Comparison of Psycho-physiological Reaction and Consumer's Response to TV Advertisement for Fashion Goods

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ABSTRACT

The purpose of the study was to investigate a probable association between EEG(electroencephalogram) signal and consumer's psychological response to eight TV advertisements for fashion goods(underwear, sportswear). Eight advertisements for fashion goods were chosen as stimuli including four informative-transferring and four emotion-evoking type ads. The advertisements were presented on TV screen in a random order. Twenty healthy college students participated in this experiment. EEG was extracted from six lobes such as right and left frontal, occipital, temporal, and recorded during TV watching experiment. The participants were also asked to fill in the questionnaire immediately after watching individual TV advertisement. Seven point scale semantic differential measurement was used to evaluate psychological response including attitude toward advertisement and brand, purchase intention, the degree of preference, amount of recollection by using written questionnaire. Data were analyzed to read the EEG pattern and consumer's responses. As results, the advertisement which showed the highest score in preference, memory, and recall rate also showed the high frequency of theta and alpha increase/decrease pattern. At the same time, the advertisement with the lowest score in purchase intention, preference and recollection showed the lowest presence of theta and alpha brain spikes. The meaning of the results in terms of association between EEG signal pattern and consumer response was also discussed.

INTRODUCTION

Advertisement is one of the communication tools used to persuade consumers to purchase goods and services, and to differentiate one from its competitors. Although the most common ways to appeal consumers for such purposes are offering information about products or brands, the number of advertisements using emotional appeals has been increased in some product categories such as fashion-oriented goods.

Fashion goods are high-value-added-products with rapidly-changing popularity, and product-differentiation through advertisement has become very competitive. In most cases of advertisements for fashion goods, companies rely excessively on emotional appeals rather than offering detailed product information in order to increase the effect of

advertisement without assessing the effect of the methods quantitatively. Consumer's preference in contents and which kind of advertisement could be appealed to their senses are critical issue in terms of saving marketing cost and providing favorable brand image to the consumer as an effective marketing tool under the present marketing environment with increased advertisement cost and intense competition.

In terms of the methods to appeals used for advertisements, Nelson (1971, 1974), Puto and Wells (1984), Pechman and Stewart (1986), Belch and Belch (1990), Lee (1990), and Kim and Bae (1994) have categorized the advertisement into informational and emotional appeals. Although it was known that the different appeal methods of advertisement did affect the consumer's buying behavior differently, it is difficult to analyze the effects of informational and emotional part of

advertisement because the assessing the effects heavily relies on consumer surveys without cross-checking quantitatively.

Therefore, this study aimed to examine the psychophysiological reaction by employing EEG and the consumer responses by using surveys to eight TV advertisements for fashion goods (underwear, sportswear), and to investigate the association between the brain wave and questionnaire survey results for emotion-evoking and information-transferring advertisements.

This approach is not new since Rothschild et al. (1986) have used EEG to examine the various brain responses to TV advertisement and found a high correlation between alpha wave and recall or cognition of advertisement. Rothschild et al. (1988) also found the different hemispheric responses to linguistic and non-linguistic advertisement stimuli. Kim et al. (2003) found such a trend that EEG activation was more dominant during emotion-evoking advertisement than information-transferring advertisement. In particular, the beta/alpha parameter at left frontal lobe and right occipital lobe showed a significant activity increase during emotion-evoking advertisement compared to the information-transferring advertisement.

METHODS

1. Participants

Ten males and ten females who watch TV for about ten hours per week, and with no experience of brain or cardiac pain, participated in the experiment. They were not allowed to take any kind of drugs and to smoke a cigarette. None of them had color blindness or color weakness. Their average age were male for $25.3(\pm 1.42)$ years and female $21.9(\pm 2.77)$ years and right handed without any physical disorder, especially brain disease or heart disease respectively.

2. Apparatus

Thirty-two channel Nihongoden's EEG system was used to extract brain wave signals, with the value of "Gain" amplified as $24\mu V$. Sampling rate was set as

500Hz. It was adjusted and extracted signals at each channel as LPF (Low Pass Filter) 30Hz, HPF (High Pass Filter) 0.5Hz, and TC (Time Constant) 0.1. Electrodes were attached on the scalp based on ten twenty international electrode system (Japer, 1958) and both sides of ear-lobes were also used as reference points. EEG signal was extracted and recorded from six lobes such as right and left frontal (higher cognitive functions), right and left occipital (primary visual reception area), right and left temporal (primary auditory processing center), and recorded while the participants were watching TV advertisements (Sarah et al, 2002; Kim et al, 2003). Therefore, this experiment tried to validate transformation of regional brain activity of frontal, occipital and temporal areas. A laptop computer with 17 inch monitor was used to present advertisement stimulus, and sound level was fixed up to 50 dB.

3. Experimental Design

Information-transferring (I-01, I-02, I-03, I-04) and emotion-evoking (E-01, E-02, E-04, E-04) type advertisements were used as stimuli in this study. Presented advertisements were aired on Korean TV between 2000~2002 in order to minimize the affection caused by exposure period and frequency. The contents of the advertisement included underwear and sports goods. EEG signals were collected during subjects were watching eight advertisements in a random order (Within subject experimental design).

4. Procedure

Subjects were seated at their comfort position without body movement. A cap electrodes were used to attach the EEG sensors on the scalp of the subjects. Subjects spent about ten minutes to familiarize the cap electrode. The data collection began after ensuring if the subject's brain waves were stable without electrical noise during rest condition. Then eight advertisements for fashion goods including four informative-transferring and four emotion-evoking types ads were presented on the 17 inch computer

screen with sound. Eight ads were presented at random order to minimize carry-over effect. Subjects watched the screen for 30 seconds for individual advertisement while EEG signals were recorded. The most stable 20 seconds data were selected. Subjects were asked to complete questionnaire immediately after watching each advertisement. Two minutes resting period was given to the subject after completing questionnaire.

5. Data Analysis

The data were normalized based on the average value during resting stage. (Equation 1) This normalization process reduced the error due to individual difference in terms of signal sensitivity.

$$\text{Normalized EEG} = (\text{EEG}_{\text{during watching Ad}}) / (\text{EEG}_{\text{rest}})$$

Equation 1.

Then, the data presented in a time domain were transformed into a frequency domain by using Fast-Fourier Transformation (FFT). Relative EEG percentage values were computed to identify the dominant range of frequency of brain activity during watching advertisement. The brain waves with various frequency ranges used in this study were theta wave(3-7 Hz), alpha wave(8-12 Hz), and beta wave(17-22 Hz). The relative EEG percentage value of each brain wave was re-organized and displayed back in a time domain to observe the temporal change during watching the advertisements. Finally, the number of presence of particular signal patterns was recorded in a frequency chart. This analysis process was diagrammed in a Figure 2

6. Pattern identification

Individual EEG data from six different lobes were closely observed and compared each other to find any consistent patterns related to advertisement characteristics. There was not much beta activity found during all advertisement. But obvious theta and alpha activity were observed during all advertisement. Thus, we were able to identify eight types of EEG

patterns: 1)theta increase (longer than 2 seconds), 2)alpha increase (longer than 2 seconds), 3)theta decrease (longer than 2 seconds), 4)alpha decrease (longer than 2 seconds), 5)theta increase and decrease (1-2 times), 6)alpha increase and decrease (1-2 times), 7)theta increase and decrease (more 3 times), 8)alpha increase and decrease (more 3 times)(Table 1).

This pattern reading scheme was used to read a complex EEG signal by Kim et al. (2002).

Figure 1. Process of data analysis

Table 1. Identified EEG patterns during watching advertisement

Pattern Types		Patterns
Theta increase (longer than 2 sec)	Theta Pattern 1
	Alpha increase (longer than 2 sec)	Alpha Pattern 2
Theta decrease (longer than 2 sec)	Theta Pattern 3
	Alpha decrease (longer than 2 sec)	Alpha Pattern 4
Theta increase and decrease (1-2 times)	Theta Pattern 5
	Alpha increase and decrease (1-2 times)	Alpha Pattern 6
Theta increase and decrease (more 3 times)	Theta Pattern 7
	Alpha increase and decrease (more 3 times)	Alpha Pattern 8

RESULTS

As results, EEG reactions and consumer's psychological responses were compared each other. The particular EEG signal pattern was found frequently in some advertisements. That is, E-01, I-01, I-03 advertisement showed high presence of theta and alpha patterns when consumer's preference, memory and level of recollection were very high or very low. The number of presence of signal patterns for particular advertisement was summarized in Table 2.

The advertisements were also rank-ordered in terms of EEG reaction and the scores of consumer responses (preference, memory and recollection) to observe the overall trend of association between two measures. It was diagrammed in Figure 2.

As it was shown in the Figure 2, theta activities (pattern 5 and 7) and alpha activities (pattern 6 and 8) in E-01 and I-01 advertisement were related with positive consumer responses in advertisement preference, memory and recollection test, and I-03 advertisement showed very low ranking in both EEG and consumer's responses. However, other five advertisements did not show any apparent relationship between EEG and consumer responses.

Table 2. Frequency of EEG pattern presence and consumer response measure

Consumer response measure and score		I D. of advertisement	Number of EEG pattern presence	
			theta pattern 5, 7	alpha pattern 6, 8
Preference	6.15	E-01	60	25
	6.35	I-01	50	30
	2.40	I-03	37	12
Memory	6.15	E-01	60	25
	6.35	I-01	50	30
	2.40	I-03	37	12
Recollection	6.15	E-01	60	25
	6.35	I-01	50	30
	2.40	I-03	37	12

Figure 2. Relationship between the rank-ordered frequency of EEG pattern presence and consumer responses

DISCUSSIONS

Most importantly, the active EEG signals including increase/decrease pattern of theta and alpha waves showed meaningful association with both highly positive and very negative consumer responses in particular advertisements. This means that the EEG can respond to relatively strong stimulus to show consumer's attitude, preference, or level of recollection toward particular product. At the same time, there were advertisements of which characteristics was not accounted by only EEG signals. It would be perhaps due to the limitation of current EEG pattern that cannot identify all the factors affecting consumer's decision. If not, it would be due to the advertisement contents itself generating both positive and negative responses of consumers.

Among advertisements with no particular relationship between EEG and consumer responses, the gender difference was apparent in the questionnaire analysis. For example, women's underwear, sports goods for outdoor activity seemed to affect subject's attitude toward advertisement, brand, memory and recollection greatly depending on their gender type. Interestingly, such gender difference was not found in EEG signal. Therefore, it was conjectured that EEG information was collected mainly during the perception stage which was involuntary and immediate reaction rather than the response selection stage involving personal intention and long-term memory of the products while answering the questionnaire.

Therefore, the comparison result of EEG reaction and consumer response indicated that EEG had a probable utility as an evaluation tool of TV advertisement as long as the visual stimulus is relatively strong whether it is positive or negative.

The distinction between information transferring and emotion-evoking advertisement was not as significant as the result compare to the previous study (Kim et al., 2003). This result might be related with the fact that the advertisements used in this study had

both information transferring and emotion evoking contents in a single advertisement.

CONCLUSIONS

This result of the study showed that EEG had a probable association with consumer response to TV advertisement of fashion goods. Further investigation of causal relationship between EEG and advertisement characteristics can improve the evaluation sensitivity of the method. In conclusion, this method can be used as an assistive tool to test the effectiveness of advertisement on the market before it is broadcasted to the public. Eventually, this type of evaluation would increase the probability of market success as well as decrease the risk of having unpopular advertisement for the product.

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