100 - THE EFFECT OF THE BIOFEEDBACK'S TECHNIC IN THE ATTENTION OF THE YOUTHFUL'S ATHLETES FROM

VALDECI FOZA1,2, DANIEL ZACARON2, CLAÚDIA F. GUARDA2 , EMÍLIO TAKASE1
1Neuroscience's lab of sport and exercise-CENESPE/UFSC Florianópolis-SC, Brasil. /
University of the Serra Gaúcha Caxias do Sul, RS, Brasil - fvaldeci@yahoo.com.br.

Introduction : Investigations about the processes of the attention's influence regarding to the perception of the signs have showed a strong hypothesis of a existence of the two principals ways (connections) of the attention control, one of them is connecting the thalamus, the tonsil, the pariental cortex, and the visual cortex, and the other with neural connections of the thalamus, frontal cortex, parietal cortex and visual cortex. This was is known as a control process from top to down or top-down, It introduces a processing very refined of analyse from stimulus, however with much time to its execution of processing and generations of reply in relation a botton- up. Theses connections can introduce capacity of morphology alteration that It's responsible to change of this function reflecting in the demeanor. Speaking about the process of attention the memory of work, that It's responsible for keeping a stimulate dice for a determinate period of time until that the replies will be begotten of a refined form, It's mentined as a great importance and It's being one of them responsible for the control top-down.

The capacity of modification in the neural morphology as the process of strengthening of neural areas is introduced as a result of exposition to a determinate ambient of a natural form or though of enrichment of the ambient in an artificial form. This factor brought the change regarding to the work of rehabilitation of the nervous sistem and also in the improvement of capacities in healtly people regarding to the improvement of the attention's performance, several works have investigated the effect of the strengthening in the stimulate of an artificial ambient enrichment to people usually show problems of attention, but They aren't normal the conducted works in the improvement of a attention in healthy people, and according to ***Abes*** *(2004),* the capacity of attention in athletes is a determining factor in efficiency of the athlete with regard to the assignment.

In the science of the sport, the research accomplished for Mikheey et al, (2002), with judocas sportmen and Rodrigues, Vickers and Williams (2002), with games of table tennis, They've checked the natural process of the demeanor change provoked for the long exposition regarding to the ambient(specific requests of the sport). At this rate, It was not observed any disquisition that introduced the application from methods of the artificial enrichment, that they would result in the demeanor change not being the exigence regarding to the exercised sport.

On the other hand, the demeanor psychology introduces several technics of congnition's changes and in the demeanor. Between the technics utilized to the apprenticeship and promotion of the neural plasticity we can see the technic of biofeedback that It allows to the fellow making a change in his neural structure and physiological though of an apprenticeship regarding the mechanism of self-control fortifying, so, the ways of action involved in the demeanor process. The technic of biofeedback was already studied with the science of sport regarding the capacity of improvement in physic's order.

So , searching to understand well the hypothesis of exposition to new stimulus and the effect of this change being connected to changes in the demeanor processed in assignment determined, as the innovation of the field training, the supposed disquisition checked in the attention in youthful athletes from field's soccer.

Method : Peolpe have checked 20 fellows of the male sex representing 15 years old, training at about 2 years of soccer, they belong from a same youthful team of field's soccer, with a training diary of 2 hours and with 1 or 2 weekly games. The fellows were separated in 2 groups (G1) the experimental group and (G2) the control group. The groups were submitted to the test proposed for Harris & Harris (1984) of a selective visual attention adapted to a version using the computer by LANESPE/CENESP-UFSC, where there's a destined version to evaluate the visual attention with memory of work(A) and the other does not have it (B).

It was checked the selective visual attention of : a) short duration with memory of work and no memory of work, regarding It consisted in the time of 120 seconds, b) long duration with or no memory of work, that It consisted of the necessary time to effect the remainder of the test before the 120 seconds. It was effected 7 interventions of 10 minutes with an interval of 4/5 days between the interventions. The interventions were effected though of a software named *Mentalgames* (*Audiostroble),* that they consisted in producing control about a stimulate in the web of a computer, commanded though of the skyn (galvanica) reply (SGR), regarding It was collected by the *Thoughtstream 2* equipament and It sends the records of the eletric's flux to the computer. The game proposes 4 stages that tThey would should be surpossed though of self-control if the skyn(galvanica) reply where the 2 first stages the fellow had to decrease the eletric conductibility, the third the fellow had to keep it and the fourth he had to decrease and or augmenting to keep it inside of a scale beginning in elevated value, decreasing and elevating again. To the analyse of dice, It was utilized the statistician package named *BioEstat 3.0.* to the analyse between before or after the test, It was utilized the test named *não- parametrico* from *Wilconox* and the *correspondence* from *Spearman.*

Results : The groups suffered losses of fellows due to transfer of clubs, lesions and expire of agreement, being that : the G1 had a loss of 2 fellows and G2 of 5 fellows. The chart 01 introduces the values of the averages and deviation models of the group G1 and of short and long duration, before and after the test.

Chart 01- introduction of the average of time (s), to the visual search and model deviation from the experimental group (G1) and control (G2), in test of selective visual attention with memory of work (A) and no memory of work (B) in the period of short and long duration before and after the test.

Grupo	Short (before)	Short (after)	Long (before)	Long (after)
G1-A	18,79±8,6	13,29±4,11	8,85±1,78	6,78±1,02*
G2-A	13,12±3,15	13,9±5,79	8,4±2,1	9,01±2,58*
G1-B	24,52±8,33	18,48±12	13,93±1,67	12,14±2,11
G2-B	31,6±16,27	17,94±13,33*	14,82±7,05	10,89±3,93*

*They are significant differences to the statistics

To the test B in the G1 It wasn't observed any differences, however in this test there was a fellow that showed discrepant values in both periods, being that the exclusion this fellow the average of time to the visual search lessened to 15,4s in the period of short duration and 11,7s to the period of long duration, introducting so, a significant value of p< 0,05 between before or after the test with memory of work against no memory of work showing a change of demeanor in the experimental group, however this change does not happen in the control group. The demeanor of the correspondences between the two tests (A and B) are introduced in the figure of :

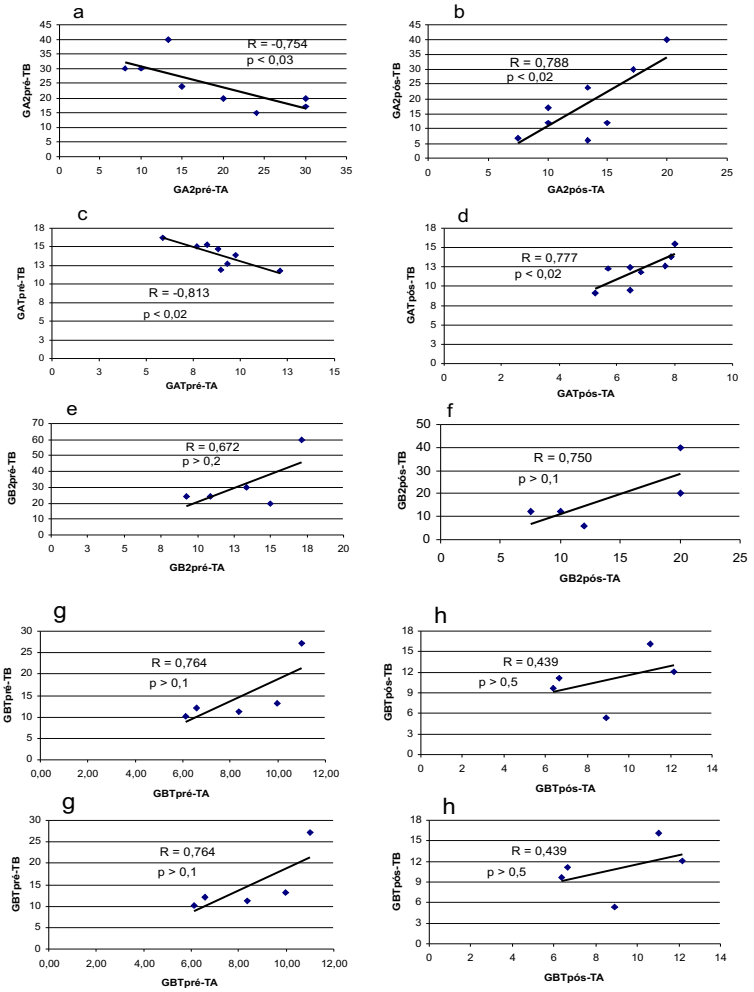

Figure 01 - Connection between the values selective visual attention of short duration from the test with memory of work (GAZ- TA) against test no memory work (GAS2 TB) of the experimental group, a) before the test and b) after the test. Connection between the memory of work (GBS2 TB) of the control group: e) before the test and f) after the test. Connection between the values of the selective visual attention of long duration from the test GBT- TA against GBST- TB of the control group: g) before the test and h) after the test

Discussion : regarding the results found with the two tests of selective visual attention, the significant differences obtained for both the groups (in the experimental group together in the test with memory of work and in the control group together to the test no memory of work). They could be maintained initially for the results of the effected works from *Biernaskie & Covbett (2001), Graybiel (2004)* and *Dan &* neural sistem in changing or creating new sinapticas connections. According to the authours, the neural system introduces a capacity constant of change of neural order and of neural connection, they are produced by the stimulus that came from the ambient or the processes that are induced as an artificial and It would be theses changes the responsible for our apprenticeship, memory and demeanor.

This way, the significant differences found in the statistics in the experimental group, but not in the control group, in the selective visual attention of long duration between before and after the test (A) (with memory of work), They can be explained for the strengthening for the neural sistem of the frontal cortex that is responsible for the memory of visual work, control of the emotion stimulus and taken of decision of an origin named *top-down.*

The involvement of the frontal cortex in the control of the RGP's action was documented from the work of *Chitchle et al. (2002*), where It observed a strong drive of the frontal cortex preceding to the RGP's stimulus and from *Bechara* (1999), *Bechara* (2000), *Dan & Lisman* (2003) and *Praamstra et al.* (2005), they observed that the frontal cortex is responsible for the process of top-down, regarding It produces a voluntary control concerning several cerebral areas and *Li et. Al (2004)* told about it in his disquisition about the visual perception the sistem named *top-down* influences directly in the primary visual cortex though of strengthening of chosen beforehand stimulus.

There haven't been any changes the significant change in the selective visual attention of chort duration can be connected with the capacity of exchange of attention, where some fellows from the experimental group could to need for mote time to the adaptation og the responsible sistem for this process, so the attribute of biological individuality from every fellow to an adaptation of the neural process that It was requered the results obtained together the tests(no memory of work), they showed some significant changes just in the control group, theses changes can be connected in the exigences provoked for the activities effected for the specify training of soccer, once that before the tests, It was effected in the end of the basic stage and in the beginning the specify stage of training and the intervention and after the tests, It was effected after the participation of training from the specify stage and games of official's competitions. So ,the results proposed that the improvement was provoked for an increase : a) in the capability of stimulus captation thru periferic zones of the eye (cellular hypertrophy synaptic) and strengthening of the involved onnection, b) in the structure of the side Geniculado nucleus of the thalamus, c) in the retinitópico map in the superior colículo, d) in the visual cortex and pariental and e) in the motora reply of the eye(sacadico movement of search.

This hypothesis is according to the results introduced for : a) *Serences et al,* (2004), regarding an increase of the antecipated activation from the retinotópico neural system in the spatial selective visual search with the results from *Easey et. al., (2000),* regarding the differentation of drive of lateral geniculado nucleo depending of the selective visual attention ; c) the observation that were found for *Delorme et al. ,(2004)* regarding to the antecipation if the drive form the parietal cortex in the generation of the selective visual attention of search ; d) with the Driver and *Mattiengey's dice(1998)* regarding the importance of the parietal cortex in the selective visual attention, and e) with the results from *Freeman, Sagi* & *Driver (2001)* that they showed the importance of the peripheral vision in the search and perpection of stimulus in the visual field.

The dice of the supposed disquisition are also according to the results introduced for : a) *Saenz, Buracas* and *Boynton (2002),* regarding the global search effected mainly by the peripheral vision as a determining factor to the

strengthening and focalizing in the attention to the place of action ; b) with the results from *Ross & Ma- Wyatt (2004),* they showed that the sacadico movement younder to increase the visual perception is necessry to the continuity of the perception and to elevate the strengh of stimulus about the action of attetion ; and c) *Astafiev et al. (2004),* that they represented the selective visual search being a product of an connection from neural areas contained in the occipital cortex, temporal, cells of the eye and motor sistem responsible by the movement of the eye and they represented adaptation regarding its exigence to the ambient.

This way, It's believed that the changes happened in the results obtained together to the test B in the control group, It'll be connected to a strengh hening of the bottom-up neural regarding to the works up mentioned. This hypothesis still has the support in the results from *Dan & Lisman (2003)* regarding to the visual system being organized with hierarchy and It's formed from two big principal ways processing informations, an original one top-down and the other bottom-up. Regarding the capacity of change from the neural system to the exigences of the Physical exercise, the dice of the control group in the test B have a support in the works from *Praag*, *Kempermann & Gage (1999),* together to the process of proliferation and neural neurogênese in mice submettided to the Physical exercise, as well as the results with human introduced for *Mikheev et al ;, (2002),* where It was observed changes in the dominion of the cerebral hemispheres in judocas with a long period of practice, and also with *Rodrigues, Vickers, and Williams (2002*), that they observed some changes in the visual capacity and cognitivas in tables of tables tennis with a long period in practice. Although of the disquisitions have showed that these cognitivas have happened just in athletes with a big period practising of sport, it's believed that there were differences in a short period of time, but the authors did not check the fellows with a short time of practice regarding to fellows that do not practice sports.

Failing of significant differences in the experimenatl group together to the test B can be connected that the two fellows from this group did not have an improvement(one of them with a long duration), They both neutralized the meaning of the statistician test. This observation can be explained for : 1) biological individuality of the fellows that they could need of more time in adaptation, or 2) in the period of realization after the test any kind of internal or external factor can be injured the discharge. However, with the same dice adjusted no present the discrepant values from theses fellows, the values showed with a margin of improvement regarding to the control group.

The dice, regarding the connection of the fellows between the test A against the test B (figure 01), They showed that the experimental group proposed a significant change in the test A against the test B to before and after the test, the same wasn't observed in the control group. The changes that were observed say regarding in the connection that in the most of the fellows that were skillful detecting the assignment in the test A as well It was in the test B after the intervention, this factor did not happen in the control group. The values of the control group in the analyzed experimental test with all the fellows when they started the disquisition showed that the loss from the fellows did not make a significant distinguished change in the correspondence between the test with or no memory of work, where the line got postive and there's no a significant value. This factor comes to reinforce the support of the analyse from the dice that there wasn't a change inside the control group.

These results suggest that the intervention provoked a change in the dominion of the selective visual attention in the experimental group of origin top- down, however because the short space of time, these effects did not show a similar increase to the provoked for the connection top-down in the control group regarding to the test B. This delay in the assimilation of the process named top-down together to the selective visual attention is according to what *Sunna & Zhangh (2004)* showed about it, regarding the time of apprenticeship long necessary for this system whrn It was compared to the bottom-up ; that It introduces a plasticity more agile. And they are also according to the introcuded information for the disquisitions form Delorme & col *(2004*) and *Suna & Zhangh (2004),* regarding the presence of neural bases in origin top-down in the cognitiva change in a demeanor.

Conclusion : The present disquisition, though of the obtained results, It conclued the following : a) the training of biofeedback is able to provoke changes in the system of selective visual attention, b) the changes happened with more intensity in the selective visual attention with the utilization of the work's memory , that It takes believing a large participation and plasticity of the top-sown system of control in the selective visual attention, c) the training of biofeedback was able to provoke a change in the demeanor of the line between selective visual attention against no memory of work , It's showing a change in the demeanor of action in the attention.

Bibliography

1 Abes, L. O. (2004). Diferença entre o foco de atenção interno e externo, freqüência cardíaca e desempenho no primeiro saque de tênis em jogadores iniciantes, intermediários e avançados. Dissertação Mestrado: Programa de Pós-graduação em Psicologia, Departamento de Psicologia, Universidade Federal de Santa Catarina.

2 Astafiev, S. V., Stanley, C. M., Shulman, G. L. & Corbetta, M. (2004). Extrastriate body area in human occipital cortex responds to the performance of motor actions. N. Neurosc., 7 (5): 542-548.

3 Bechara, A. , Damasio, H. & Damasio, A. R. (2000). Emotiom, decision making and the orbitofrontal córtex. Cerebral Cortex, 10: 295-307.

4 Bechara,A., Damasio,H., Damasio,A. R.& Lee, G. P.(1999). Different contributions of the human amygdala and ventromedial prefrontal córtex to decision-making. J. of Neur., 19(13): 5473-5481.

5 Bechara, A., Damásio, H., Damásio, A. R. & Lee, G. P. (1999). Different contributions of the human amygdala and ventromedial prefrontal córtex to decision-making. J. Neur., 19: 5473-5481.

6 Biernaskie, J. & Cobertt, D. (2001). Enriched rehabilitative training promotes improved forelimb motor function and enhanced dendritic growth after focal ischmic injury. The Journal of Neuroscience, 21 (14): 5272-5280.

7 Birbaumer, N. & Flor, H. (1999). Applied psychophysiological regulation. Applied Psychophysiological and Feedback, 24 (1): 1-3.

8 Casey, B. J., Thomas, K. M., Welsh, T. F., Badgaiyang, R. D., Eccard, C. H., Jennings, J. R. & Crone, E. A. (2000). Dissociation of response conflict, attentional selection, and expectancy with functional magnetic resonance imaging. PNAS, 97 (15): 8728-8733.

9 Critchley, H. D., Elliott, R., Mathias, C. J. & Dolan, R. J. (2000). Neural activity relating to gereration and representation of galvanic skin conductance response : a funcional magnetic resonance imaging study. The Journal of Neuroscience, 20 (8): 3033-3040.

10 Dan, G. & Lisman, J. (2003). Cognition by top-down and bottom-up processing in cortex: o control of selective attention. Neurophysiology, 90: 798-810.

11 Dan, Y. & Poo, M. (2004). Spike timing-dependent plasticity of neural circuits. Neuron, 44:23-30.

12 Derlome, A., Rousselet, G. A., Mace, M. J. M. & Fabre-Thorpe, M. (2004). Interaction of top-down and bottom-up processing in fast visual analysis of natural scenes. Cognitive Brain Research, 19: 103-113.

13 Driver, J.& Mattingley, J.B. (1998). Parietal neglect and visual awareness. N. Neur., 1(1): 17-22.

14 Farah, M. J., Illes, J., Cook-Deegan, R., Gardner, H., Kandel, E., King, P. Parens, E., Sahakian, B. & wolpe, p. r. (2004). Neurocognitive enhancement: what can we do and what should we do? Nature Neuroscience Reviews, 5: 421-426.

15 Freeman, E., Sagi, D. & Driver, J. (2001). Lateral interactions between targets and flankers in low-level vision depend on attention to the flankers. Nature Neuroscience, 4 (10): 1032-1036.

16 Graybiel, A. M. (2004). Network-level neuroplasticity in cortico-basal ganglia pathways. Parkinsonism and related disorders, 10: 293-296.
17 Johnson, J. T.., Johnson, B. F., Doyle, J. A., Higbie, E. J., Moore, G. E. & Tis, L. L. (2002). The effects of a biofeedback device on lifting posture: a biomechanical assessment. Medicine Science in Sports Exercíce, 34 (5): Suplement 1: S215.
18 LeDoux, J. (1998). O cérebro emocional: os misteriosos alicerces da vida emocional. Trad. Santos, T. B., 2 ed., Rio de Janeiro: Objetiva.
19 Li, W., Piëch, V. & Gilbert, C. D. (2004). Perceptual learning and top-down influences in primary cortex visual. Nature Neuroscience, 7 (6): 651-657.
20 Mikheev, M., Mohor, C., Afanasiev, S., Landis, T. & Thug, G. (2002). Motor control and cerebral hemispheric specialization in highly qualified Judo wrestlers. Neuropsychology, 40: 1209-1219.
21 Moleiro, M.Á. & Cid F.V. (2001). Effects of Biofeedback Training on Voluntary Heart Rate Control During Dynamic Exercise. Applied Psychophysiology and Biofeedback, 26 (4): 279-292.
22 Praag, V., Kempermann, H. & Gage, F. H. (1999). Running increases cell proliferation and neurogenesis in the adult mouse dentate gyrus. Nature Neuroscience, 2: 266-270.
23 Praamstra, P., Boutsen, L. & Humphreys, G. W. (2005). Frontoparietal control of spatial attention and motor intention in EEG. Journal Neurophysiology, 94: 764774.
24 Rodrigues, S. T., Vickers, J. N. & Williams, A. M. (2002). Head, eye and arm coordenation in Table Tennis. Journal of Sports Sciences, 20: 187-200.
25 Ross, J. & Ma-Wayatt, A. (2004). Saccades actively maintain perceptual continuity. Nature Neuroscience, 7 (1): 65-69.
26 Saenz, M., Buracas, G. T. & Boynton, G. M. (2002). Global effects of feature-based attention in human visual cortex. Nature Neurocience, 5 (7): 631-632.
27 Serences, J. T., Yantis, S., Culberson, A. & Awh, E. (2004). Preparatory activity in visual cortex indexes distractor suppression during covert spatial orienting. J. Neurophysiology, 92: 3538-3545.
28 Suna, R. & Zhangb, X. (2004). Top-down versus bottom-up learning in cognitive skill acquisition. Cognitive Systems Research, 5: 63-89.
Key words: Biofeedback , soccer field, cognition and attention

THE EFFECT OF THE BIOFEEDBACK'S TECHNIC IN THE ATTENTION OF THE YOUTHFUL'S ATHLETES FROM

Abstrat

Objective: Checking the tecnic's application of the biofeedback about the attention of the youthful's athletes from field's soccer, 20 fellows, male, 15 years old that belong from the same team, a daily training of 2 hours and middle weekly games. They are separated with uniformity: (G1) experimental group, (G2) control . It was utilized the Harris & Harris' test (1984). It was checked the visual selective attention from a duration short with a memory of work (AVMTT) and no memory of work(AVT.). Seven interventions about 10 minutes. They are perfomed though of a softaware named *Mentalgames* (Audiostrobe), that consisted in control about a stimulate in the computer, They are commanted though of the skyn galvanization reply(RGP). To the analyse between dust and after the test, It was utilized the test from *Wilconox* . The results of the experimental group to the AVMT2 of 18,8+86s and 13,3+4,1s, to the AVMTT of 8,9+ 1,8s and 6,7+ 1s, to the AV2 of 24,5+ 8,3s and 18,5+ 12s and to the 13,93 +1,7s and 12,1 +2,1s to before and after the intervention, respectively. Just in the values of the AVMTT proposed a significant difference. The results of the control groups : to the AVMT2 of 13,1 + 3,2s and 13,9 + 5,8s , to the AVMT2 of 8,4 + 2,1s and 9+ 2,6s, to the AV2 of 31,6+ 16,3 s and 17,9+ 13,3s and to the AVT of 14,8 +7s and 10,9 +3,9s to after and before of the intervention, respectively. There were differences between in the values AV2 and AVT. The analyse of *Correspondence from Spearman* showed a significant change in the demeanor just from the experimental group of the after and before the test. Conclusion : the tecnic of the biofeedback is able to change and or developing the processes of the selective visual attention.

L'EFFET DE LA TECHNIQUE DE BIOFEEDBACK DANS L'ATTENTION DES JEUNES ATHLÈTES DE FOOTBALL.

RÉSUMÉ : Le biofeedback est une technique cognitive de modification du comportement par l'apprentissage volontaire, qui est nommé auto-régulation, sur les processus physiologiques. Cette étude a eu l'objectif d'investiguer l'application de la technique de biofeedback dans l'attention des jeunes athlètes de football. L'étude a eu la participation des 20 sujets du sexe masculin à l'âge de 15 ans, qui étaient intégrants d'une même équipe et qui avaient plus de 2 ans de pratique, 2 heures d'entraînement par jour et 1 ou 2 jeux hebdomadaires. Ces sujets ont été répartis aleatóairement en deux groupes: (G1) le groupe expérimental et (G2) le groupe contrôle. Les deux groupes ont été soumis au test d'attention visuelle sélective proposé par Harris & Harris (1984). L'attention visuelle sélective de courte durée a été investiguée avec la mémoire de travail (AVMT2) et sans la mémoire de travail (AV2), l'attention visuelle sélective de longue durée a été aussi investiguée avec la mémoire de travail (AVMTT) et sans la mémoire de travail (AVT). Sept interventions de 10 minutes ont été accomplies dans la période de 6 semaines par un logiciel nommé «mentalgames» (Audiostrobe®). Sa fonction est de reproduire le stimulus dans l'écran d'un ordinateur commandé par la réponse galvanique la peau (RGP) qui a été rassemblée par le matériel ThoughtStream2®. Le jeu était constitué de quatre phases qui devraient être vaincues. Le paquet statistique BioEstat 3.0 a été utilisé pour analyser les données. Pour analyser la période de pré et post-intervention, il a été utilisé le test non-paramétrique de Wilcoxon. Les résultats du groupe expérimental: pour AVMT2 de 18,8+8,6s et 13,3 +4,1s, pour AVMTT de 8,9+1,8s et 6,7+1s, pour AV2 de 24,5+8,3s et 18,5+ 12s et pour AVT de 13,93+1,7s et 12,1+2,1s pour la pré et la post-intervention respectivement. Seuls les valeurs d'AVMTT ont présenté la différence considérable entre le pré et le post-test. Les résultats du groupe contrôle: pour AVMT2 de 13.1+3,2s et 13,9+5,8s, pour AVMTT de 8,4+2,1s et 9+2,6s, pour AV2 de 31,6+16,3s et 17,9+13,3s et pour AVT de 14,8+7s et 10,9+3,9s pour la pré et la post-intervention respectivement. Ils ont été trouvés des différences dans les valeurs du pré et du post-test dans AV2 et AVT. L'analyse de corrélation de Spearman a démontré un changement considérable dans le comportement du groupe expérimental entre le pré et le post-test. Le même résultat n'a pas été observé dans le groupe contrôle. D'après les résultats atteints, il a été conclu que la technique de biofeedback est capable de modifier et/ou développer les processus d'attention visuelle sélective.
Mots-clés: Biofeedback, Football, Cognition et Attention.

EL EFECTO DE LA TÉCNICA DE BIOFEEDBACK EN LA ATENCIÓN DE LOS JÓVENES ATLETAS DE FÚTBOL.

RESUMEN

Este estudio tuvo el objetivo investi de la aplicación de la técnica de biofeedback en la atención de los jóvenes atletas de fútbol. El estudio tuvo la participación de los 20 temas del sexo masculino en la edad de 15 años, que eran integrales de un mismo equipo y que tenían más de 2 años de práctica, 2 horas de impulsión al día y de 1 ó 2 juegos semanales. Estos

temas se distribuyeron aleatóairement en dos grupos: (G1) el grupo experimental y (G2) el grupo controla. Se sometió a los dos grupos a la prueba de atención visual selectiva propuesta por Harris y Harris (1984). La atención visual selectiva de corta duración investiguée con la memoria de trabajo (AVMT2) y sin la memoria de trabajo (AV2), la atención visual selectiva de larga duración también investiguée con la memoria de trabajo (AVMTT) y sin la memoria de trabajo (AVT). Se realizaron siete intervenciones de 10 minutos en el período de 6 semanas por un programa informático nombrado "mentalgames" (Audiostrobe®). Su función es reproducir el estímulo en la pantalla de un ordenador encargado por la respuesta galvánica la piel (RGP) que ha sido reunida por el material ThoughtStream2®. El juego estaba constituido por cuatro fases que deberían superse. El paquete estadístico BioEstat 3.0 se utilizó para analizar los datos. Para analizar el período de prado y post intervención, se utilizó la prueba no paramétrica de Wilcoxon. Los resultados del grupo experimental: para AVMT2 de 18,8+8,6s y 13,3 + 4,1s, para AVMTT de 8,9+1,8s y 6,7+1s, para AV2 de 24,5+8,3s y 18,5 + 12s y para AVT de 13,93+1,7s y 12,1+2,1s para el prado y la post intervención respectivamente. Sólo los valores de AVMTT presentaron la diferencia considerable entre el prado y la post prueba. Los resultados del grupo controlan: para AVMT2 de 13.1+3,2s y 13,9+5,8s, para AVMTT de 8,4+2,1s y 9+2,6s, para AV2 de 31,6+16,3s y 17,9+13,3s y para AVT de 14,8+7s y 10,9+3,9s para el prado y la post intervención respectivamente. Se encontraron de las diferencias en los valores del prado y la post prueba en AV2 y AVT. El análisis de correlación de Spearman demostró un cambio considerable en el comportamiento del grupo experimental entre el prado y la post prueba. El mismo resultado no se observó en el grupo controla. Según los resultados obtenidos, se concluyó que la técnica de biofeedback es capaz de modificarse y/o de desarrollar los procesos de atención visual selectiva.

Palabras clave: Biofeedback, Fútbol, Cognición y Atención.

O EFEITO DA TÉCNICA DE BIOFEEDBACK NA ATENÇÃO DE ATLETAS JUVENIS DE FUTEBOL DE CAMPO

Resumo

Objetivo: investigar a aplicação da técnica de biofeedback sobre a atenção de atletas juvenis de futebol de campo. 20 sujeitos, masculino, 15 anos, integrantes de mesma equipe, treinamento diário de 2 horas e 1/2 jogos semanais. Distribuídos randomicamente: (G1) grupo experimental, (G2) controle. Utilizou-se o teste de Harris & Harris (1984). Investigou-se a atenção visual seletiva de curta duração com memória de trabalho (AVMT2) e sem memória de trabalho (AV2), e de longa duração com memória de trabalho (AVMTT) e sem memória de trabalho (AVT). Sete intervenções de 10 minutos, realizadas através de um software denominado mentalgames (Audiostrobe®), o qual consistiam em controle sobre um estímulo no computador, comandado através da resposta galvânica da pele (RGP). Para a análise entre pré e pós-teste utilizou-se o teste não-paramétrico de Wilcoxon. Os resultados do grupo experimental: para a AVMT2 de 18,8±8,6s e 13,3 ±4,1s, para a AVMTT de 8,9±1,8s e 6,7±1s, para a AV2 de 24,5±8,3s e 18,5± 12s e para a AVT de 13,93±1,7s e 12,1±2,1s para pré e pós-intervenção, respectivamente. Apenas os valores da AVMTT apresentou diferença significativa. Os resultados do grupo controle: para a AVMT2 de 13.1±3,2s e 13,9±5,8s, para a AVMTT de 8,4±2,1s e 9±2,6s, para a AV2 de 31,6±16,3s e 17,9±13,3s e para a AVT de 14,8±7s e 10,9±3,9s para pré e pós-intervenção, respectivamente. Foram encontradas diferenças nos valores AV2 e AVT. A análise de correlação de Spearman demonstrou uma mudança significativa no comportamento apenas do grupo experimental do pré para o pós-teste. Conclusão: a técnica de biofeedback é capaz de modificar e/ou desenvolver os processos de atenção visual seletiva.