

A Systematic Review Investigating the Use of EEG Measures in Neuromarketing

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Abstract : Introduction: Neuromarketing employs numerous methodologies when investigating products and advertisement effectiveness. Electroencephalography (EEG), a non-invasive measure of electrical activity from the brain, is commonly used in neuromarketing. EEG data can be considered using time-frequency (TF) analysis, where changes in the frequency of brainwaves are calculated to infer participant's mental states, or event-related potential (ERP) analysis, where changes in amplitude are observed in direct response to a stimulus. This presentation discusses the findings of a systematic review of EEG measures in neuromarketing. A systematic review summarises evidence on a research question, using explicit measures to identify, select, and critically appraise relevant research papers. This systematic review identifies which EEG measures are the most robust predictor of customer preference and purchase intention. Methods: Search terms identified 174 papers that used EEG in combination with marketing-related stimuli. Publications were excluded if they were written in a language other than English or were not published as journal articles (e.g., book chapters). The review investigated which TF effect (e.g., theta-band power) and ERP component (e.g., N400) most consistently reflected preference and purchase intention. Machine-learning prediction was also investigated, along with the use of EEG combined with physiological measures such as eye-tracking. Results: Frontal alpha asymmetry was the most reliable TF signal, where an increase in activity over the left side of the frontal lobe indexed a positive response to marketing stimuli, while an increase in activity over the right side indexed a negative response. The late positive potential, a positive amplitude increase around 600 ms after stimulus presentation, was the most reliable ERP component, reflecting the conscious emotional evaluation of marketing stimuli. However, each measure showed mixed results when related to preference and purchase behaviour. Predictive accuracy was greatly improved through machine-learning algorithms such as deep neural networks, especially when combined with eye-tracking or facial expression analyses. Discussion: This systematic review provides a novel catalogue of the most effective use of each EEG measure commonly used in neuromarketing. Exciting findings to emerge are the identification of the frontal alpha asymmetry and late positive potential as markers of preferential responses to marketing stimuli. Predictive accuracy using machine-learning algorithms achieved predictive accuracies as high as 97%, and future research should therefore focus on machine-learning prediction when using EEG measures in neuromarketing.

Keywords : EEG, ERP, neuromarketing, machine-learning, systematic review, time-frequency

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