

Comparing the Effectiveness of Visual Versus Auditory Advertising Through the Use of
Electroencephalography (EEG) and Electromyography (EMG)

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Abstract:

Increased technological capabilities allow for new and exciting ways to market to potential consumers. As a result, advertising has assumed an ever-increasing presence in the world. Marketers need guidance in navigating this complicated sector, leading to the emergence of a new field: neuromarketing. Neuroscience can reveal key, subconscious and potentially lucrative information about the responses advertisements elicit in viewers. Tools such as electroencephalography (EEG) and electromyography (EMG) can trace physiological responses that indicate levels of receptiveness to the stimuli being presented. This proposed research experiment seeks to present a sample of participants with either visual or auditory advertisements, tracked via EEG or EMG, to essentially determine which mode of advertising is more effective. It also seeks to determine if EEG and EMG indicate similar levels of response.

I. Introduction

Advertising was part of our world as early as the eighth century B.C.; modern expressions of it have existed since early in the twentieth century. Marketing campaigns have matured from rudimentary tackups to the highly responsive advertisements that adjust based on preferences and behaviors (Beard, 2017). The development of such advanced technology has allowed advertising to assume a dominant space in our lives. On Pandora and Spotify, music is often interrupted by advertising; radio programming devotes significant air time to long series of commercials; web surfing is marred by cookies displaying previous searches and expected preferences; and quite often, sports games watched remotely, on TV or online, are injected with brand promotion that is digitized on the field or rink (Johnson, 2006). An evident consequence of the growing space of advertising in the average person's daily life is that such a level of information overload makes it difficult for any one company to stand out. Forbes author and business owner Lois Geller wrote: "You'd think that after a lifetime in [the marketing] business, I'd have seen thousands of memorable ads and commercials. Nope" (Geller, 2013). In fact, as consumers' senses continue to be flooded by advertising, it will become increasingly difficult to capture their attention, as humans are incapable of comprehending multiple streams of information (Wang, Muehling, 2010). The increase in the various options for advertising available to marketers is tricky, bringing success only to those who have the knowledge to navigate the field.

Much research has been done hoping to assist marketers in developing effective advertising. A study in 1968 discovered that viewers' feelings about the information, enjoyment, annoyance and offensiveness of ads were indicators of how they would feel about the brands themselves. From this study, the industry also learned the link between the way people feel toward an advertisement and the way they will subsequently feel about the brand (O'Donohoe,

1991). Thus enters the exciting new field known as neuromarketing, in which a marriage between neuroscience and marketing is working to reveal new insights about consumers. Understanding brain activity and physiological reactions in response to stimuli has the potential for predicting consumer behavior and attitudes about brands (Peacock, 2011). The possibility that a viewer will develop a more positive attitude about a particular product or service if it is advertised to them via radio or via television, for instance, merits further research. Gary Soldow experimented with this concept in 1983. He explored which of TV, radio, and print advertising influenced children to best remember products. TV advertising succeeded (Soldow, 1983). His experiment can be expanded upon through the use of neuroscience technology. Thus, this experiment is seeking to use EEG and EMG to study the difference in responses elicited by visual and auditory advertising to determine which is the most effective medium. This study will seek to determine which form of advertising will generate the highest level of brand recall.

II. Background/Related Work and Motivation

My research hopes to contribute to the field of neuromarketing. EEG and EMG allow for objective measures of consumer responses. At this point, the terms EEG and EMG deserve elaboration. EEG is a tool that is often used for studies in neuroscience. It works by placing conductive gel and a mesh cap of electrodes on a person's head in order to track the brain's electrical brain wave responses on the cortex to particular stimuli. Such results can provide gross information about the brain areas activated in response to stimuli (Myers, Dewall, 2015). EMG is another neuroscience tool that involves placing sensors on a person's face to measure the muscle contractions associated with various facial expressions. Such imperceptible changes in facial muscles can indicate emotional responses (Peacock, 2011).

Pioneers have begun experimentation using neuroscience. In James Peacock's study in 2011, he conducted research with EMG to measure the facial responses to radio and television advertising to determine which was more effective. An *effective* medium of marketing in Peacock's study was operationally defined to be one that produced the most positive emotional response, which he determined was the best indicator of brand recall. The study's results did not show a significant difference in positive responses elicited by TV and radio advertising. TV was shown to have a slightly more negative response, however, which was proven to have a lower yield on brand recall (Peacock, 2011). The proposed experiment seeks to model after Peacock's study, widening its methodology.

III. Methods

It will be beneficial to the field to replicate parts of Peacock's procedure, comparing the results he found with those found in this proposed experiment. This will evaluate the repeatability of Peacock's methodology. This study, however, will further the span of his by using EEG, in addition to EMG, to objectively gather data that will help determine which mode of advertising is more effective: visual or auditory. Effective will also be operationally defined as that which yields the highest level of brand recognition and intent to buy from viewers.

The first step will include collecting a sample of 200 participants. Participants will be found using a national field service list; the sample selected from this list will be randomly chosen due to age, ethnicity, socioeconomic status and will to participate. The sample will include men and women varying in age between 18 and 55 years old, of varied ethnicities and yearly income. Participants will be compensated. Upon their arrival at the research center, participants will be led to a comfortable space, simulating a living room. The research assistant will ask for informed

consent, notifying participants that they will be watching TV programming or listening to radio programming, while hooked up to either EEG or EMG, followed by a one-on-one discussion with the assistant.

Participants will then be hooked up to EEG or EMG technology, such that half of each group will be tracked via brain wave activity and the other half will be tracked via facial muscle movements. 100 participants will be watching TV programming of their choice, with embedded TV advertising, and the other 100 will be listening to radio programming of their choice, with embedded radio advertising. There will be three visual and three auditory advertisements. Each of the three products/services being advertised will have both visual and auditory advertisements. Advertisements corresponding to the same product or service will be predetermined to also have corresponding thematic content. Thus, some participants will watch or listen to advertising predetermined to have positive thematic content. Others will watch or listen to advertising predetermined to have negative thematic content.

At the conclusion of the visual and auditory programming, participants will be disconnected from the EEG or EMG mechanisms and will be engaged in an interview with the research assistant. The research assistant will ask questions that quiz how well participants remember the products/services advertised to them. The questions will also quiz how willing each participant is to buy the products/services they saw or heard about. Following the interview, the assistant will explain the experiment to the participants to conclude the session.

The objective results gleaned from the EEG and EMG data will be analyzed in comparison to the subjective results gleaned from the interview. Ideally, there will be notable changes in brain wave activity and facial movements signaling later brand recognition and willingness to consume

that occur either in visual or auditory advertising, allowing the study to determine one as more effective than the other.

IV. Expected Results

The results this experiment hopes to find are twofold. It hopes to see if there are gross brain regions that can be linked to a willingness to buy and if there are facial expressions that can also be linked to a willingness to buy. It is also hoping to determine if EEG and EMG readings can predict the same brand recognition or willingness to buy. The results of my experiment will be disseminated in an academic paper detailing my conclusions and suggesting further avenues for research.

V. Conclusion

Advertising is growing. Marketers are able to reach their potential consumers in a variety of ways. In order to successfully turn viewers into consumers, companies need to be able to develop advertising that encourages brand recall and willingness to buy. Neuromarketing provides a new level of insight about consumers that is invaluable. This experiment seeks to use EEG and EMG to determine whether visual or auditory advertising methods are more effective in yielding consumers. It will involve acquiring objective and subjective data. Ultimately, there is a need for research to help marketers cultivate effective and memorable marketing campaigns. This study will contribute to their decision-making process.

Works Cited

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Budget

The following is a list of the funds required for the proposed experiment:

Category	Quantity	Cost per Unit	Cost	Other Costs	
Personnel					
Research Assistant Wage	5	\$11/hour for 80 hours each	\$4,400		
EEG Analyst	1	\$30/hour for 40 hours	\$1,200		
EMG Analyst	1	\$30/hour for 40 hours	\$1,200		
Equipment					
EEG	1	\$850	\$850	\$110	*shipping
EMG	1	\$1,500	\$400	\$43	*shipping
				\$30	*tax
Other					
Participant Cooperation Fee	200	\$50	\$10,000		
Total Cost:	\$18,233				

Further, there is a time cost associated with this experiment. Collecting willing participants that fit the goal demographics is set to take a month. Each session will be thirty minutes of setup, thirty minutes of programming, thirty minutes of interviewing and ten minutes of debriefing. With 200 participants with varying degrees of availability, this is projected to take four weeks to complete. Analysis communicated through a paper will take eight weeks.