Neuroscience Controversy Comp Question – 2018

Brain fingerprinting – A breakthrough or a sham?

Brain fingerprinting is a forensic science technique that uses electroencephalography (EEG) to determine whether specific information is stored in a subject's brain. This fingerprinting is accomplished by measuring electrical brainwaves based on the brain's response to words, phrases or pictures presented to it on a computer screen. As amazing as this new technology is, brain fingerprinting has generated much controversy since its introduction and until now. It is claimed that brain fingerprinting can tell whether a memory is present or absent in a person's brain with over 99% accuracy and used to test suspects of crimes.

The theory of brain fingerprinting was developed by Dr. Lawrence Farwell (http://www.larryfarwell.com) in the early 1990s and has been developed further since then (Farwell 2012, Cogn Neurodyn. 2012 Apr; 6(2): 115–154). While Farwell has often used the science behind the P300 wave, an event related potential (ERP) measured by means of EEG, to justify his techniques, many scientists do not agree with this application. In 2013, a group of researchers struck back against Farwell's work, writing that his research "is misleading and misrepresents the scientific status of brain fingerprinting technology." (Meijer et al., Cogn Neurodyn. 2013 Apr; 7(2): 155–158).

In the US, brain fingerprinting has been ruled admissible in court and the manufacturer, Brainwave Science (http://brainwavescience.com), claims success in two high-profile criminal cases – the JB Grinder and Terry Harrington cases. It is unlikely that a conviction could have been secured on the evidence of brain fingerprinting alone, but is brain fingerprinting an accurate indicator of guilt or innocence?

You are required to:

1) Evaluate the technique of electroencephalography (EEG) recordings while also discussing the various rhythms of the brain (delta, theta, alpha, beta and gamma). (30%)
2) Detail the use and interpretation of event related potentials (ERPs), highlighting the historical significance of the P300 wave. (30%)
3) Summarize the current state of the P300 wave in concealed information detection and brain fingerprinting. (25%)
4) Discuss the implications of brain fingerprinting and the arguments for and against its use. (15%)

Please limit your answer to 10-15 pages, double spaced, excluding references.

Be sure to support your statements with proper literature citations.