

INVESTIGATING NEUROPHYSIOLOGICAL CORRELATES OF COVERT ATTENTION IN SOCCER GOALKEEPERS

JEUNET C.^{1,2}; BIDEAU B.³; ARGELAGUET F.¹; CHAVARRIAGA R.²; MILLAN J.D.R.²; LECUYER A.¹; KULPA R.³

¹ Inria, France. ² CNBI, EPFL, Switzerland. ³ M2S, Univ. Rennes 2, France

Introduction

Soccer goalkeepers must process information from their peripheral vision at the same time they look towards the ball. This ability, committing attention to a position other than the fixation point, is called Covert Visuo-Spatial Attention –CVSA– (Posner, 1980). CVSA being essential to reach high performances, it is primordial to find innovative and efficient ways of improving it. Neurofeedback, which consists in training specific brain features in order to enhance a cognitive ability, has been proven to increase attentional abilities (Fuchs et al., 2003). Also, different studies have suggested the existence of a neurophysiological marker specific to covert attention: a lateralised modulation of the α waves in the visual cortex (Sauseng et al., 2005; Thut et al. 2006). Moreover, it has been shown possible to compute this marker online, thus opening the door to a potential neurofeedback training procedure (Schmidt et al., 2010; Tonin et al., 2013; Trachel et al., 2015). In this view, we propose in a first instance to further investigate the relevance of this marker for soccer goalkeepers. The objective is to answer the following questions: Is this marker transferrable to goalkeepers? How stable is it across athletes? Does it depend on their expertise?

Methods

Ten soccer goalkeepers (amateurs and professionals) take part in an ElectroEncephaloGraphy (EEG) study while they perform a CVSA task. They have to look at a fixation cross and then, based on the cue displayed, commit their attention to a target located on the left or right of the screen (without overt eye movements) (Tonin et al., 2013). The protocol includes two sessions so that we can assess the stability of the marker.

Results & Discussion

An α wave modulation in the visual cortex should be observed contralateral to the target (e.g., in the left visual cortex when the target is on the right). Moreover, professional goalkeepers should produce a greater α wave modulation, reflecting a main effect of expertise. If our hypotheses are underpinned by the results, the next step will consist in proposing a new generation of EEG-based training tools for goalkeepers, with a neurofeedback training targeting this marker, and in evaluating the effect of these training tools on goalkeepers' performance.

References

- Fuchs, T. et al. (2003) - *Appl Psychophysiol Biofeedback*. 28(1):1-12
- Posner, M.I. (1980) - *Q. J. Exp. Psychol.* 32(1):3-25
- Sauseng, P. et al. (2005) - *Eur. J. Neurosci.* 22:2917-26
- Schmidt, N. et al. (2010) - *IEEE SMC*. 481-87
- Thut, G. et al. (2006) - *J. Neurosci.* 26:9494-9592
- Tonin, L. et al. (2013) - *J. Neural Eng.* 10:056007
- Trachel, R.E. et al. (2015) - *Front. Hum. Neurosci.* 9:358

Contact

richard.kulpa@univ-rennes2.fr, camille.jeunet@inria.fr