

COGNITIVE P300 POTENTIAL IN RETIRED SPORTSMEN WITH A CAREER IN CONTACT SPORTS

Iliya V. Valkov,
Rositza D. Dimkova¹

*Department of Neurosurgery,
Faculty of Medicine,
Medical University – Pleven,
Bulgaria*

¹*Department of Theory and
Methodology of Physical Education,
Faculty of Pedagogy,
University of Veliko Tarnovo,
Bulgaria*

Corresponding Author:

Iliya V. Valkov
Department of Neurosurgery,
University Hospital – Pleven
8A, G. Kochev Blvd.
Pleven, 5800
Bulgaria
e-mail: valkovns@abv.bg

Received: May 29, 2017

Revision received: July 05, 2017

Accepted: November 02, 2017

Summary

Eleven retired sportsmen, who had a career in contact sports (three boxers, four footballers, four wrestlers) and one cyclist with a history of several falls from a bicycle and had been diagnosed with a cerebrovascular trauma, were investigated with auditory cognitive P300. The age range was aged between 26 and 63 years. Ten out of the twelve presented cognitive wave latency between 512 msec and 928 msec. This finding made us conclude that repetitive minor head injuries (mHI) that they inevitably had experienced during their carrier has led to cognitive problems in older age.

Key words: cognitive P300 potential, retired sportsmen, carrier in contact sports, “punch drunk”

Introduction

In the professional literature, we quite often detect discussions concerning the effect of repetitive minor head injury (mHI) [1, 2] in sportsmen practicing contact sports [3]. The term “punch drunk” was introduced to the medical lexicon in 1928, when Harrison Marthland, a pathologist, first described this syndrome in the *Journal of the American Medical Association*. A great number of examples are already known that have verified a slowly progressing intellectual decline to merely acute development of neurological pathology as Parkinson disease or pugilist dementia. Still, there is no categorical proof whether boxing caused the problems that the most graceful heavyweight champion of the time Muhammad Ali had [4].

The objective of the study was to establish the cognitive data of former sportsmen, who had practiced contact sports: boxers, wrestlers and footballers by performing the auditory cognitive potential P300 test.

Materials and Methods

Twelve retired sportsmen (age range 26-63) were investigated. P300 was performed. The control group consisted of eleven healthy persons, age matched to the study group. Auditory P300 cognitive potentials were performed, using 30 scalp electrodes to elaborate topographical maps, according to Barnett 1993 [5]. The

band-pass was 1-70 Hz, ground electrode placed in Fpz and reference at linked balanced earlobes. The auditory oddball paradigm consisted of pitched tones (1000 Hz frequent and 2000 Hz rare stimuli), which were administered binaurally and randomly. The duration of stimuli was 150 ms, rise-fall time 30 ms, and the inter-stimulus period was 1300±250 ms. The frequent/rare ratio was 4:1. The patients, comfortably seated on a chair, were instructed to mentally count and press a button to respond to rare stimuli. An average of 20 rare stimuli was presented to the patients, and each test was performed three times to verify the repeatability of the waves.

Results

Figure 1 and Figure 2 demonstrate the P300 data, of the youngest (the cyclist) and the oldest of them (a boxer), respectively. In the first case (Figure 1), a cognitive P300 [6] wave was obtained at 568 msec. In the second case (Figure 2), the P300 wave occurred at 495 msec.

In eight cases we detected a cognitive P300 wave between 512 msec and 928 msec. Only in two cases (a boxer and a soccer player), P300 data showed normal values – 286 msec and 330 msec, respectively. The control group of 11 healthy persons presented normal P300 waves (between 280 msec and 312 msec) [1, 2].

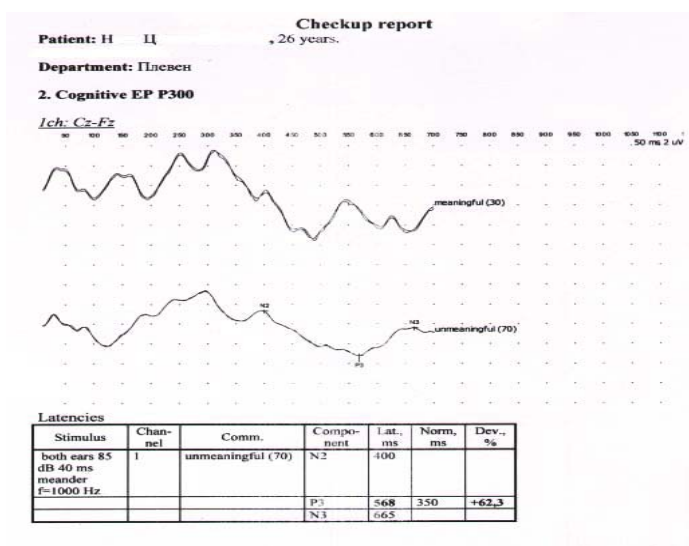


Figure 1. Cognitive P300 at 568 msec

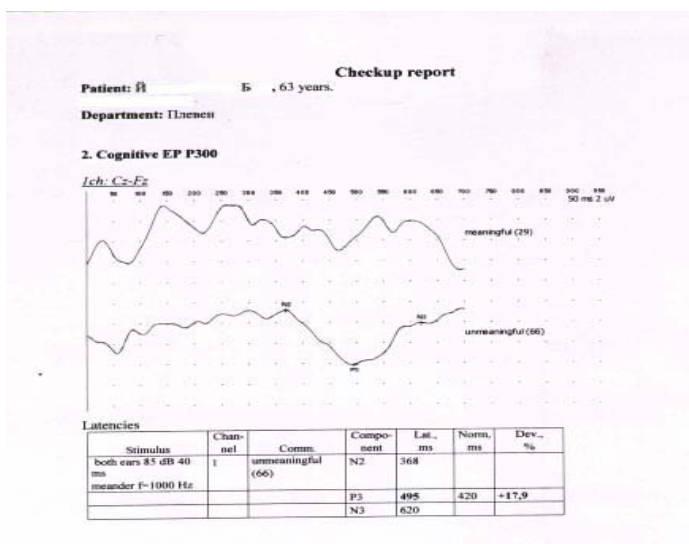


Figure 2. Cognitive P300 at 495 msec

Discussion

The electrophysiological modality P300 cognitive potential is an objective method that characterizes the ability of certain cortical and subcortical brain areas to detect and analyze some specific (in this study, auditory) signals [5]. When an investigated person reacts to it, the time needed for this cognitive process is detected. Normally, this needed time is 300 msec (P300 means wave obtained at 300 msec elapsed time).

In our present study, the P300 at 928 msec was quite troublesome. Such persons need continuous clinical assessment. The clinical doctor must choose the appropriate time to recommend additional neuroimaging and neuropsychological methods in order to eventually figure out a serious neurological problem [1, 2].

Thirty years later, there is still no way to determine whether boxing caused Parkinson disease to Muhammad Ali: he might have developed the condition even if he had been a lawyer. Nevertheless, it is beyond doubt that professional boxing often damages the brain.

Conclusions

Repetitive minor head injuries may lead to cognitive problems in older age.

References

1. Valkov I. [Mild and moderate TBI .Cognitive P300 potential to estimate the outcome] [dissertation]. Varna: MU – Varna; 2014. 124 p.
2. Valkov I, Tzvetanov P, Kedia R. Correlation between cognitive P3 changes and the grade (mild and moderate) of traumatic brain injury. In: Proceedings of the XVth WFNS world congress of neurosurgery; 2013 Sept 8-13; Seoul, Korea.
3. [Curry SH. Event related potentials as indicants of structural and functional damage in closed head injury.](#) Prog Brain Res. 1980;54:507-15.
4. Clancy F. THE BITTER SCIENCE: Head blows from boxing can cause dementia and Alzheimer's. Can the same chronic brain injury also lead to Parkinson's? Neurology Now. 2006;2(2):24-25.
5. Barnett G. Clinical applications of event-related potentials: event-related potentials in close head injury. In: Halliday AM, editor.

Evoked potentials in clinical testing. Churchill-Livingstone; 1993.

6. von Bierbrauer A, Weissenborn K. P300 after minor head injury (a follow up examination). Acta Neurol Belg. 1998,98(1):21-6.