

Exploring a bio/neurofeedback training intervention to enhance psychological skills & performance in sport

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Abstract (Summary)

The purpose of the present study was to explore whether BNFK, which trains self-awareness and self-regulation of physiological and mental-emotional states, can enhance an athlete's psychological skills, specifically their ability to focus, relax and regulate their arousal and anxiety levels, and ultimately, enhance their sport performance. This research utilized a multiple-case study design. Six elite athletes, with a minimum of five years experience at the international or Olympic level, each received 30 hours of a BNFK training intervention. The effect of BNFK training was explored in three ways: (a) three phases of interviews were conducted with each athlete, prior to the BNFK training, between 20-30 hours of BNFK training, and at the end of the 2007-2008 competitive season; (b) physiological and neurological quantitative data was collected which measured improvements specific to the BNFK training; and (c) performance results were noted at the completion of the 2007-2008 competitive season and compared to previous results.

The findings indicate that within the lab setting, the athletes developed (i) greater self-awareness of how they hold tension and anxiety in the body and (ii) self-regulation techniques to decrease that tension. As well, the athletes became more aware of their mental state, and through regulation of their level of anxiety and tension in the body, they enhanced their ability to focus. Although much improvement was seen, none of the athletes developed optimal self-regulation of all aspects measured. With respect to competition results, no definite improvement in performance was seen. The results of the study are further discussed in the context of the BNFK and sport psychology literature. Implications and future directions are also offered.

EEG Correlates of Golf Performance: Training the Brain to Drain the Putt

The link between sport performance and attentional processes is well established. The present research investigated relationships between golf putting performance and electroencephalogram (EEG) activity in two studies. In Study 1, putting performance of eight skilled male golfers (handicap ≤ 4) was assessed by absolute error over 60 trials, putting from 9m on a regulation green. EEG was measured at 19 sites – far more than in most previous studies – with two EOG and one EMG sites used for artefact reduction and removal. Data were divided into 15 frequency bands and three 500ms epochs prior to impact. Correlations between putting error and EEG amplitudes for each site, frequency and epoch showed substantial individual differences, suggesting a more complex process than has previously been found with fewer sites, frequencies, and epochs. Although correlations were small, the EEG frequency mostly closely associated with performance was in the beta range, specifically 19 – 20 Hz, rather than in the alpha range (i.e., 8 – 12 Hz) as identified previously. Intra-individual correlations identified the most pertinent sites and frequencies for subsequent individualized neurofeedback training, whereby electrocortical activity of specific frequencies at particular sites is rewarded or inhibited. In Study 2, four participants received neurofeedback training over 20 sessions during which visual and auditory reinforcement was provided when EEG activity met their individualised criteria. Putting performance was assessed before and after neurofeedback training. Results of Study 2 will be presented.

EEG and superior performance

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Electroencephalography (EEG) has been the primary technique to investigate bioelectrical processes of the brain employed in sports. It allows the study of sport-related motor tasks as well as the preparation periods in closed skill sports, such as shooting (Lawton et al., 1998). Until now we performed two experiments using EEG. The first study focused on the modification of brain oscillations by flicker light stimulation and the respective influence on maximal voluntary contractions. Before and during a maximal isometric strength test the photic stimulation was used to evoke different brain oscillations. Flicker induced EEG activity served as a tool to study the neural basis of the generation of maximum strength. Aim of the study was to investigate whether the induction of specific frequencies by means of photic stimulation might lead to a change in maximum strengths and to which frequency of brain oscillations the increase was related. The second study compared EEG parameters of focused attention in the EEG of novices and experts during the aiming period of shooting. The primary goal was to analyze frontal midline theta (Fm θ) in the shooter's aiming period to get a better understanding of the neural mechanisms associated with sustained, focussed attention. Background was the assumption that tasks requiring continuous attention to a stimulus usually evoke a specific type of cortical activation (Aftanas & Golocheikine, 2001), termed Fm θ most pronounced at the frontal midline electrode location Fz. The two experiments demonstrate that EEG analysis is limited to epochs without any movement such as preparation and concentration or regeneration phases. Hence, EEG in sports is appropriate to test existing knowledge concerning attention and preparation processes in a setting that delivers ecological valid results. In the future EEG could be applied in the diagnostic process, for example to gain additional valid information about the athlete's attentional ability, as well as in neurofeedbacktraining. In recent studies neurofeedback has been successfully used to enhance attentional and memory performance (Egner & Gruzelier., 2004; Vernon et al., 2003). Finally, I will point out according to the three-system model (Lang, 1968) that additionally to physiological reactions and overt behavior the subjective experience of the athlete will be an important source in the psychophysiological assessment of human performance.

Literatur

Aftanas, L.I., & Golocheikine, S.A. (2001). Human anterior and frontal midline theta and lower alpha reflect emotionally positive state and internalized attention: high-resolution EEG investigation of meditation. *Neuroscience Letter*, 310, 57-60.

Egner, T. & Gruzelier, J. (2004). EEG Biofeedback of low beta band components: Frequency specific effects on variables of attention and event related brain potentials. *Clinical Neurophysiology*, 115, 131-139.

Lawton, G. W., Hung, T. M., Saarela, P. & Hatfield, B. D. (1998). Electroencephalography and mental states associated with elite performance. *Journal of Sport and Exercise Psychology*, 20, 35-53.

Lang, P. J. (1968). Fear reduction and fear behaviour: Problems in treating a construct. In J. M. Schlien (Ed.), *Research in psychotherapy* (pp. 90-102). Washington, DC: American Psychological Association.

Vernon, D., Egner, T., Cooper, N., Compton, T., Neilands, C., Sheri, A. et al. (2003) The effects of training distinct neurofeedback protocols on aspects of cognitive performance. *International Journal of Psychophysiology*, 47, 75-85.

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Visual Attention and Brain Processes That Underlie Expert Performance: Implications for Sport and Military Psychology

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Abstract

Advances in methodology have allowed sport psychologists to broaden their understanding of expert performance through inclusion of physiological assessments of expertise (e.g., eye movements and bioelectric signals such as the electroencephalogram [EEG]). Innovations linking physiology, basic cognitive processes, and performance have illustrated the degree to which these techniques can converge on a finer-grained understanding of factors driving learning and performance at exceptional levels. A recent focus of this research has centered on the coupling between visual search patterns and other psychophysiological indices of attention and arousal (such as the spectral characteristics of the EEG), particularly among expert and nonexpert performers. Within this context, we describe results of recent investigations that have employed psychophysiological assessment of emotion/attention interactions and their influence on motor task performance in increasingly applied ecologically valid environments either simulated in the laboratory or monitored in actual competitive settings. Current theoretical, empirical, and applied questions in sport psychology are discussed while considering critical issues pertaining to current and future military initiatives.

Attention and Neurofeedback Synchrony Training: Clinical Results and Their Significance

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Abstract

Background. Previous research on information processing by the primate brain prompted further investigation of phase synchronized alpha brain wave activity at five loci in humans. The results of this investigation indicated that a particular form of attention was associated with production of whole brain synchrony.

Method. Patients were treated with a dual approach, a systematic program of attention training

coupled with the regular practice of multi channel alpha phase synchrony training. One hundred thirty-two clinical patients were treated for a variety of stress related symptom categories by six therapists in different locations. Patients were rated for symptom intensity, frequency and duration.

Results. It was found that learning to develop this particular form of attention, coupled with the regular practice of multi-channel alpha phase synchrony were effective in resolving many common stress related disorders. Analysis of 132 cases using this dual approach found that more than 90 percent of the patients reported an alleviation of symptoms. These positive results were found with stress-induced headache, joint pain, and gastrointestinal disease.

Conclusion. The authors propose that there exists a common mechanism operating in these widely different successful applications; to wit, attentional flexibility, which is achieved through systematic practice of audio taped attention exercises and neurofeedback phase synchrony training. Patients who participated in this program generally reported experiencing a release from their symptoms and from emotional conditioned responses in favor of more flexibility and more stable homeostasis. The significance of this “release experience” is discussed and attention-neurofeedback training is compared to other interventions, which rely exclusively on peripheral modalities of biofeedback training.

Psykinetics and Biofeedback: Abhinav Bindra Wins India's First-Ever Individual Gold Medal in Beijing Olympics

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Abstract

The author describes sports psychophysiology interventions with the Indian Olympic gold medal winner, Abhinav Bindra, who performed in the air rifle event at the 2008 Beijing Olympics. The article proposes an evolutionary psykinetics approach, accenting “psykinetic states”—postural patterns linked to dominant personality characteristics. The interventions included biofeedback training using respiration, thermal biofeedback, electro-dermal biofeedback, neurofeedback, and heart rate variability. Training objectives included assisting the athlete to remain extremely calm (to avoid any trembling during sighting) while also remaining mentally alert and reactive. The neurofeedback training was customized to this athlete, and the breathing interventions included training tolerance for extended breath holds, because athletes shoot during a suspension of respiration for stability in sighting. Chiropractic manipulation and muscle activation completed the training regimen.
