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Neuroscience and Cognitive Rehabilitation: The Role of Cognitive Training, Musculoskeletal Therapy in Neuroplasticity Models for Advanced Rehabilitation

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INTRODUCTION

Learning to write requires a good functional, motor, intellectual and level affective and presupposes the knowledge and appropriate use of language. A complex of skills that the subject does not always possess, and which makes him vulnerable to school failure. The state of failure can provoke inattention, demotivation, behavioural disorders with possible manifestations of aggression or apathy. A problem, as we can see, which is not indifferent that worries teachers and parents, who must be directed to find suitable programs to face difficulties, to formulate and define helpful answers. The activity of writing is a learning, but before being a means of intellectual evolution, this learning is in close relationship with neuroprotective behavior-motor. We know that language is prior to graphism and although we do not dwell on this work on language, let's not forget that learning to read and write are based on an expressive language where sound succession and sound quality are important issued. In other words, before learning to read and write, the child must be helped to use as rich a language as possible. In fact, writing and reading are before everything, the means of communication and personal expression. It is a way of expression that they are based on a graphic code, from which it is necessary to find the sounds that bring meaning. They therefore re quire the intervention of two symbolic systems in agreement with each other, one sound, the other graphic. The establishment of the graphic code and its deciphering require, however, the other hand, the intervention of psychomotor functions. It is currently acquired, outside the development of the language and good pronunciation, that the prerequisites belong to the psychomotor field. There writing is primarily a motor learning and the acquisition of th is specific praxis, particularly complex, it requires that the adjustment function be educated. This is why we particularly turn to manual skills that can be developed with experiences of modeling, clipping, and collage, both with dissociation exercises at the level of the hand and fingers, identified as perception exercises of the body that make one intervene in the internalization function. The awareness that intervenes in the adoption of a balanced attitude, allows the release of movements such as, for example, those of the arm, important for writing, such as also in the relaxation of the muscles that do not intervene in the praxia, whose tension

constitutes a disturbance, fatigue. At the same time, certain movement-directing muscles, in particular at the level of the shoulder girdle, must have sufficient strength to support the movement. The set of these needs of decontration or tensioning constitutes the tonic control. It also intervenes in the subtle play of the pressure exerted by the fingers on the writing instrument. Other attentions, for the prevention of graphic disorder, turn to the rhythmicity of the layout, al speed control, perception and mental representation of space, etc., which we will try to analyze. The rhythm of the track and its orientation from left to right they need to be improved through graphic exercises that focus on prescriptive forms. The speed control and the maintenance of its constancy can be obtained through graphic exercises that use pairs in increasing and decreasing series. The mental perception and representation of space are essential in learning writing. The good visualization and fixation of the shapes, and above all the possibility of respecting their shape succession, imply mastery of a fixed orientation, on which the temporal order depends both in deciphering and in production. Graphic design therefore requires a number of skills: global motor skills and fine motor skills, good laterality, symbolic skills, decoding of the verbal message, correct perception, and spatial representation. The evolution of the graphic function, however, is the crowning glory of oculomanual coordination and starts from birth with visual activity and then translates into prehension and manipulation of different objects from the palmar grip to the opposition of the thumb). It is a long one up to 16 months-18 months characterized by exploration of the surrounding environment, in which is the first graphic activity.

Stages of graphism

The origin of the doodle can be found in the many exploration experiences of the environment by the child, in his desire to discover the characteristics of the objects and in his desire to assert himself, to leave "traces". In fact, I attempt by the 6 month-8-month-old baby to trace finger marks on food, on land, on water. The first scribble, intended as a graphic sign, left by a pencil guided by the hand, appears usually around 18 months. It is initially a recreational motor activity: the child does not tend to associate the instrument with the track and the movement that produces it. This first graphic activity is an evolution of manipulation and is located in the stage of "impulsive graphism". There characteristic of this graphic is that it initially solicits the dominant hand and is, therefore, an index of dominance. It is an impulsive path consisting of rhythmic tonic discharges (with a tempo weak and strong) and oriented from left to right for a right-handed, from right to left for a left-handed. Subsequently, when the child has acquired good pr ehension an d ad equate motor efficiency, the eye will follow the hand and then guide it in a vi suomotor integration mo re an d mo re re fined. The scribble ther efore becomes more organized; the ability to inhibit and control movement it allows the passage from the impulsive to the controlled one: we are in the stage of "graphism checked ". This step can be mediated first by activities that involve the use of large surfaces, then smaller surfaces to help understand the contour lines of a figure. The visual control of the outline of a figure brings automation into play of the visual pursuit. During the third year of life, the graphic line assumes the sign value, the child discovers his own personality and can represent the design of the "little man". And starting from this period that graphism brings into play the symbolic function. This stage called representative graphics "(4 years) is the expression of the graphic symbolic function, with elements even ghostly of reality. From this moment, the drawing increasingly manifests the experience lived and is enriched with the cognitive and intellectual maturation, personalizing in relation to the evolution of affectivity. There the next phase is that of "unrepresentative graphism" (5 years) where they are represented plastic objects without reference to reality. This process takes place parallel to knowledge of geometric shapes and the perception of space. It is in this period that you do they offer pre-writing exercises that allow you to coordinate eye-hand movements.

Laterality problems and body pattern orientation

The laterality and orientation of the body pattern are very important for the 5-7 child years that will have to solve numerous difficulties in relation to school learning. We now know that at 4 years of age the preferential laterality of the child is not consolidated, even if not few children reinforce a predominance of the right or left side. The laterality (which stabilizes between 6 years and 8 years) is a function of a dominance that gives one of the hemispheres the initiative of the organization of the motor act that will lead to learning and consolidation of the praxies. It is important that the child organizes his global motor activities on his own and this is the action fundamental education to access a homogeneous and coherent laterality. We said that I 4-year-olds have not yet consolidated a preferential laterality, but under pressure of the educational environment some subjects of this age use the right hand for certain activities, such as the graphical ones, but remain left-handed as regards the directing eye or the foot. The teacher's at titude must therefore be directed towards observation and knowledge of true dominance, though not so much writing tests, which often do not account for the true dominance, but through motor activities in situations of spontaneity. The tests of speed and strength at the level of the upper limbs will be those that allow the teachers to regain genetic dominance. The search for dominance of the lower limbs will then be a confirmation of the results obtained in the tests previous. However, there may be discrepancies between visual dominance and motor dominance. It's here the role of observation is very important: observe the hand chosen spontaneously in the tests of force, the possible contradiction between the launch of force and the launch of precision etc. When there is no hand-eye agreement, a learning phase of the longer writing, completing school work with a specific re-education and a job psychomotor method. The motor problems involved in writing The child who enters the first grade should be characterized by a rhythmic motor skills spontaneous, free and controlled, supported by an attention paid to more and more acquisitions specifications. For many children, however, these skills have not been achieved. The need to improve manual activity, coordination and precision of fine gestures, addresses these children towards a long list of experiences that want to see the subject engaged in modeling, in cutout, in collage, in DIY, in manual and digital exercises with cushions sand, in dexterity exercises, refinement of prehension, etc; as well as exercises aimed at familiarization with the keeping and use of the of the tracer or scriptural tool, such as, for example, graphic exercises to obtain regular and precise paths that are part of the work of eye-manual coordination. The graphic exercises on the prescriptive forms allow the child the acquisition of the rhythm

of the track, an orientation from left to right, as well as constant speed control and maintenance. Furthermore, all these experiences ask to be completed with the perceptive work of dissociation of the fingers which brings into play the function of internalization. It seems unthinkable, however, to want to re-educate the mobility of the fingers before the child has achieved a segmental awareness of the upper limb, in particular of the hand. Internalization is difficult to achieve in children between six and eight years old, so dream of starting to educate the segments that are easier for the child to control. The internalized attention will be directed to the discovery of the movements of the arms, hands and fingers, and control of the hands and fingers on defined positions of the arms and forearms. Subsequently the awareness of the mobility of the body axis (of the spine, head, pelvis, shoulder blades will allow you to better identify movements and achieve one greater independence of the arm in relation to the body axis. This last aspect is a lot important to prevent school deformations, often caused by parasitic school contractions, which constitute real synkinesias during sign-writing figuration. To make the dissociation of movements possible, it is essential to train the child to voluntary relaxation, this means making the child take control first consciously and then unconscious on the degree of tension of his muscles and therefore be able to leave others to rest muscle groups. Relaxation that has as its object tonic control at the level of the upper limb has effects on the ease, ease and speed of the writing movement. While knowing that true relaxation requires a mental level and capable of maturing that is not reached until 7 years-8 years, we are still required to obtain a situation of distension to improve the independence of the arms and torso, hands: "forearms, using the decontrazione". Awareness of the degrees of, muscle tension and, in particular, of decontrazione must be completed then: by a re-education to breathing. The breathing associated as it is with the perception of one's body, calls into play the game of chest and abdomen but also of the internalized attention that controls general relaxation and the segmentary one. The close relationship between breathing and general child behavior pays attention to the education of conscience and the subsequent control of the respiratory act, important elements of body shape education. Awareness will also have to intervene in postural work, an adjustment that is one way essential to work on the tone in a global way. We must not think of the rest, that the child manages to naturally maintain the position of the body because it is an acquisition (that of correct posture) very slow. When the child is confronted with the adjustment graphic the commitment is so broad that it is unable to maintain its position since postural automatisms will not easily come into play; therefore, we will have to work on it in a way particular. From this analysis, it emerged that the motor problems inherent in learning to write in particular, concern some aspects, among which, starting from the last considered, we find the postural adjustment while sitting, important to acquire the best position to be able to to write. segmental relaxatiis on useful for axis stability and upper limb relaxation for graphism. the control of motor skills, in particular that of the hand and fingers, by associating with this is a more targeted work of perception of the proper body that looks at dissociation of the hand and fingers. Perceptual and spatiotemporal problems in learning to write. The writing experience requires the imitation of a movement from left to right with copying of alphabetical symbols in succession among them. Added to this is the need to identify sounds and to combine them with alphabetic symbols, therefore achieve the phoneme / grapheme construct. The evolution in the writing representation also requires the acquisition of an organization space-time that requires the child's understanding of the transition from succession temporal before/after according to the left / right code, necessary for graphic transcription. The assumption of these skills goes through methodical psychomotor work which will allow the subject to deal positively with school learning.

Sounds and perceptions of forms

In written language it is not uncommon to meet children who have perceptual-hearing difficulties, such as to slow down the correct analysis of the sound signals of each letter. The refinement of the perceptive-auditory discrimination ability occurs gradually, through various and frequent opportunities for contact with concrete or figurative reality. Subsequently it does perfect and can be transferred to the conventional symbolic level of the signs of writing. In fact, there are some children who have hearing problems that are not equivalent to deafness: they are children who hear but do not perceive the different phonemes. These uncertainties pose the pupil of faced with a difficulty of perceptual order and another of symbolic order. therefore, it is necessary develop situations that we could define as "noise identification" used in the method Montessori. Next it will be necessary to bring the child to identify the different noises in consecutively, so that memorization can also be developed, an important requirement for learning. the next step will be identification with graphic symbolization: to a specific sound transcription of the graphic code will be requested. At 4 years-5 years old the child is in the Euclidean space stage and moves towards a space geometric with mental representation. It has the different elements as its reference point of space, organized starting from geometric shapes. The recognition of geometric shapes basic, round, square, triangular, etc. it is fundamental to arrive at the graphic transcription. This urges the mental representation of space that has not yet finished at 6 years old which rests precisely on geometric shapes. It is important that the child experience from a point of motor view of these forms and, therefore, first trace geometric shapes with the help of ropes, large squares, large circles and then make the evolutions outside, around or within the forms. These activities are then carried out on an appropriate scale for manipulable and associated forms to graphism. This goal can be completed by learning about signs differently oriented with graphic reproduction and reproduction of other more complete forms deriving from the curve o from the stretch, which were first performed through movement. It is a work made first with models, then by heart. Soliciting memory and discrimination of forms will gradually lead to the structuring of the graphic space, with drawings.