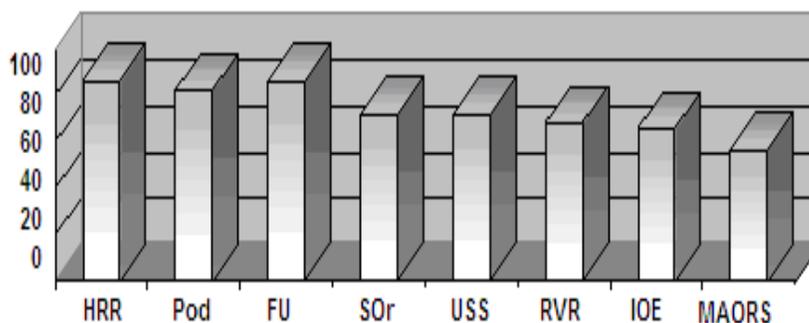


Figure 1: Representation of the Results Obtained in the Neuropsychological Examination

Legend: HRR: Hearing retention and recovery; Pod: perception of objects and drawings; FU: functional understanding; SOr: spatial orientation; USS: understanding of simple sentences; RVR: retention and visual recovery; IOE: intellectual operations in space; MAORS: motor acoustic organization of rhythmic structures.

The present study identified that 60% of the subjects had their performance within the average expected for their age. However, 40% demonstrated compromised performances in the way the perceptual stimuli were structured by the individuals when making the pictures. In the tests that involved perceptual visual-motor abilities related to the spatial orientation, relative position and construction of angles, performance was considered unsatisfactory. For the tasks that did not involve visual-motor constructive abilities, their performance was superior to those that demanded constructive praxis. Thus, the subjects demonstrated compromising of their perceptual visual-motor praxis competency, being 70.1% in relation to the construction of angles, 55.8% in the spatial orientation of the drawing and 66.2% in relation to the relative positioning of the picture on the paper (Figure 2).

	Angles	Spatial orientation	Relative position
Above average	14.9	16.9	6.5
Average	15.0	27.3	27.3
Below Average	70.1	55.8	66.2

Figure 2 - Representation of the Results Obtained in the Perceptual Visual Motor Tests

Considering the premise that the perception and the reproduction of the pictures are determined by biological principles and by sensory-motor action, which vary in function of the developmental standard and maturational level of the individual, as well as, of its functional instability [13,17] the distortions observed in the visual-motor productions of the individuals with cleft lip and palate were indicative of praxis dysfunctions, that is, smaller relation with the global motor function and a bigger one with the lack of integration of the visual stimuli in the oculo-motor graphical construction, whose abilities make the efficient organization of the drawing in the paper possible.

The brain has great anatomical complexity and the organizational principles that conduct its functioning, and from the embryonic stage, develop and lead to an organization that privileges the development and that obeys some principles, such as, the interconnectivity, centralization, neuroaxial hierarchy, laterality, structural and functional specialization, topographical organization and neuronal plasticity [18]. Cleft lip and palate, condition which stems from alterations in the fusion of embryonic facial processes, and that current studies have demonstrated neuropsychological damages, induce questioning as if the malformation would compromise other cognitive abilities, such as the perceptual visual-motor maturation.

In terms of formal learning, the visual-spatial praxis alterations are translated into dyspraxias, with atypical manifestations connected to the graphical act. The performances below average for the age group were compatible with the difficulties of sensory-motor integration of the visual and motor systems, with incorrections observed in imprecise or weak and little controlled lines, or even, extremely strong lines, undifferentiated in their shape and size. In the analysis of the performance of the studied group, disorganization and irregularities in the movement, lack of rhythm in the construction of the graphical signs, compromising the totality of the set or drawing were observed. The incorrect accomplishment of base movements, especially those related to the spatial orientation and sensory-motor integration, which produce aesthetically compromised writing, report to the neuropsychological dysfunction of cortical parietal-cerebellar areas [19].

The problems of language development in children with cleft lip and palate have received less attention from researchers than those related to the voice and articulation [20]. And in regard to other neuropsychological functions (besides language) and school performance, the literature has been significantly more scarce justifying the delays as not inherent to pathology, but questions of familiar and environmental order. If early literature indicates that individuals with cleft lip and palate have the same neuropsychological abilities as an average person, paradoxically, significant difficulties in the perceptual visual-motor construction process were observed, ability which is fundamental for the development of writing and academic abilities.

It is increasingly necessary to understand the importance of the cognitive and praxial resources of the child with CLP, specifically the visual-motor ones addressed in this study, such as interactive activities and those supplementary to the context of educational, social, and cultural activities even with the presence of a craniofacial malformation, as it occurs in the individuals with cleft lip and palate.

4. Conclusion

In this study, the aspects involved in the process of acquisition and development of visual-spatial praxis abilities of children with Cleft Lip and Palate, important for the development of activities of independence in daily life and academic tasks, such as writing, were analyzed. Although literature has proven incipient on neuropsychological findings with this population, the present study demonstrated deficit in the visual-motor perceptual capacity of the studied population in carrying through movements under verbal and visual command.

Performances below average for the age group were compatible with the difficulties of sensory-motor integration of the visual and motor systems. Before becoming automatic, in order for the learned movement to be made correctly, it is necessary that an appropriate knowledge of the body schema be added to the sensory-motor component and of its action in the corresponding space and expected time.

In this sense, what has been considered learning problems for the children with cleft lip and palate, whose craniofacial malformation causes repercussions in the construction of their own image and self-esteem possible is being questioned. However, the evidences presented result from the research methodology adopted, based in contextualized tasks and related to the conceptual bases of Neuropsychology and not justified by the craniofacial deformity presented by the child.

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