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## Transcranial Magnetic Stimulation for a Suitable Activity of Reticular System in Athletes with Low or High Level of Arousal

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Dear Sir/Madam,

The Ascending Reticular Activating System (ARAS) has been considered as a main neural structure for consciousness [1]. The ARAS is a complicated network that connects a portion of the brainstem Reticular Formation (RF) with nonspecific thalamic nuclei, the basal forebrain, hypothalamus, and the cerebral cortex [1]. It has been shown that the relationship between consciousness and the ARAS by using Diffusion Tensor Tractography (DTT) in patients with Traumatic Brain Injury (TBI) [1].

Human consciousness consists of 2 critical components: arousal and awareness [2]. The physiological and neuroanatomic basis of arousal in the brainstem has historically been conceptualized as the ARAS [2]. Consciousness is an arousal and awareness of environment and self, which is achieved through action of the ARAS on the brain stem and cerebral cortex [3]. The ARAS mediates arousal, an essential component of human consciousness [3]. The upper ARAS is responsible for conscious awareness and the lower dorsal and ventral ARAS are responsible for arousal and sleep [4].

Sports psychologists have for some time put forward the inverted-U-hypothesis as a useful working model of the relationship between arousal and performance [5]. This critical point has been referred to as the point of optimal arousal and a graphical representation of the relationship forms an inverted-U shape [5]. Generally moderate levels of arousal are considered most conducive to top level performance in sport [5]. Physiological arousal can benefit performance but only to a certain point [6]. Theoretical frameworks regarding emotion and performance typically focused on changes in physiological arousal as an index of the magnitude or intensity of emotional experience [6]. According to drive theory higher levels of arousal facilitate performance while low levels of arousal hinder performance [6].

Transcranial Magnetic Stimulation (TMS) a non-invasive and painless technique that allows researchers to stimulate discrete brain areas [7]. TMS can stimulate superficial areas of the brain including those involved in movement [7]. Deeper brain regions which may form parallel pathways for motor control are inaccessible to direct non-invasive stimulation [7]. TMS might provide an easy, non-invasive method for activating the motor reticular formation in human subjects [8]. The possibility of interfering with complex cognitive functions in the long term opens new strategies for modifying brain-behavior relationships, making TMS a hypothetical rehabilitative tool in its own [7].

Based on the above mentioned point the psychological factors are important for sport achievement as athletes face cognitive and arousal challenge inherent to competition. High arousal in particular situations produces feelings of anxiety and low arousal is manifested by feelings of boredom. It is very important to keep arousal at a moderate level to have the best cognitive function. For this reason we hypothesize that Consciousness and arousal are mainly controlled by actions of the Ascending Reticular Activating System and widely reported that Repetitive Transcranial Magnetic Stimulation (rTMS) has a therapeutic effect on impaired consciousness. With this explanation we thought TMS can be an effective and useful method to control arousal and improving cognitive task in athletes.

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