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Preliminary Evidence for the Psychophysiological Effects of a Technological Atmosphere in E-Commerce

Yeo Jin Jung*† · Yuri Lee** · Ha Youn Kim* · So-Yeon Yoon***

*Department of Textiles, Merchandising and Fashion Design, Seoul National University

**Department of Textiles, Merchandising and Fashion Design / The Research Institute of Human Ecology, Seoul National University

***Department of Design Environmental Analysis, Cornell University

Abstract

As information and communication technologies (ICTs) become more advanced, consumers are able to experience retailing activities such as searching for products and services in online retail shops and for Internet-exclusive branded contents. Specifically, fashion retailers are facing the need to develop more novel experiential design than one another to maximize customers' experience in Internet websites and secure sustainable competency. Confirming methods of organic integration of experiential and visual features of both online and mobile channels is an important aspect of the study of extended consumers' interfaces of retail channels. Mehrabian and Russell's stimulus-organism-response (S-O-R) paradigm and Sugiyama and Andree's attention, interest, search, action, and share (AISAS) model were used for this research. Specifically, the present study considered the effect of e-commerce website features on consumers' emotional reactions (pleasure and arousal) and the consequent impact on online consumer behaviors (search, action, and share). Hence, plus the self-reported survey methods, each subject's psychophysiological indicators (i.e., pleasure and arousal) were measured to obtain more objective and reliable data and to redeem the results of the self-reported survey. Findings revealed the implications of the e-commerce website feature by comprehending the S-O-R paradigm and AISAS model and extending the understanding of the role of variables associated with comprehended frameworks based on psychophysiological data.

Key words: Online Atmospherics, E-commerce, S-O-R Paradigm, AISAS, Website Feature, Psychophysiology

1. Introduction

Previous research regarding the retail industry has focused on the roles of retail channels such as online, offline, and omnichannel, which integrates both online and offline channels. Each channel has its pros and cons with regard to satisfying consumers' needs (Floh & Madlberger, 2013; Park et al., 2014; Piotrowicz & Cuthbertson, 2014). During the last decade, when smart devices began becoming popular among consumers

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† Corresponding Author : Yeo Jin Jung (Dept. of Textiles, Merchandising and Fashion Design, Seoul National University)
E-mail : remnantusa86@snu.ac.kr
TEL : 02-880-8925
FAX : 02-875-8359

across the world, both e-commerce and brick-and-mortal retail stores started to have a mutual influence on the entire consumption process—from searching information to purchasing products and services—and the boundaries of retailing between online and offline blurred during the process (Cao, 2014; Floh & Madlberger, 2013; Piotrowicz & Cuthbertson, 2014). Given such revolutionary changes to retail channels, it is critical that retailers strengthen both online and offline channels to retain current customers and attract prospective customers. Moreover, developing an organic relationship with customers in any retail channel appears to be a critical factor in the success or failure of retailers (Cao, 2014; Mahajan et al., 2002). Unlike consumers before the smart device era, current consumers live in an era when life is convenient because products, technologies, and services have become integrated (Cao, 2014; Piotrowicz & Cuthbertson, 2014). Hence, consumers today are also known as smart consumers who are active in their consumption journey, especially on the Internet, which requires retailers to adapt to new consumer behavior trends. For instance, current retailers are required to go beyond simply providing products. Although Pine and Gilmore (1999) proposed four types of experiences (esthetic, educational, entertainment, and escapist), there is a discrepancy with regard to applying them to online fashion retailing, and a detailed strategy to put them into practice is missing.

Prior to further investigation of a more innovative retailing strategy, it was understood that clarifying consumer behaviors on the Internet was necessary. A multidimensional experience, along with explicit factors such as sociocultural, economic, and technological factors, is seen as an important research topic to investigate overall consumer behavior on each channel (Piotrowicz & Cuthbertson, 2014; Li et al., 2017). As information and communication technologies (ICTs) become more advanced, consumers are able to experience retailing activities such as searching for products and services in online retail shops and for Internet-exclusive contents feature (Brady & Fellenz, 2008; Renko & Druzijanic, 2014; Li et al., 2017). Specifically, fashion retailers are facing the need to develop more novel experiential design than one another to maximize customers' experience on Internet websites and secure sustainable competency (Huang, 2003; Jeong et al., 2009; Floh & Madlberger, 2013; Lunardo & Mbengue, 2013). Confirming methods of organic integration of experiential and visual features for both online and mobile channels is an important aspect in the study of extended consumers' interfaces of retail channels (Avery et al., 2012; Heitz-Spahn, 2013; De Nisco & Warnaby, 2014; Li et al., 2017). However, although past research investigated online shopping experiences (Kaltcheva & Weitz, 2006; Mollen & Wilson, 2010), online advertising (Cho & Cheon, 2004; Lee et al., 2013; Tang et al., 2015), and Internet retailing (Ha & Lennon, 2010; Huang et al., 2009; Menon & Kahn, 2002), in addition to general consumer behaviors on the Internet (Liu et al., 2016), limited research exists on consumers' emotional reactions and behavioral responses regarding contents feature on websites prior to the actual shopping process. Hence, the purpose of this study is to investigate the effect of technology features on websites (i.e., content videos feature) on consumers' affective states (i.e., pleasure and arousal) and their consequent responses such as searching, acting, and sharing. Mehrabian and Russell's (1974) stimulus-organism-response (S-O-R) paradigm and Sugiyama and Andree's (2010) attention, interest, search, action, and share (AISAS) model were used for this research.

In the following section, the theoretical background and literature reviews of the S-O-R paradigm and consumers' decision process and the AISAS model, focusing on e-commerce, are discussed. Based on the S-O-R paradigm, hypotheses regarding the impact of the online technological atmosphere, such as contents feature displayed on the first page of websites, on consumers' emotional reactions and consequent behavioral

responses are developed. Along with a quantitative survey, physiological responses (i.e., pleasure and arousal) are measured using the BioPAC system. The data are analyzed, and the results are provided and discussed.

2. Literature Review

2.1. S-O-R Paradigm

The impact of the external stimulus, such as the retail environment, on consumer behavior has been studied based on theories of psychology (Kawaf & Tagg, 2012). Research initially posited the importance of the retail environment and its atmosphere as marketing tools (Kotler, 1973), which were subsequently defined as "all of the physical factors that can be controlled by the firm to enhance (or constrain) employee and customer actions" (Bitner, 1992, p. 65). Mehrabian and Russell (1974) proposed the S-O-R paradigm, which explains the direct influence of the environment on consumers' responses and emphasizes the inner organism's reactions that separate human beings from machines. Specifically, the S-O-R paradigm proposes that a consumer's inner organism changes according to the exposed external environment (Donovan & Rossiter, 1982; Mehrabian & Russell, 1974) and the changes antedate behavioral responses (Kawaf & Tagg, 2012).

Research has described the components of the S-O-R paradigm as follows: Mehrabian (1976) described the stimulus component (S) as the load of information of the environment: (a) the amount of novelty, such as "how well an individual knows an environment and can predict what will happen" in the environment, and (b) the complexity, such as "a number of elements, features, and changes in the environment." In other words, when consumers are exposed to a high-load stimulus, they will experience novel, unpredictable, and complexity toward the stimulus (Donovan & Rossiter, 1982; Mehrabian & Russell, 1976). The organism component (O) is generally explained as consumers' emotional reactions to the environment (Petrie, 1967). According to Mehrabian and Russell (1976), individuals' emotional reactions to the environment are classified into three different states known as PAD: (a) pleasure-displeasure, (b) arousal-nonarousal, and (c) dominance-passivity. However, research has proposed the elimination of the dominance state because, according to empirical research, it requires cognitive judgment of consumers rather than an affective reaction, which is a more natural inner reaction. This aspect makes it the weakest part of the model (Ha & Lennon, 2010; Russell & Pratt, 1980). Thus, this study focuses on pleasure and arousal factors. Pleasure is the affective response to the environment and is defined as emotional valence (Kaltcheva & Weitz, 2006). Mehrabian and Russell (1974) defined arousal as an affective dimension from calm (nonarousal) to excitement (arousal), whereas research categorized it as subjective arousal from the subjective experience (Russell & Barrett, 1999). The responses component (R) was initially categorized as approach-avoidance behavior, which can be stated as consumers' level of arousal and pleasure experienced will determine their approach-avoidance responses (Ridgway, Dwason, & Bloch, 1989).

2.2. Hypotheses Development

Although online retail channels have grown along with developing technologies in daily life, offline retail channels have applied information communication technology (ICT) and experiential technology to improve the shopping environment (Cao, 2014). Specifically, ICT technologies allow retailers to manage consumers through either integrated channels or independent online or offline channels by providing a variety of experiences (Blázquez, 2014; Cao, 2014; Piotrowicz & Cuthbertson, 2014; Li et al., 2017). Fashion products are categorized as high-hedonic products that enhance

the significance of consumers' shopping experiences both offline and online (Blázquez, 2014). Hence, the retail store environment has a significantly positive influence on not only the store itself but also the attractiveness and favorability of the brand, which, in turn, is connected to consumer behaviors such as the approach to the brand and purchase intention (Eroglu, Machleit, & Davis, 2003; Grewal, Krishnan, Baker, & Borin, 1998; Kushwaha & Shankar, 2008).

Research has implied that as consumer behaviors change significantly, continuous innovations in the retail store environment are demanding (Shankar, Inman, Mantrala, Kelley, & Rizley, 2011). Environmental features, including both the physical retail store environment and the fashion e-commerce retail website designs and contents feature with brand information and promotional messages, have an influence on consumer shopping behaviors (Floh & Madlberger, 2013). Consequently, behaviors such as visual exploration, attention to displayed products, and efforts (e.g., time spending) on information processing play a significant role in developing attractiveness and perception of the products (Hyllegard, Ogle, Yan, & Kissell, 2016; Orth & Coruch, 2014). Shankar et al. (2011) posited that technology is a significant feature in the retail store environment and that it can be applied to e-commerce in the context of rapid growth of the mobile and the Internet, which allow consumers both accessibility and usage of product information in addition to the ability to share their reviews and comments regarding the website and brand. Furthermore, informational and promotional technological features provide consumers with opportunities in both online and offline retail stores (Floh & Madlberger, 2013; Hyllegard et al., 2016; Shankar et al., 2011). Several researchers implied that innovative technology for e-commerce has a significant effect on consumers' shopping decisions (Floh & Madlberger, 2013; Hyllegard et al., 2016; Renko & Druzijanic, 2014). Additionally, as a variety of technologies that increase the importance of experiences on websites and maximize the experiences are added to the retail store environment, consumers will be exposed to retail store environments with a variety of features. As Mehrabian (1976) previously noted, such external stimulus can be categorized as the high load of information stimulus, which is novel to consumers because it is unpredictable and complex. Research has implied that features in retail store environments are considerably important factors to differentiate consumers' behaviors accordingly (Orth & Wirtz, 2014).

Handayani and Hudrasya (2015) discussed the linear classic model of the purchase decision process, also known as the attention, interest, desire, memory, and action (AIDMA) model. Although it has been suggested that AIDMA plays a central role in describing the psychological processes involved in purchasing behavior of consumers, it is limited to traditional media advertisers. Today's smart consumers, meanwhile, are familiar with new technologies and media (Handayani & Hudrasya, 2015). However, according to the Aberdeen Group's (2012) indication, many retailers operated retail channels separately (online store, offline store, catalog shopping, etc.) until 2010. This phenomenon reflects the discrepancy between technology development and consumer satisfaction (Cao, 2014). Based on the perceptions of consumers, retailers integrated channels to offer uniformed shopping experiences (Cao, 2014). Hence, the extended AIDMA model is needed to explain consumers' cross-channel behaviors, including the AISAS model (Wang & Jin, 2010; Zhang & Duan, 2012). In the AISAS model, which is nonlinear, search, action, share (SAS) replaces desire, memory, action (DMA) from the prior purchase decision process model (Handayani & Hudrasya, 2015) according to the influence of new technologies such as social media and mobile devices (Sugiyama & Andree, 2010). This indicates changes in consumer behavior, with consumers becoming more active than before through the Internet to satisfy their needs and wants in this social networking service era and expecting

two-way communication with both brands and other consumers (Jung & Kim, 2016). For instance, as technologies are continuously being developed and innovated smart devices are being rapidly diffused, consumers are becoming familiar with more communication technologies and more willing to choose the best options after searching for as many options as possible before taking any actual action (i.e., purchase) and then sharing the retail experience through social networking services, either positively or negatively (Wang & Jin, 2010; Zhang & Duan, 2012). The AISAS model suggests that when an e-commerce website's features capture consumers' attention and stimulates their interest in them, consumers will want to gather information on the Internet (search), and the consequent positive evaluations will lead them to take action such as making a purchase on the e-commerce website (action). Additionally, after-purchase behavior will take place through word of mouth on the Internet (share). Hence, this study focuses on SAS specifically because it reflects consumers' online behaviors rather than the AIDMA model for e-commerce.

Therefore, including a variety of technology types, such as contents videos feature, on the first page of a website may confirm the impact of the e-commerce web environment on consumers' online behaviors. Further, managing consumers on the Internet systematically seems to be a critical issue for handling further consumer responses. Hence, this study hypothesizes as follows (Fig. 1):

H1: When consumers are exposed to an e-commerce website's feature, it will have a positive impact on affective internal states: (a) pleasure and (b) arousal.

H2: Affective internal states (a) pleasure and (b) arousal will have a positive impact on behavioral responses: (a) search, (b) action, and (c) share.

3. Methodology

This study focused on the importance of e-commerce website features. Because consumers are becoming smarter thanks to smart devices, website features are beyond the limitations of redisplaying items by category and interactive features and play the main role of shaping consumers' online shopping experiences. The present study considered the effect of e-commerce website features on consumers' emotional reactions (pleasure and arousal) and the consequent impact on online consumer behaviors (search, action, and share). Hence, in addition to self-reported survey methods, each subject's psychophysiological indicators (i.e., pleasure and arousal) were measured to obtain more objective and reliable data and to redeem the results of the self-reported survey.

3.1. Subject

A total of 30 female students from a university in South Korea participated in the experiment. The

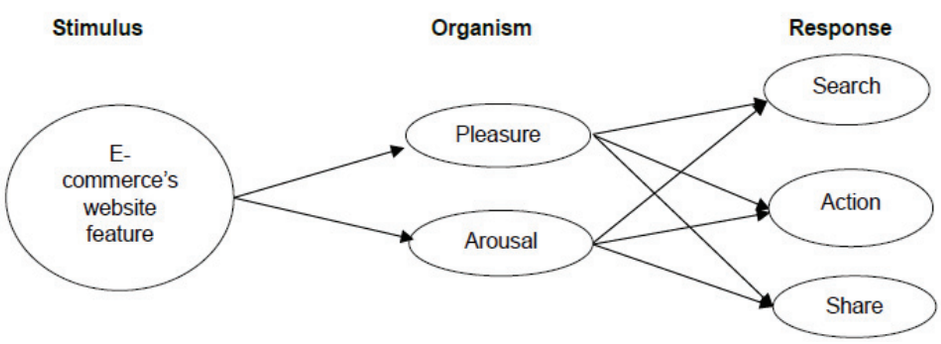

Fig. 1. Research framework

subjects were in their 20 and 30s and were chosen because they were familiar with using smart devices and migrating among shopping channels as they shopped. Previous research has determined that each individual receives a different perception from visual stimulus and consequent reactions are according to his or her personal characteristics (Hsiu-Feng, 2014). Because the current research focuses on subjects' technology familiarity and consequent reactions to fashion e-commerce websites, the age of subjects was limited to control possible errors.

Subjects were asked to observe the stimulus, and their psychophysiological reactions—that is, pleasure and arousal—were observed. Such methods lead within-subject analysis, which provides stable and unyielding grounds and requires a certain number of subjects to predict and generalize online consumer behaviors. Therefore, the total number of subjects, 30, is valid for the study and for further analysis. Each subject received $10 as an incentive. This study was approved by the Seoul National University IRB, and all subjects were provided with written informed consent.

3.2. Stimulus

A lab experiment was conducted using a mock content video feature that was supposed to be played on the first page of a fashion e-commerce website. Adobe Premier Pro was used because providing more realistic content video feature stimulus to subjects is critical to increase the psychophysiological reliability of e-commerce website feature research. A design and development expert incorporated with the stimulus development and the final results was used for the experiment (Fig. 2).

3.3. Procedure

Subjects were recruited through the university's online community and guided to set up the schedule contacting to authors. Each experiment session lasted an average of 30 minutes, and subjects participated in each session individually. Before the experiment session, each subject sat in an armchair placed in front of a large-screen TV and was informed of the purpose, content, and detailed procedure of the experiment as well as the steps taken to protect their privacy. The experiment was conducted with a lab assistant in each session to utilize time more efficiently. While the authors provided information on the experiment to the subjects, the lab assistant attached electrodes and disposable adhesive sensors to the subjects' left

Fig. 2. Screenshot of e-commerce' branded content

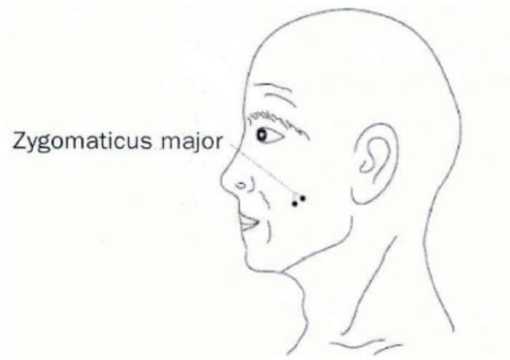

Fig. 3. Location of Zygomaticus major (smile) muscle (Martínez-Fiestas et al., 2015)

cheek, specifically to the zygomatic muscle (Fig. 3) (Cacioppo & Tassinary, 1990; Martínez-Fiestas, del Jesus, Sánchez- Fernández, & Montoro-Rios, 2015), and to the arms and the nondominant hand. The lights in the experiment room were turned off after all the sensors were completely attached, and the subjects were told to calm down for a minute. Baseline is an important factor to describe in psychophysiological experiment, which has been missed in this section. First baseline was measured for five seconds when the lights of the room and TV screen were turned off until the subjects were relaxed and calm. Second baseline was measure for five seconds after subjects finished the survey for the first stimulus. After they were relaxed, the authors asked them to watch the TV screen and follow the instructions shown there. Randomly ordered mock stimuli (Luxury; With technology, Without technology) of e-commerce website features were shown for 15 seconds each and changed in the next step, where subjects answered a self-reported survey through a tablet PC regarding the e-commerce website feature stimuli they had observed just before. Survey scales include mock experience of the stimulus such as entertainment ("This video has entertainment features"), escapism ("This video made me to forget about my daily routine"), education ("This video stimulated my curiosity to new things") and aesthetic ("This video really showed attention to design in detail") based on work of Pine and Gilmore (1999), and responses toward the stimulus such as intention to search ("After watching the video, I feel like to look around this e-commerce website more" and "After watching the video, I feel like to know about products of this e-commerce"), action ("After watching the video, I feel like to purchase a product of this e-commerce") and share ("I feel like to transmit the e-commerce's information to my friends" and "I feel like to share my experience and comments about this e-commerce website") based on the work of Wang and Jin (2010) and Zhang and Duan (2012).

After subjects were done observing the stimuli and answering the survey questionnaires, they were asked to answer the manipulation questions ("Did you find this stimulus as a luxury e-commerce website feature?" and "Did you recognize the technology attributes in the luxury e-commerce website feature?") using a 7-point Likert scale. The electrodes and disposable adhesive sensors were removed by the authors, and sanitation tissues were provided to the subjects to clean their face, arms, and nondominant hands on their own. Before leaving the experiment room, the subjects signed a form confirming they had received the aforementioned incentives.

Before the experiment began, authors cleaned the experiment room and made it dark and quiet to eliminate any bias from both inside and outside. The experiment spot and computer were connected to the BioPAC MP150, and the experiment space was separated with a partition to provide a better experiment environment for the subjects.

3.4. Psychophysiological Measurement

Psychophysiological is a tool for developing experiential strategy in the retail store environment. Self-reported surveys carry the possibility of fabricated results, exaggeration, and devaluation, especially when measuring one's emotional states upon expressing the emotion. Psychophysiology is "the study of the relationship be-

tween the mind and the body in a bidirectional way," and consumer research has employed psychophysiological techniques (Martínez-Fiestas et al., 2015) to obtain data that cannot be reported verbally or through self-reports (Micu & Plummer, 2010). Because psychophysiological measurements record continuous emotional reactions of consumers to the environment, observing alterations in emotional reactions is possible. Positive emotional reactions to the retail environment are connected to positive consumer behaviors such as brand satisfaction and loyalty. Hence, this study explored how changes in electromyogram (EMG), galvanic skin reflex (GSR), and heart rate (HR) affect consumers' behavioral responses.

4. Results and Discussion

4.1. Psychophysiological Responses to Technological Features of E-Commerce Websites (S-O)

Repeated measure ANOVA was conducted to test hypothesis 1. This study employed repeated measure ANOVA for 2(Luxury e-commerce website with technology feature vs. Luxury e-commerce website without technology feature) X 3(physiological responses) design to compare means of two within-group about the stimuli on repeated observation for three different physiological changes (EMG, GSR and HR) (see Table 1). Results of the psychophysiological measure showed the change of the emotional changes to the stimulus used. Consistent with the hypothesis, when subjects were exposed to the content feature that was supposed to be displayed on the first page of the fashion e-commerce website, physiological changes of pleasure (EMG and HR) and arousal (GSR) were detected. According to numerous researches, indicating role of heart rate has been discusses in with various interpretations. However, this study referred the definition from work of Greenwald, Cook and Lang (1989), which stated that heart rate appears to be "a sensitive and specific measure of valence." Based on this definition, number of researches has been done to prove the relationship between heart rate and pleasure (Bradley & Lang, 1994; Wagner et al., 2005; Bradley et al., 2008; Salimpoor et al., 2009; Dellacherie et al., 2010; Lang, 2014), and indicate that heart rate is increased as subjects experienced pleasure. In other word, the speeding up and slowing down of the heart rate tells researchers whether an individual finds a particular stimulus pleasant or unpleasant.

Table 1. Repeated Measure ANOVA results

Stimulus (S)	Emotional States (O)	df	F	*p*
Content feature on e-commerce's website	Pleasure (EMG)	27	4.356	.000
	Arousal (GSR)			
	Pleasure (HR)			

$p < .05$**

However, among the three psychophysiological measurements (EMG, GSR, and HR), the analysis obtained significant results for GSR alone for the stimulus of the luxury e-commerce website with technology feature. Results for the stimulus of the luxury e-commerce website without technology feature showed insignificant effects on subjects' pleasure (EMG [F (1, 30) = 2.320, MEMG = 30.568, p = .134] and HR [F (1, 30) = 0.043, MHR=379.482, p = .836]) and arousal ([F (1, 30) = .852, MGSR = .733, p = .360]) states. Specifically, results showed an S-O relationship where the content feature on the e-commerce website had a significant effect on arousal [F (1,30) = 4.688, MGSR = .411, p = .006] and an insignificant effect on pleasure, which was reflected in the results from both the EMG [F (1,30) = 1.709, MEMG = 187.757, p = .125] and HR [F (1,30) = 1.257, MHR = 1122.743, p = .288]. Therefore, H1 (a) was rejected, whereas H1 (b) is supported that a feature on e-commerce website has a positive impact on the affective internal state; specifically, the level of arousal.

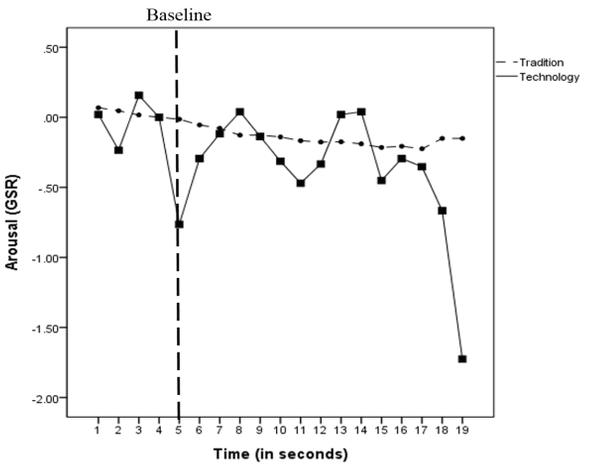

Fig. 4. Galvanic skin response (GSR) during the 15-second (S-O relationship)

According to past research (Wang & Minor, 2008), arousal is closely related to galvanic skin responses, which assess the ability of the skin to conduct electricity. Specifically, changes to GSR, which is detected as subjects watch content video feature stimulus, is significant and shows the positive relationship of S-O. This result is consistent with past research that has posited the positive relationship between stimulus and change of arousal (Mella, Conty, & Pouthas, 2011). Fig. 4 shows the change of arousal level during a 15-second period, and distinctive changes are shown during the first three seconds. In general, such distinctive changes reflect significant emotional changes in the subjects that would have a consequent impact on behavioral responses. However, significant of entire 15 seconds was resulted, and analyzing its effect on consumer's responses would result reliable implication. Hence, the O-R relationship is analyzed based on the entire 15 seconds.

4.2. Affective Internal State Responses on Behavioral Responses (O-R)

The effect of the affective internal state, which in this case means arousal according to the results of the observation of the S-O relationship, on behavioral responses (O-R) was analyzed using regression analysis (Table 2). Regression analysis was conducted to test hypothesis 2, and change scores were used to calculate effect of each physiological data of affective internal state (pleasure and arousal) on each behavioral responses, such as search, action (i.e. purchase) and share. Behavioral responses were measured by conducting survey scales with 5-Likert (i.e. "After watching the video, I feel like to look around this e-commerce website more," "After watching the video, I feel like to purchase a product of this e-commerce," and "I feel like to transmit the e-commerce's information to my friends"). Huang (2003) argued that individuals tend to maintain an optimal level of stimulation that would minimize their boredom and ensure to avoid too much stimulation. According to the approach-avoidance theory, Chang and Cheung (2001) implied that individuals who found the Internet website to be excited, or highly aroused, had higher intention to search the website. Specifically, researches (Greenland & McGoldrick, 1994; Foxall & Greenley, 1998; Huang, 2003) implied that arousal has been an important determinant to increase consumers' intention to remain and to purchase in excited retail environment including the e-commerce website. This research referred these previous research results to describe relationship between arousal and intentions to search and action. During the stimulus exposure, the increased level of arousal led to behavioral responses such as search and action (i.e., purchase intention). In other words, increased arousal had an actual impact on subjects' intention to search about a brand and make purchases related to the brand. The results had significant

Table 2. Regression analysis results (O-R)

Affective internal state - Behavioral responses(O-R)	R^2	β	*t*	*p*
Arousal → Search	.280	3.492	2.091	.046
Arousal → Action	.402	7.429	3.387	.002
Arousal → Share	.170	4.098	2.025	.053

$p < .05$

positive effects on search and action, reflecting the reduction or elimination of share intention after the stimulus exposure. Overall, H2 (a) and (b) were fully supported. Moreover, the subjects showed no intention to share any information about e-commerce only by being exposed to the contents video feature on the website. Therefore, H2 (c) was not supported.

5. Conclusion and Future Works

This study extends the understanding of the e-commerce website feature on consumers' affective responses that predict consequent behavior, and it is the first to measure physiologic responses such as heart rate, electrodermal responses, and facial muscle activity. Analyses of the website features' impact provided partial support for the S-O-R paradigm (Mehrabian & Russell, 1974) regarding the AISAS model; in particular, findings from the analyses showed that the stimulus influences consumers' arousal (S-O relationship) and that arousal has a significant impact on consumers' responses—namely, search and action (O-R relationship).

The findings revealed the implications of the e-commerce website feature by comprehending the S-O-R paradigm and AISAS model and extending the understanding of the role of variables associated with comprehended frameworks based on psychophysiological data. Collectively, the findings showed that subjects who were exposed to the e-commerce website's content video feature experienced, relative to baseline, a distinctive change during the stimulus exposure time in galvanic skin responses. However, heart rate and facial muscle activity responses were statistically insignificant, indicating that subjects' physiological state of pleasure was not detected. This finding, the significant change of arousal level, was consistent with past research (Orth & Coruch, 2014) that argued about the effect of the environment's construct on the electrodermal system, which is closely related to the arousal state of the individual. In other words, the content video feature on the e-commerce website stimulated the subjects' arousal state, and hence, galvanic skin responses were detected. Interesting results from the experiment showed that there are different impacts of arousal states by time on behavioral responses. The e-commerce website's content video feature increased physiological arousal during the first three seconds, thereby initiating behavioral responses such as search and purchase intention. Furthermore, physiologic arousal decreased significantly after the fifth second, and the whole 15 seconds, overall, initiated search and purchase intentions. These results provide significant evidence that online features must contain strongly impressive contents in the first few seconds to capture consumers' attention and lead to consequent responses, including continuous observation of the feature contents; further searches about the e-commerce website; and possible intent to purchase products and services. There is limited research and psychophysiological evidence regarding consumers' affective state and its consequent impact on their behaviors. Hence, this study will benefit further research by contributing to the importance of measuring physiological evidence supporting self-reported surveys. Moreover, the results reveal that e-commerce websites must look impressive to attract consumers' attention in the first couple of seconds because, according to the results of this study, consumers are not willing to pay attention afterwards. The results in the overall 15 seconds in this study showed significant effects of arousal on subjects' search and purchase intentions. For online retailers, this result implies that when their website features, such as video contents feature, are exposed to consumers, their impact on consumers' intention to search for more information regarding the contents. Hence, displaying attractive or influential website contents is recommended according to the results of this study. Moreover, not only Internet retailers but also online channel-based retailers may be

able to refer the implications of capturing consumers' positive intention to search for more information about their brands and products and possibly take purchase action. This knowledge will be valuable to online retailers and can improve the online shopping experience for smart consumers.

Even though psychophysiological data was collected, a self-report survey for pleasure and arousal states－which would have provided concrete and supportive evidence－was not conducted. Furthermore, psychophysiological experiments analysis can be done in various methods according to its research purposes and objects such as comparing changes of subject's affective internal states between before and after the exposure of stimuli. Hence, future study should be designed to compare and analyze baseline and stimulus effects. In addition, physiological data are resulted in each second and the each data would imply different analysis for the research. Future study should focus on depth of the physiological data and conduct discriminant analysis in order to derive detailed implication. Moreover, further experiments should have been conducted with subjects from different cultural backgrounds to generalize the results. Future studies should use additional psychophysiological measurements such as hormone and brain activities in addition to self-reported surveys.

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