

99 - ENTRAINMENT BRAIN WAVES (BWE): A LITERATURE REVIEW ON THE EFFECTS OF PHOTIC AND AUDITIVE SYNTHESING IN VARIANTS OF MOTOR AND COGNITIVE BEHAVIOR HUMAN

¹BIANCA KALIL DE MACEDO JAKUBOVIC,

²CARLA DA SILVA REIS,

³GISELE VIEIRA,

⁴CARLOS MAGNO MONTEIRO,

⁵VERNON FURTADO DA SILVA

^{1,2,3,4}Laboratório de Neuromotricidade Universidade Castelo Branco –RJ/ Rio de Janeiro / Brasil

⁵Coordenador do Laboratório de Neuromotricidade da Universidade Castelo Branco-RJ/ Rio de Janeiro / Brasil

¹ e-mail: bia.jakubo@gmail.com

² e-mail: reiscarla@ig.com.br

³ e-mail: giselefisio04@hotmail.com

⁴ e-mail: carlos.magno.silva@uol.com.br

⁵ e-mail: vernonfurtado2005@yahoo.com

INTRODUCTION

The stimulation by light and sound, or visual stimulation, consists in changes on the pattern of brain waves using photic and auditory stimuli, which alters the individual's mental state. In other words, after a certain time of stimulation (10 minutes), the stimulus will cause the brain resonate in this frequency, changing the whole physiology of cerebral¹. The entrainment of Brain Waves by Means of Light and Sound is called the BWE Brain Wave Training, is also known for Audiovisual Training (AVE / AVS), and brain stimulation through Light and Sound, among others.

Most people believe that training brain wave by repetitive pulses of light and sound is a new technology. But the history of training the brain wave by visual excitement can be found in the early days of human evolution, when our ancestors made fire to keep warm. This activity, besides making them aware of the flames of fire, led to the experiences associated with beliefs religiosas². Today, photic and auditory stimulation has been used aiming to change the mental, motor, cognitive and psychological processes.

The first device designed to artificially produce this type of stimuli was called Brain Wave Synthesizer and was invented in the 70s in California, while the first handset with the same purpose was developed in 1980 in Belgium, which has since been used by the medical professionals in the U.S., Japan and Europe for treatment and prevention of diseases and to promote relaxation¹.

This study is a bibliography of publications on AVE, aiming investigate the emergence of this technique and to raise the existing literature presents results in the direction that this technique is effective in terms of improved prospects related to the motor, cognitive and psychological systems.

METHODOLOGY

This study was based on analysis of 29 articles and books registered in the databases Pubmed and BIREME, 1934 until 2009, since it was aimed, too, the presentation and analysis of old articles that could point the point where initiated the development of technical AVE. Among the items studied, it was found that some have discussed the influence of this technique in learning skilled cognitive motor (2), while others investigated the effects of AVS on physiological parameters of human performance (1), the events of the implicit cognition events working memory, focused attention and reaction time (1). Other articles dealt with events related to human health and the use of AVS in diseases such as migraine (1), fibromyalgia (1) alzheimer (1), hypertension (1), hiperatividade and attention deficit (1) children, behavioral disorders (1), bruxism (1), other cases dental (2) and seasonal affective disorder (1). Regarding the theoretical framework of instrumental base inherent in the use of the technique, it was necessary to study material that reflect knowledge about the relationship between brain waves and hemispheres (2), the base of the AVS technology, (1) its historical and physiological mechanisms (1), compared with the technique of EEG (electroencefalogram) (3) and cortical changes produced as a result of the interaction of the retina with visual stimuli (1), and studies on hypnotic induction (3), the effect of AVS on anxiety in dental procedures (1), in depressed subjects who suffer falls (1) and motor reaction time of athletes (1).

HISTORY

The first documented trial, known as photic excitation was performed by Ptolemy in AD 200, who noted that by rotating one wheel in front of the sun had an apparent immobility of the spokes of the wheel when it turned at a certain speed, it also realized that the flashing light caused the color patterns changed before his eyes. This phenomenon of fusion of flickering light was established in 1834-1835 by the English and Belgian Talbot Highlands, who observed that healthy people and sick people saw this flashing light at a frequency diferente¹.

Some years later, at the turn of the century. Century, the French psychologist Pierre Janet, the Salpetriere Hospital in France, noted a reduction in hysteria and an increase in relaxation when exposed patients to flickering light in a spinning wheel illuminated by a kerosene lantern. This was the first report of clinical application that uses brain wave training (BWE) as a tool of treatment^{2,3}.

After the discovery of Berger in 1929 that electrical brain activity could be recorded through a device called an electroencefalogram (EEG), it's easy to understand the different types of brain waves and assign them to different states of consciousness through the electrodes placed on the scalp. The alpha rhythm was the first rhythm of human brain wave discovered by Berger, and has since been the object of intense investigation. Previous studies show that the alpha band is related to learning, physical relaxation and mental⁴. Alfa was formerly called Berger rhythm.

In 1934, researchers, Adrian and Matthews confirmed many of the observations of Berger, but disagreed with respect to the origin of rhythm. They were the first to use a balanced amplifier, known today as bipolar or differential, and also postulated that this rate was associated with mental processes involving a large number of neurons. This was the first study that showed that the Berger rhythm could be driven beyond its natural frequency by means of photic driving, ie, the alpha rhythm could be amplified by the same photic frequência². This discovery encouraged several studies in the field of physiology, discussing stimulation cerebral⁵⁻¹⁰. One study, conducted in 1942, noted the "repetitive sensory response" with respect to the excitation of the sciatic nerve, where they found that the BWE could also be induced by a stimulus tátil¹.

The first tests using guinea pigs were published in 1956 by W. Walter Gray, comparing the stimulation of flashing lights

with the emotional responses produzidas². Finally, in the second half of the century. Century was created the first electronic clinical photic, research from Koger's, who worked with U.S. military combining the knowledge of electron Sidney Schneider, Brain Wave synthesizer, which could be adjusted with frequency deviation of 4 ritmosecond². This invention made it possible for studies in the field of psychiatry, and in 1959 Robert Ellingson, Ph.D. Psychiatric Institute in Nebraska, examined the effects of photic excitation in 700 babies. The study was positioned a strobe light to ten inches from the face babies. It was noted that premature babies had a response latency of 220 milliseconds (msec), as babies born at term, the latency was 190 msec. The magnitude of the evoked response in babies was better when their eyes were closed and they were probably sleeping.

Kroger and Schneider developed studies related to hypnotic induction with audio visual stimulation¹¹. Hypnosis has been used by BWE to maximize the effect of anesthesia on cirúrgicos¹² procedures to control pain and anxiety, to reduce bleeding, to accelerate the healing of dental treatment¹³.

In 1976, Takahashi and Tsukahara, Tohoku University, School of Medicine in Japan, published the results of studies on the influence of color in the photo-convulsive response (PCR). They measured the effects of white, red, yellow, blue and green in the PCR and found that the red at a frequency of 15 Hz could cause PCR, and also noted that the PCR caused by red excitation could be inhibited by introducing, while low levels of light azul¹.

H. Russell, noted improvements in hemiplegia after aneurysm in those who had experienced a conventional therapy for 4 years without getting better. Could see also some improvement in fine motor skills after using the stimulation of the AVE, which contributed to the increase in dendrites, featuring an anatomic change in response to stimulation by AVS¹.

In 1985, the "Comptronic Devices Ltd., also called" Mind Alive Inc. "launched Project Integration Digital Audio-Visual (David¹), used for hypnotic induction with sedating and relaxing effects²

In 1989, one researcher performed a work for the treatment of headaches in the Military Hospital. The subjects were instructed to use BWE at the beginning of a migraine. Of the 50 reported symptoms of headaches, 49 were relieved, and 36 individuals stated that the migraine had stopped totalmente¹⁴.

Russell and Carter (1993), organized a blind study with a group of boys between 8 and 12 years of age with learning difficulties. The children were treated during 40 sessions of AVE at 10 Hz and 18 Hz and showed an increase in IQ common to 8 points. They also obtained significant improvements (<.01) in memory, reading and ortografia¹⁵.

Even in 80 years, Shealy has studied some colleagues, who performed 30-minute sessions of 10 Hz photic excitation. We measured blood levels of serotonin, endorphin, melatonin and norepinephrine, has been recorded significant increases in the concentration levels of these hormones. Shealy's group suggested that the increase in beta endorphin was associated with the feeling of well being and decreased pain. The increase in norepinephrine and serotonin, and decreased melatonin suggested an increase in speed. Shealy has studied the course of several neurotransmitters, stimulation with light purple and white with excitement around 10 Hz for 20 minutes, and observed the intensity of relaxation due to the use of white light and the intensity of relaxation using violet light. Shealy showed the discovery of the production of neurotransmitters and also that melatonin levels were around 6% following a training optica¹.

David Noton, during the Annual Conference of the Association for Applied Psychophysiology and Biofeedback, in 1995 and 1996, presented on the Pre-Menstrual Syndrome (PMS) in which found that the SMP consists of a "brain wave slow" and it belongs to the group of disorders, including attention deficit disorder, chronic fatigue syndrome, and headache. The seventeen women who completed the study, 76% experienced a reduction greater than 50% in their symptoms and the results showed that the BWE with an increase of cerebral blood flow and not just a change in brain waves lentas¹.

Through the results of this research, we found that the use of audio-visual stimulation achieved satisfactory results even in diseases such as fibromialgia¹⁶, afetiva¹⁷ disorder, Alzheimer's Alzheimer¹⁸, attention deficit^{15,19}. This technique also has shown efficacy in improving cognitive function in idosos¹⁸ and reduce the risk of falls in mesmo²⁰, and has shown to be effective even in dental procedures, it was shown that muscle tension and deterioration in the temporo-mandibular joint (TMD) are often interpreted as a response to stress psicológico²¹, but with the use of AVS was obtained decreased anxiety, pain in the jaw during these procedures, as well as reducing tension in this region, commonly known bruxism^{22,23,24}.

In another study, patients who had fear or panic obtained a decrease in depression, drug addiction and suicidal, having experienced a marked improvement in quality of life after undergoing stimulation of the AVE. During the first months, the use of strokes was stopped and used a transcutaneous electric stimulation in order to compare the treatments. The result was that the symptoms piorou¹.

In other research, even Hypertension, a condition that is controlled by drugs, performance was very effective in reducing their symptoms²⁵.

STUDIES IN BRAZIL

Some recent studies on the subject were conducted at the Universidade Castelo Branco. One of them found the acute effects of visual stimulation at 20 Hz, heart rate and noted an increase of 10.3% in the same, indicating that the intervention was conducted physiological adaptations, even in the absence of physical movement and sporting reais emotions²⁶.

Researchers observed the acute effect of cortical stimulation on reaction time (RT) driving young athletes aged between 13 and 25 years, who have two sports. The result allowed support the idea that the brain stimulation through light and sound, was responsible for the improved reaction time of motor atletas²⁷

Researchers from the same university found the acute effects of stimulation in visual working memory, attention concentrated on the reaction time of a child with diagnosis of bipolar and attention deficit hyperactivity disorder. The results indicate an improvement of 150% in focused attention, 16.7% in working memory and a result without significance for the test of time reação²⁸.

In 2005, another study divided 30 children, aged between 7 - 8 years, in 2 groups, where both played 36 matches and 45 minutes of bowling. One group (experimental) received sessions of 35 minutes of audio-visual stimulation with Alpha waves. The result showed the best performance of the learning that has received the training program of light and / or sound (experimental), whose skill gains were significantly higher than in the control group. The authors concluded that these results were achieved as regards the interaction between the brain balance, the training of light and / or sound and learning-skilled motriz²⁹

Even for the able-motor learning, one 2006 study that investigated the performance of motor learning and cognitive training program after augmentation brain and auditory orientation, considering the phenomenon of hemisphericity showed that the program established to enhance the cortical activity produced effects on motor and cognitive performances of the groups, depending on the type hemispheric⁴

CONCLUSIONS

Throughout this work we see in the analysis of texts that formed the present study, the use of technical training produces photic-ear, in fact, a change in physiology and anatomy of the central nervous system, which explains the behavioral changes of individuals subjected to them.

We found that the use of a brain stimulator, modulation of cortical waves, via synthesis photic / hearing (sound and light), changes the default Cerebral, being effective both to improve learning ability, motor and cognitive, which makes us believe the program used by the synthesizer of brain waves through sound and light, makes a unique brain wave predominates in both brain hemispheres, balancing them and facilitating the synaptic process, causing the nervous system being overwhelmed by visual stimulation, and provide better organization of neural networks and strengthening the synapses, facilitating cognitive and motor tasks, and ensure a greater state of concentration and mental and physical relaxation.

This literature review also shows the need for new techniques and new methods that may go even further in benefits for both the treatment and prevention of various diseases.

You can, synthesizing, saying that training brain wave through the audio-visual stimulation alters the cortical response and hence the pattern Brain, favoring a more synchronous between the two hemispheres, promoting motor activity, cognitive and behavioral, and therefore quite useful in both rehabilitation and prevention of various pathologies, besides being useful for training of various bio-operating conditions in athletes, in order to improve its performance.

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ENTRAINMENT BRAIN WAVES (BWE): A LITERATURE REVIEW ON THE EFFECTS OF SYNTHESIZING PHOTIC AND HEARING IN VARIANTS OF MOTOR AND COGNITIVE BEHAVIOR HUMAN

ABSTRACT

Evidence in the literature show positive results regarding the use of brain stimulation, the effect of synthesis photic / auditory dysfunction in motor, cognitive and behavioral in various everyday situations common to several particular sample groups. The rationale for the application is established on the theoretical assumption oriented principle by Siever (1999), whose reference point is that this stimulation is projected via neurons of the reticular formation, joining the groups own neurochemicals in the brain stem and hence modulating neurons sub cortical and articulation appropriate to the integrative process of learning, memory and attention. The reference to the relationship that is the balance between the hemispheres, a substrate for an optimized disposition of the brain to integrate and enhance stimulus appropriate responses. These precepts have guided the structure of the present study, which reviewed a series of studies in line with the objective of adding bases of theoretical and practical guidance for future research.

KEYWORDS: Brain waves, photic and auditory stimulation, behavior

PROGRAMME D'ENTRAÎNEMENT CÉRÉBRAL ONDES: A REVIEW LITTÉRATURE SUR LES EFFETS DE LA SYNTHÈSE LUMINEUSE L'AUDIENGE ET VARIANTS DE EN MOTRICES ET COGNITIVES COMPORTEMENT HUMAIN

RÉSUMÉ

Preuves dans la littérature montrent des résultats positifs quant à l'utilisation de la stimulation cérébrale, l'effet de la synthèse visuel et auditif troubles de l'audition dans le moteur, cognitif et comportemental dans diverses situations quotidiennes communes à plusieurs groupes d'échantillons particulier. La justification de la demande est établie sur l'hypothèse théorique principe orienté par Siever (1999), dont le point de référence est que cette stimulation est projetée via les neurones de la formation réticulée, rejoignant des groupes de substances neurochimiques propres dans le tronc cérébral et la modulation de sous donc neurones corticaux et l'articulation nécessaire au processus d'intégration de l'apprentissage, la mémoire et d'attention. La référence à la relation qui est l'équilibre entre les hémisphères, un substrat pour une disposition optimisée du cerveau à intégrer et renforcer les réponses de stimulation appropriée. Ces préceptes ont guidé la structure de la présente étude, qui a examiné une série d'études en ligne avec l'objectif de l'ajout de bases théoriques et des conseils pratiques pour la recherche future.

MOTS-CLÉS: ondes du cerveau, la stimulation lumineuse et sonore, le comportement

FORMACIÓN BRAIN WAVES: UNA REVISIÓN DE LITERATURA SOBRE LOS EFECTOS DE SINTETIZACIÓN FÓTICA Y AUDIENCIA EM VARIANTES DE LA CONDUCTAS MOTORAS Y COGNITIVAS

RESUMEN

Evidencia en la literatura muestran resultados positivos en relación con el uso de la estimulación del cerebro, el efecto de sintetización fótica / auditiva en disfunciones motoras, cognitivas y de comportamiento en diversas situaciones cotidianas de los grupos de muestras diferentes. La justificación de la aplicación se establece en el supuesto teórico basado en un principio por Siever (1999), cuyo punto de referencia es que esta estimulación se proyecta a través de las neuronas de la formación reticular, uniéndose a los grupos neuroquímicos propios del tronco cerebral y por lo tanto la modulación de las neuronas corticales y subcorticales a una articulación adecuada al proceso integrador de aprendizaje, memoria y atención. El punto de referencia de este conjunto es el equilibrio entre los hemisferios, un sustrato de una disposición optimizada del cerebro para integrar y mejorar las respuestas de estímulo apropiado. Estos preceptos han guiado a la estructura del presente estudio, que examinó una serie de estudios en línea con el objetivo de la adición de las bases teóricas y prácticas de orientación para futuras investigaciones.

PALABRAS CLAVE: ondas cerebrales, la estimulación fótica y auditiva comportamiento.

TREINAMENTO DE ONDAS CEREBRAIS (BWE): UMA REVISÃO BIBLIOGRÁFICA SOBRE OS EFEITOS DA SINTETIZAÇÃO FÓTICA E AUDITIVA EM VARIANTES DO COMPORTAMENTO MOTOR E COGNITIVO HUMANO

RESUMO

Evidências na literatura mostram resultados positivos relativos ao uso da estimulação cerebral por efeito de sintetização fótica/auditiva em disfunções motoras, cognitivas e comportamentais em diversas situações do cotidiano de diversos grupos amostrais. O racional de aplicação se estabelece no pressuposto teórico orientado, a princípio, por Siever (1999), cujo ponto referencial é de que esta estimulação se projeta via neurônios da formação reticulada, integrando-se a grupos neuroquímicos próprios do tronco encefálico e, daí, modulando neurônios corticais e subcorticais para uma articulação integrativa apropriada do processo de aprendizagem, memória e atenção. O ponto de referência dessa articulação é o equilíbrio entre hemisférios, um substrato para uma predisposição otimizada do cérebro para integrar estímulos e realçar respostas apropriadas. Estes preceitos orientaram a estruturação da presente pesquisa, a qual revisou uma série de estudos na linha, com o objetivo de se somar bases de orientação teórica e prática para futuras pesquisas.

PALAVRAS-CHAVE: ondas Cerebrais, estimulação fótica e auditiva, comportamento

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