EEG/ERP Research in Consumer Perceptions of Apparel Products

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Neuromarketing uses neuroscientific knowledge or techniques such as functional magnetic resonance imaging (*f*MRI), electroencephalography (EEG), magnetoencephalography (MEG), etc., to answer marketing questions. While EEG and event-related potentials (ERPs) have been measured and analyzed to understand cognitive process and affective responses of the human brain in neurosciences, neuropsychology, or neurophysiology since the 1930s (Luck, 2014), it is not until recent years that these neuroscientific technologies have been used as a research tool in applied sciences such as neuromarketing (Morin, 2011). Neuroscientific techniques have emerged in marketing research since they measure consumer responses occurring below the level of conscious awareness (Genco, Pohlmann, & Steidl, 2013). Human brain subconsciously and instantly reacts and processes information during exposure of a consumer to marketing stimuli such as product or advertisement. The electrical activity of the brain (EEG) or its temporal reaction (from one millisecond to 1,000 milliseconds) to stimuli can be measured in event-related potential (ERP) experiments. ERPs, as a subset of EEG measurement, have been studied in research on attention, emotion, memory, language processing, and other cognitive processing (Genco, et at., 2013) and are known for a non-invasive technique to measure an electrical change recorded from the brain through electrodes placed on the human scalp when something occurs either in the external world or within the brain itself (Picton, Lins, & Scherg, 1995). The purposes of this research are (1) to review EEG/ERP research that may be applicable to understanding how consumers actually but subconsciously process fashion-related information or stimuli and (2) to speculate about possible uses of ERP experiments as a new research tool to study fashion consumer behavior.

ERP components can be measured with a lycra-fitted electrode cap using multiple scalp sites of the 10-20 international system (see Figure 1). Luck (2014) defined an ERP component "as a set of voltage changes that are consistent with a single generator site and that systematically vary in amplitude across conditions, time, individuals, and so forth and a source of systematic and reliable variability in an ERP data set" (p. 68). The electrical signals generated in the brain are amplified by a factor of 20,000 and then converted into digital form for storage on a hard drive. In a typical ERP experiment, whenever a stimulus is presented, the simulation computer sends marker codes to the EEG digitization computer which stores them along with the EEG data. Figure 2 shows the brain waves recorded for 9 seconds on one electrode site (Pz) where Xs and Os are controlled stimuli. Owing to the previous cognitive neuroscience research, several ERP components have been identified as visual sensory responses (C1, P1, N2, P2, N170), auditory sensory responses (N1, mixmatch negativity), and somatosensory, olfactory, and gustatory responses (Luck, 2014).

Wang, Huang, Ma, and Li (2012) used ERPs to investigate the affective responses to pendant pictures with different aesthetic values. In their ERP experiments, less beautiful pendants elicited higher amplitudes of the P2 ERP component than beautiful ones (determined by the sales data) indicating that at the early stage of an aesthetic experience, negative emotional experience is automatically aroused for less beautiful (less selling) objects. Thomas, Hammer, Beibst, and Münte (2013) found that ERPs to brand products had a more positive waveform starting around 300 ms than no-name products. Similarly, Nazari et al. (2014) reported that a large significant difference was seen in the N1 ERP component for familiar logos than unfamiliar ones. A sizable number of ERP research have been done in perception of color and form (see Shen, 2005); however, most ERP researchers investigating the visual processing of color and shape have used non-pictorial drawings such as geometric shapes, gratings, checkerboards, or alphanumeric characters as visual stimuli. Therefore, the application of the previous ERP study to the field of fashion marketing or fashion consumer behavior is possible, but not certain.

Further research is called to investigate how fashion-related information or stimuli are processed in the brain when they are solely or conjointly presented by measuring the electrical activity of the brain in ERP experiments. Using apparel products as a visual stimulus may expand the applicability of neuropsychological research findings to more applied sciences such as fashion marketing. Also, apparel products are so versatile and emotional that various sensory stimuli can be developed to study diverse cognitive and affective neural processes such as preference-related brain activity, the selection of color, color and shape relationship, and emotional responses to tactile properties. The use of apparel products as stimuli may be also effective in developmental ERP experiments with various age groups including children and with groups with psychiatric disorders such as autism, dementia, or schizophrenia. The preceding discussion has shown a great potential that neuroscientific technologies especially EEG/ERPs have for the field of fashion marketing. Further experimental ERP experiments should be conducted to develop an index of ERP components that are associated with visual, auditory, and tactile properties of apparel products, which would expand our understanding of cognitive process as related to fashion consumer behavior.

Figure 1. The international 10-20 system of electrode placement

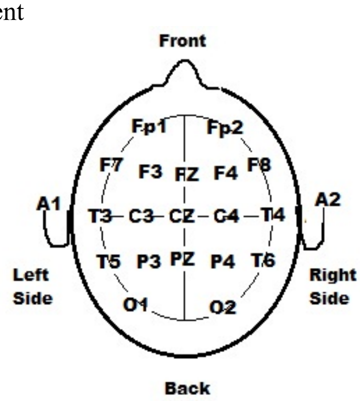
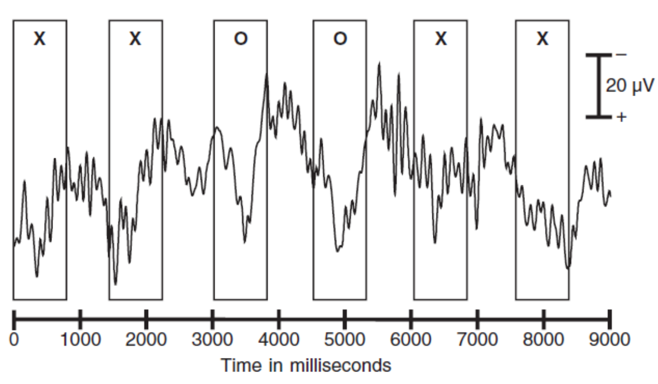


Figure 2. EEG recorded from the Pz electro site (Luck, 2014)



References: Available upon request