182 - SENSORY INTEGRATION: DIFFERENCE IN PATTERNS CORTICAL WAVE POST-TRAINING IN COMPLEX PSYCHOMOTOR TASK

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INTRODUCTION

Human being can accomplish many kinds of learning of different natures during his hole life, and one that stands out is the driver, it is guaranteed by the integration of various neural processes organizers and managers of motor behavior (TANI, 2005; LENT, 2001; BEAR, CONNORS and PARADISO, 2002; ANNUNCIATO and OLIVEIRA, 2004). This perspective, therefore, establishes a vey important relationship for the discussion of teaching techniques, as well as reference for researches in this area.

The sensory integration is the neurological process that organizes sensations of the body itself in the actions and activities that do routinely adding that all actions not only motor but also the processes of learning and concept formation are dependent on the ability to interpret sensory information (Magalhaes and LAMBERTUCCI, 2001; BALLOUEFF, 2002; BUNDY et al, 2002; BEAR; CONNORS, PARADISO, 2002).

The results of sensory integration stimulate among other things, the development of adaptive responses each time more complex they improve the thick and the thin motor skill and the cognitive performance of language, increasing self-confidence and self-esteem (Magalhaes and LAMBERTUCCI, 2004).

The expected results with stimulation of sensory integration are the increased processing and organization of the sensory afferent central nervous system. Due to this fact, it provides basis to the improvement of the occupational performance manifested by motor skill, academic learning, language, daily activities and personal social abilities. (BALOUEFF, 2002).

Experiences made with rats in laboratory, show that animals raised in enriched environments, full of exciting objects, developed a cerebral cortex thicker compared to those which were raised in poor environment and they were also more limited when compared to those which live isolated. (BEAR; CONNORS; PARADISO, 2002).

Therefore, there is a considerable number of evidences that point out, favorably, to the idea that a sensory integration practice with a high stimuli load, tends to promote more meaningful results than with low load (BEAR, CONNORS, PARADISO, 2002, Magalhaes, 2002, Morris, 1998).

The five sensory systems (auditory, visual, vestibular, proprioceptive and tactile)provide the basis for the development of functional capacities that allow the development of more complex abilities. (MAGALHÃES and LAMBERTUCCE, 2004).

The human being brings all these feelings and it organizes an action plan. Disturbances in the reception and the organization of sensory information received about the world will affect performance in the other areas. When a child does not receive important sensory information in a clear and concise manner, may not be getting the “food” that the brain needs to process the learning (MAGALHÃES and LAMBERTUCCE, 2004;

OLIVEIRA, 2007).

All motor learning, results in changes in neural activity in different brain regions (BEAR; CONNORS; PARADISO, 2002;TANI, 2005; LUFT and ANDRADE, 2006). There are many instruments of investigation about this activity, such as Topography by emission of Positrons (TEP), functional representation by Magnetic Resonance (fRMR) and Optic Image (OI). In the research in Motor Learning, the electroencephalogream (EEG) has been the most widely used because it records the electrical activity and its changes in the brain during the execution of a complex motor task or during its own exercise, with a temporal resolution greater than the other instruments (LUFT e ANDRADE, 2006; MARQUES et al, 2006).

METHOD

Sample

It was used in this study a sample of two seven-year-old twin boys from a specific school in Rio de Janeiro. The project was previously approved by the Ethics in research involving Human Beings of the UCB-RJ (under no protocol 0028 / 2009).

Procedures

-From selecting the sample

After the search has been duly authorized by the Ethics Committee for Coordination and Regional Education (CRE) in Rio de Janeiro, it was making contact with the school board is providing the signature of the information to the institution and Term of Consent for participation in research directed to the legal guardian. The twins were both selected the same series and class. The guardian filled a Neurosemiologic spreadsheet, developed by Dr. Luiz Antonio Ferreira da Silva, CRM 15719-6, making sure that the twins were in perfect neurological health condition to take part of the research.

-From intervention

After the base test the twins attended the training for 30 days in 4 weekly sessions and each session were made three passes through the circuit at a place near the school and a field full of grass. One of the twins accomplished the sensory integration circuit with a load of high stimulus composed of 5 stations and basic motor skills needed to jump rope, attached to stimuli, hearing the whistle (a short whistle to stop and two to continue running the exercise) , visual red ball and one green (when the twin sees a green ball it means he has to stop and the red ball he has to continue the circuit, this command has variations, such as changing the sound of the whistle, or the color of the ball , introduction of the vestibular system (changing the direction or run the route holding a basketball ball), proprioceptive and tactile (barefoot in the grass). The stations were composed of (1) to move a distance in zigzag using 3 cones and barriers, (2) Jumping with both legs simultaneously within 3 hoops arranged sequentially, (3) to move alternating legs to bridge 3 mats arranged one after the other, (4) Skip side with their feet simultaneously, 3 obstacles (cones lying) to return (from right to left and vice versa) and (5) jump on a rope near the ground and supported by two cones, also return. The circuit at low load was composed of the same stations earlier, but with only the auditory stimulus, in other words, the trainer explained the sequence of the circuit and how it should be run each season.

-From data collection

The twins passed through a data collection individually. The pre and post tests were applied by the same person previously trained in the Castelo Branco University Neuroscience Laboratory. When we arrive the place, the twin is sitting on a chair comfortably and, so it was explained all the procedure and after his comprehension, the test was started.

The twins were submitted, analysis of trace electro encephalic, with the objective of verify the cortex map before the intervention of the training. To the analysis it was used an instrument called Procomp+, manufactured by Thought Technology LTD, with a program called Biograph in version 2.1, connected in sensory to electroencephalogram. In the data collecting electro encephalographic was used just one sensor in the Z area, and one sensor behind each ear, it was fixed with gel and hair band. They also took a baseline test by performing a familiarization session with three (3) attempts and a final value from 1 to 6 for complex psychomotor task, jumping rope. Understanding level 1, the condition of jump rope without a result being "burned" in the 1st round of the rope, level 2, when the learner has demonstrated the competence to run from 1 to 5 turns jumping rope, level 3, when performed from 6 to 10 laps following a jump rope, level 4, was assigned to the learner who performed 11 to 20 laps at 5, the student was able to run over 20 laps and jumping rope at 6, had the same capacity from the previous level increased competence in, jump on one foot, skip running a spin around the axis, one hand touching the floor and finally out of the rope still in motion without being "burned." After testing the basic began training with the circuit for 30 days, 4 times a week. Once this step the twins were re-evaluated by checking the advance level and finally subjected to analysis of trace electro encephalic post-training, aiming diagnostic changes in the cortical map.

Data analysis

The data were shown in descriptive projections and later studied by means of inferential statistics. For this, we used the Student t test, with the objective of verifying possible differences between the means of electroencephalographic data obtained in the immediate moments, pre and post-training circuits specific to each twin. The data were obtained corresponding to four patterns of cortical waves, Theta, Alfa, SMR and Beta. These averages were plotted in order to facilitate interpretation of the results of the analysis. Gains in performance of jump rope have been described in relation to quantitative and qualitative standards, made reference to evolution (learning) the experimental task. The index alpha <or = 0.05, reference was set to reject the hypothesis of the study.

RESULTS AND DISCUSSION

Statistics results used to study the data from the tests effectuated in this research are described, in principle, descriptive form and then, based on inferential analysis.

Looking at Figure 1 (below),the twin whit high demand for sensoryintegration (AI) influenced in actived Teta, Alfa and Beta and a decrease in activity Beta characterizing a mental state more concentrated and therefore more attentive to external perceptions (SMR increase and Beta alpha), already decreased as a result of the increase in concentration, while the other twin trained with low sensory integration (BI) in Figure 2 showed increased disproportionately in waves, including a great increase in wave theta, sleep-related activity and stay in the same default previous Beta, characterizing a mental less concentrated activity, less visible external stimulation.

However, there is also that there was a reversal in hemispheric balance when compared among them, the projections of the wave SMR identifying this factor (hemispheric balance). That is, before the specific practice in the circuits, the twin who commits the circuit inherent high load stimuli (AI), showed an average lower than the other twin, the wave SMR, which means a worse basic balance compared to the other twin (BI). Following the practice of multiple sessions on immediate measures, the pattern was reversed, showing the twin AI with a pattern of hemispheric balance lower than the other twin. The same trend occurred in reference to the alpha wave. Considering that this reflects wave relations with learning, it could be explained in relation to this information that, somehow the system of connection between the cerebral hemispheres, twin participant circuit with high levels of stimulation evolved more than the twin with the same system who practiced the simple circuit with low load stimuli.

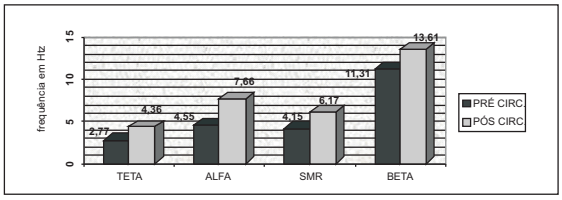

Figure 1. Shows the averages of cortical activity, measured in relation brain waves, immediate moments, pre-(before starting) and post-circuit (after the last session), the twin who participated in high burden of integration (AI).

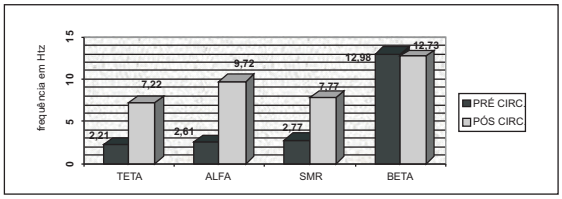

Figure 2. . Shows the averages of cortical activity, measured in relation brain waves, immediate moments, pre- (before starting) and post-circuit (after the last session), the twin who participated in low-load circuit (BI).

This perspective, however, should be viewed with caution, because despite the good quality of the instrument, used in electroencephalography, data associated with this measure reflect the patterns of cortical waves, rather than the functioning of structures, which in some ways are more visible in high-tech instruments such as PET test and / or others in the same line.

Studies indicate that the alpha wave was inversely proportional to activation and is associated with greater synchronization and a small neural effort consequently related to better learning and motor performance (Luft and Andrade, 2006; MARQUES et al, 2006; SIEVER, 2003; HATFIELD et al, 2004, Haufler et al, 2004). The rhythm of SMR wave is directly related to attention, in other words, the onset of SMR activity indicates higher levels of processing attention (LUFT and Andrade, 2006, VERNON et al, 2003).

Regarding the test of averages (Student t test) showed that both with regard to SMR waves on the Alpha, the differences mentioned above were not sufficient to indicate statistical significance in both cases p> 0.05. In any case, those differences are considered appropriate to increase learning found in the test of jumping rope, where the twin who commits the circuit-laden stimuli advanced level 2 for the higher level of performance (level 6). Moreover, the twin burden of which stimulus was low and hence low demand in terms of sensory integration, has not evolved in such mounts, remained at the entry level 3, while increasing the number of executions of the motor task (de 8 to 10 times), meaning that the practice in the circuit of low load stimuli was not sufficient for a significant neuromotor development. Worth resaltar that the twin AI presented Alpha 2nd largest wave, followed by SMR, while the other twin had almost equals the SMR theta, i.e. external stimulation was not as relevant to it. It seems that the twin AI was more balanced Theta level hemisfericamente, with low SMR similar and beta alpha, showing excitement with external activity after the task gain, also seems to have been proportional, perhaps by being more balanced hemisfericamente. Beta decreased because anxiety negative also decreased, excitation, which seems to have predominado was the concentration in the task to be performed (circuit). BI twin already showed an EEG more active, anxious, Theta level is similar to the SMR and alpha, the increase was disproportionately in waves, the external stimulus seems to have diminished the anxiety it. Can be assumed that through the EEG found that rich sensory integration favoured a proportional increase in waves, whilst poor stimulation, the change has been disproportionate

Indeed, these results are consistent with studies of other authors such as Lambertucci & Magalhães (2004); Baloueff (2002), Bear, Connors & Paradiso (2002), Morris (1998) viewing the same perspective related to the integration factor sensory and learning.

CONCLUSION

Considering the results of this research, which are the effects of manipulation of the variable charge of stimuli for sensory integration, one can conclude that the training program with high charge sensory stimulation achieved a major breakthrough in the level of performance compared to the program training of low demand for integration. Although the differences found in the behavior of cortical alpha waves and SMR (p> 0.05) are not sufficient to indicate statistical significance, research now completed adds timely knowledge in terms of mental processing suggesting some possibilities for new ways to teach and rehabilitate people with the systematic use of educational and sensory integration. These findings may be valuable for both health professionals and educators. However, the knowledge generated from this research should not be considered conclusive. Sensory integration, learning and cortical activity are phenomena associated with the organic attributes of man, which were little explored further in terms of research.

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SENSORY INTEGRATION: DIFFERENCE IN PATTERNS CORTICAL WAVE POST-TRAINING IN COMPLEX PSYCHOMOTOR TASK

ABSTRACT

Referenced to sensory integration phenomenon it was investigated a possible relationship between sensory stimulation load and learning rateio of a complex psychomotor task. Sample of two boys, twins, 7 years old. After the task baseline and standard electroencephalographic alpha measures, one of the twins practiced a low stimuli load circuit, and the other a high load one, for 30 days. Statistics of the data pre and post-circuits associated a better performance to the high stimuli load practitioner (P <0.05). Alfas patterns were statistically similar. A better interhemispheric balance measured in one of the twins was discussed as related to his better performance.

KEYWORDS: sensory integration, Psychomotor learning, EEG.

INTÉGRATION SENSORIELLE : DIFFÉRENCE NOUS NORMES DE LA VAGUE CORTICALE PÓS-TREINAMENTO DANS DES TÂCHES PSYCHOMOTRICE COMPLEXE

RÉSUMÉ

Referencialmente au facteur intégration sensorielle s'est enquêté une possible relation d'efficacité entre chargement de stimulation sensorielle et un rateio d'apprentissage d'une tâche psychomotrice complexe. Échantillon de deux garçons, jumelles, 7 ans d'âge. Après mesures de base et de norme eletroencefalográfico, un des jumeaux a pratiqué un circuit avec chargement bas de stimulations et, l'autre, avec chargement haut, pendant 30 jours. Des statistiques des données pré et des pós-circuitos ont associé un meilleures performances au praticien du chargement haut de stimulations (p< 0,05). Des normes Alpha se sont montrées homogènes. Un plus grand équilibre inter-hemisférico, dans un des jumeaux on a discuté à l'égard de meilleure performance de celui-ci.

PALAVRAS-CHAVE : Intégration sensorielle, Apprentissage psychomoteur, EEG.

DE INTEGRACIÓN SENSORIAL: DIFERENCIAS EN LOS PATRONES DE LA ONDA CORTICAL DESPUÉS DEL ENTRENAMIENTO EN TAREAS PSICOMOTORA COMPLEJA.

RESUMEN

De una referencia al factor de integración sensorial investigó una posible relación entre la eficiencia de carga de la estimulación sensorial y el prorrateo de aprendizaje de una tarea psicomotora compleja. Muestra de dos niños, gemelos, de 7 años. Después de las mediciones de referencia y el nivel EEG, uno de los gemelos practicó un circuito con estímulos de baja carga y el otro con carga alta, durante 30 días. Estadísticas de los datos antes y después circuitos asociaron un mejor rendimiento mediante la práctica de alto estímulos de carga (P <0,05). Normas Alphas fueron homogéneos. Una interacción hemisférica más equilibrada en uno de los gemelos se debatió sobre el mejor rendimiento de este.

PALABRAS CLAVE: integración sensorial. Aprendizaje psicomotor. EEG.

INTEGRAÇÃO SENSORIAL: DIFERENÇA NOS PADRÕES DA ONDA CORTICAL PÓS-TREINAMENTO EM TAREFAS PSICOMOTORA COMPLEXA

RESUMO

Referencialmente ao fator integração sensorial investigou-se uma possível relação de eficácia entre carga de estimulação sensorial e rateio de aprendizagem de uma tarefa psicomotora complexa. Amostra de dois meninos, gêmeos, 7 anos de idade. Após medidas de base e de padrão eletroencefalográfico, um dos gêmeos praticou um circuito com carga baixa de estímulos e, o outro, com carga alta, durante 30 dias. Estatísticas dos dados pré e pós-circuitos associaram uma melhor performance ao praticante da carga alta de estímulos (p<0.05). Padrões Alfa mostraram-se homogêneos. Um maior equilíbrio inter-hemisférico, em um dos gêmeos foi discutido relativamente à melhor performance deste.

PALAVRAS-CHAVE: Integração sensorial, Aprendizagem psicomotora, EEG.

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