

**Psychological Characteristics of Virtual Experience:
A Comparison of Verbalization in 3-D and 2-D Advertising**

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Consumers learn about products through experiences. Experiences are ongoing transactions that increase in quality, intensity, and meaning by integrating both cognitive and affective responses from interactions with people, objects or environments (Mathur 1971). An experience can be an event or process that occurs spontaneously or voluntarily but always involves the internal awareness of something taking place (Lundh 1979). These psychological conditions are ultimately accomplished via the generation of thoughts and/or sensations brought together creating the experience (Hirshman 1984).

Research has documented that consumers learn about products through indirect experience, such as advertising, and via direct experience, such as product trial (Deighton 1984; Hoch and Ha 1986; Kempf and Smith 1998; Smith and Swinyard 1982; 1983). However, Hoch and Deighton (1989) believe that consumer learning from experience is not a simple matter of discovering objective truth and therefore subject to influence. Thus, a role of marketer-controlled communication such as advertising is to "frame" how and what consumers will learn from experiences either directly or indirectly.

The Internet has the ability to serve as a more powerful medium in the sense that consumers are able to interact with products in 3-D multimedia environments simulating a new form of experience – virtual experience. A virtual experience has been defined as a psychological and emotional state that consumers undergo while interacting with products in 3-D environments (Klein 1998). Potentially, a virtual experience relying on 3-D product visualization could play a unique role in the future of consumer learning in computer mediated environments because it is a simulation of the real or physical experience and can be construed to

be located between direct experience and indirect experience on an experience spectrum (Li, Daugherty and Biocca 2001). Because most products are 3-D objects that are experienced with the senses, the use of dynamic 3-D visualization in e-commerce is increasing as companies seek to give users a virtual experience of the product. Therefore, an understanding of these newer forms of virtual experience becomes important as we consider the future advertising and marketing in computer mediated environments.

Literature Review

Klein (1998) suggests that virtual experience may occur in each of three scenarios. First, information about a product's specific attributes is easily accessible on the Internet. Second, the format of information presented can alter the weighting consumers give to different attributes, especially when experience attributes are absent. For instance, the history or personality of a wine product may be sufficient for a consumer in absence of direct contact with the packaging or display information. Third, Internet advertising may provide experience from expert sources to assist consumer learning. As a result, such a virtual experience is able to "transform" experience attributes into search attributes and thus, reduce perceived risk prior to purchase.

The notion of virtual experience evolves as Internet technology advances. If Klein's concept of virtual experience is based on "semantic associations," dynamic 3-D visualization of products is more likely to generate a virtual experience via "imagery associations." Both spontaneous and voluntary imagery can facilitate the simulation of a virtual experience (Richardson 1984). Imagery-based virtual experience is likely to be richer than semantic-based virtual experience because of interactivity, vividness, and a sense of engagement from examining 3-D visual products.

Interactivity is a multidimensional construct that can refer to numerous methods in which users of a medium can influence the form or content of a mediated environment (Ariely 2000; Haubl and Trifts 2000; Heeter 2000). In computer-mediated environments, interactivity has been described as both the ability to communicate with people (person interactivity) and access information (machine interactivity) (Hoffman and Novak 1996). While interpersonal communication is an important advantage of the Internet compared to traditional media (i.e., e-mail, chatrooms, etc.), interface design and the manner in which information is accessed are most applicable in 3-D product visualization. In fact, the goal of many designed experiences in computer-mediated environments is to impact, involve, and/or enable human interaction as easy as possible (Heeter 2000). Haubl and Trifts (2000) found that interactive design aids in ecommerce environments have a substantial influence on consumer decision making. While their study focused on breadth and comparisons of products in online shopping environments, they emphasized that their results should apply across various dimensions of interactivity, such as 3-D product visualization (Haubl and Trifts 2000).

In turn, vividness refers to the clarity and ability of an image to produce a sensory rich mediated experience and is generally thought to be more persuasive. However, studies in this area have not produced consistent findings. Furthermore, a significant limitation in comparison to a virtual experience is that most research investigating vividness is based on either semantics or passive imagery (Keller and Block 1997). In a study specifically designed to test the effects of verbal product representations versus vivid computer realistic images, Vriens, Loosschilder, Rosbergen, and Wittink (1998) found that pictorial representations improved understanding of design attributes. However, they emphasized that a higher degree of realism is possible with 3-D rendered products and would probably result in a stronger impact. Dahan and Srinivasan (2000)

set out to test this proposition in order to identify a low-cost alternative for new product testing. Using a portable bicycle pump as the product category, actual physical products were measured against static and animated Web representations to predict overall market share. Surprisingly, the static and animated Web representations produced nearly accurate market share rankings compared to direct product experience. While predicted levels of market share were lower than the physical interaction, virtual prototypes cost significantly less to build and allow more concepts to be tested (Dahan and Srinivasan 2000). The interactive and vivid nature of 3-D product visualization stimulates mental imagery within consumers in a virtual experience engaging them in the environment or with an object.

In order for any consumer to perceive and evaluate a product actively, it must hold some form of personal relevance. Krugman (1965) referred to this as a type of involvement. The construct of involvement has been heavily explored by advertising researchers resulting in a diverse number of conceptual approaches (Andrews, Akhter, Durvasula and Muehling 1992). Studies have defined, examined, measured, and tested involvement using both a theoretical and practical context to examine products, messages, decisions, situations, and psychological states (Muehling, Laczniak and Andrews 1993). Hence, involvement continues to remain a significant influence in the processing of information (Bettman 1979).

Cho (1999) recognized the importance of involvement in an Internet advertising study designed to explore the influence on information processing. The purpose of the investigation was to test a modified version of Petty and Cacioppo's (1981) Elaboration Likelihood Model developed for the Internet. The Elaboration Likelihood Model (ELM) specifies conditions under which persuasion is mediated by messages and postulates that central and peripheral routes influence persuasion. The results of Cho's (1999) interpretation using ELM indicate that

subjects are more likely to initiate a behavioral response when the experience is personally relevant and involvement is considered high rather than low on the Internet. Furthermore, in a virtual experience, personal engagement is activated when examining 3-D visual products with various levels of cognitive processing stimulating involvement. As a result, consumers tend to perceive 3-D products as being realistic enough to evaluate the potential benefits and utility for others (Li, Daugherty and Biocca 2001).

The combination of vividness, interactivity, and sensory stimuli combine to create a sense of presence in virtual experience. Presence, also known as telepresence, is the experience of “being there” in the virtual environment. This perceived sense is generated from sensory input, mental processes, and past experiences assimilated together in a current state (Gibson 1966). Steuer (1992) described presence as the extent to which one feels present in a mediated environment. While presence is the design goal of virtual reality, few media theorists would argue that the sense of presence is suddenly emerging with the debut of virtual reality, which consists of both immersive and non-immersive 3-D visualization (Biocca, Kim and Levy 1995).

In an exploratory study, Li, Daugherty and Biocca (2001) addressed what constitutes a virtual experience in order to identify key characteristics of this new type of experience. From a sample of 30 subjects, participants were asked to verbalize what they were thinking and feeling while interacting with 3-D products in an e-commerce environment. The results indicate that consumers undergo similar psychological processing when examining products in a virtual experience as in a direct experience. Furthermore, several characteristics associated with a virtual experience were classified, such as interactive enjoyment, presence, virtual affordances, and personal relevance from interacting with 3-D visual products. Li, Daugherty and Biocca (2001) defined virtual experience as “vivid, involving, active, and affective psychological states

occurring in an individual interacting with three-dimensional computer simulations” (p.27). An issue that remains to be addressed is how virtual experience differs from indirect experience in terms of psychological activities. In other words, how many of the thirteen types of psychological activities observed by Li, Daugherty and Biocca (2001) may manifest in the verbalization of indirect experience as derived from 2-D graphic advertising? Thus, The purpose of this study is to explore such differences. Specifically, it compared psychological activities as concurrently verbalized by subjects who were exposed to 2-D graphic advertising with those by subjects who interact with 3-D visualization in order to reveal any similarities and differences between two types of consumer experiences.

Research Questions

In Li, Daugherty and Biocca’s (2001) study, thirteen types of psychological activities were identified in virtual experience (see Table 1 for their definitions). This study classifies these activities into three broad aspects: cognitive aspects, associative aspects and experiential aspects. *Cognitive aspects* consist of product attribute attention, product evaluation, questioning about product attributes, seeking further information, and purchase intention. *Associative aspects* include self-involvement, third-person involvement, and product attribute association. And *experiential aspects* are made of presence-real, presence-natural, enjoyment from experience, expectation for richer experience, and affordances. We see a hierarchy of these three aspects, from cognitive aspects to associative aspects to experiential aspects.

This tri-classification of psychological activities is largely based on the dichotomy of the information processing perspective and the experiential perspective of consumer behavior (Hirschman 1984; Holbrook and Hirschman 1982) and the theory of involvement (Celsi and

Olson 1988; Mitchel 1979; Rothschild 1984; Zaichkowsky 1985). Cognitive aspects emphasize on active information process about products and rational choices. Associative aspects focus on the perceived relevance of a product to a consumer herself, other people and even other objects the consumer is familiar to form easy connection. For instance, when a consumer sees a new ring, she may think about one of her grandmother's and associate the style of the new ring with that one. We consider product attribute association is another form of involvement and worth more theorizing.

For the purpose of exploration, this study asks a key research question:

How will virtual experience differ from indirect experience in these three aspects and thirteen categories of psychological activities?

Method

When the purpose is to explore consumer experiences, one technique central to consumer behavior research has been protocol analysis (Gould 1999). This method, also known as cognitive response, thought verbalization, and thinking aloud, is generally used because of the message-evoked thoughts it inspires in consumers (Wright 1980). Essentially, protocol analysis involves participants verbalizing thoughts, either concurrently or retrospectively, when exposed to a stimulus. The benefit of using protocol analysis when examining consumer behavior is the introspective nature of the method. Introspection forces participants to search their own mind in order to report their thoughts and feelings about a message, event or product (Gould 1999).

Experimental Design

A laboratory experiment was conducted using a 2 by 3 mixed - design. The first between-subjects factor, visualization type, was comprised of two levels, 3-D interactive visualization or

standard 2-D graphics. The second within-subjects factor was product type with each participant exposed to three products—wristwatch, bedding material, and laptop computer. The order of the within-subjects variable was randomized for each subject.

Participants

Sixty undergraduate students enrolled at a major Midwestern university participated in the study. Participants were solicited from common general elective communication courses that included a diverse number of academic majors resulting in sample comprised of 55 percent male and 45 percent female. Student participants were considered appropriate for this experiment because they are high in Internet literacy and are likely to represent potential early adopters of e-commerce in 3-D visualization.

Stimulus

Two advertising web sites for each of the test products were created based on the independent variables: (1) interactive 3-D visualization or (2) static 2-D graphic. Advertising in 3-D visualization is a visual representation of a product that allows the consumer to move, rotate, and zoom-in and out enabling detailed visual inspection and interaction. In contrast, advertising utilizing 2-D graphics was represented by static images eliminating the ability to interact with the product (see Figure 1).

Procedure

Because it was assumed participants would have no prior experience examining 3-D visual products, combined with the difficult nature of concurrent verbalization, each participant

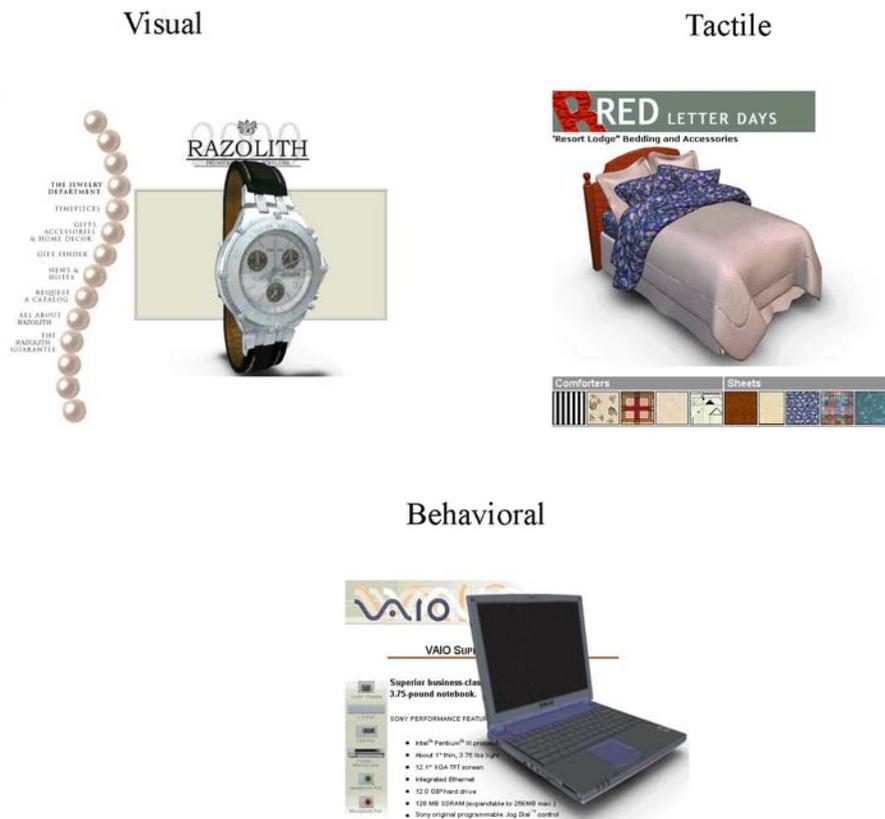
took part in two training sessions totaling five minutes. The first training session was designed to make the participants feel comfortable with verbalizing their thoughts. Participants were instructed to examine a magazine ad for a unisex fragrance while continuously communicating their thoughts and feelings. The second training session allowed participants to familiarize themselves with the keyboard and mouse controls needed to examine 3-D products through rotating, zooming in and out, and moving a 3-D rendered lightweight jacket.

The concurrent verbalization was recorded in a laboratory setting with each participant accessing a computer containing three icons hyperlinked to the corresponding 3-D products. Participants were instructed to examine the products individually, taking as much time as needed to verbalize what they “think and/or feel.” In addition, each participant was informed to continuously verbalize his or her thoughts and feelings as they examined each product. Concurrent verbalization was utilized in order to minimize memory loss since three separate products were evaluated and the entire session could last as long as thirty minutes (Wright 1980). If participants were silent for more than ten seconds, they were prompted: “Please tell me what you are thinking or feeling.” As a result of the training, however, prompting was rarely needed. The verbal reports for each product averaged five minutes and were ended by the researcher if the session extended beyond eight minutes per product.

Dependent Measures

The dependent measures of the study were the number of recorded units of thought corresponding with each of the thirteen categories previously identified from research designed to characterize a virtual experience (Li, Daugherty and Biocca 2001).

Figure 1. Interactive 3-D and Static 2-D Test Products



Note. Test products courtesy of Metastream (now Viewpoint)

Table 1. Psychological Activities

Category	Definition
1. Involvement – Self	Perceived relevance of the product or product attributes to oneself.
2. Involvement – Third-person	Perceived relevance of the product or product attributes to others.
3. Product attribute attention	Attention to specific product attributes such as brand name, color, size, etc.
4. Product attribute evaluation	Comment, either positive or negative, on the product or product attributes.
5. Product attribute association	Connecting a product or product attributes to other objects to make sense of it.
6. Questioning about product attributes	Uncertainty about a produce attribute (but no desire or intent to figure it out).
7. Information Seeking	Desire or intent to seek more information about product attributes.
8. Purchase intention	Expressed intent to either purchase or not purchase a product.
9. Presence – Physical	Feeling as if he or she’s with a physical product or perception of no difference between a physical and a virtual product.
10. Presence –Natural	Describing the virtual representation of a product as natural, real or believable.
11. Enjoyment with virtual product inspection	Feeling of pleasure or enjoyment of interacting with a virtual product.
12. Expectation of richer virtual experience	Desire for more design features such as more customizable items, more brands or colors to choose from.
13. Affordances	Recognizing the lacking of tactile affordances.

Data Analysis

The verbal protocol tapes were transcribed and analyzed using a qualitative data analysis software program (N5 2000) in accordance with established content analytic procedures (Riffe, Lacy and Fico 1998). First, the content of each subject’s verbal report was divided into “units of thought” (Gardial et al. 1994; Rook 1987). A “unit of thought” is defined in this study as a

smallest set of words that are meaningful out of its context. Hence, a coder is able to interpret the meaning of the statement, without reading the text before and after the statement. If it were further divided, a UOT would become meaningless. As a result, a total of 706 units of thought were identified from the transcribed data.

The second step involved coding each unit of thought into one or more of thirteen dependent variable categories. Initial categories were pretested using a ten percent randomly selected subsample of the units of thought and were identified as suitable training material. Category definitions were revised if needed and a second randomly selected subsample appropriate for measuring coder reliability was selected. Two coders independently analyzed 26% (182 out of 706) of the units of thought, which resulted in only eighteen inter-coder disagreements. Thus, an acceptable overall reliability of 90% was achieved, with a Scott's Pi accounting for chance agreement of .88 (Riffe, Lacy and Fico 1998). In addition, individual category reliabilities ranged between 80 to 100 percent.

Results

The results indicate that participants were more active in all five activities of cognitive aspects when examining the interactive 3-D products rather than the static 2-D versions (see Table 2). Because each participant was instructed to evaluate all products to determine how they think and feel, it is not surprising that over 900 units of thought were coded for the product attribute attention and product attribute evaluation categories. However, the finding that over 63% of the product attribute attention and 75% of the product attribute evaluation units of thought were coded for the 3-D condition was unexpected. Furthermore, questioning about product attributes (75%) and information seeking (81%) units of thought were also predominantly coded from the interactive 3-D evaluations.

Table 2. Results of Cognitive Aspects

	Interactive 3-D				Static 2-D			t	df	p <
	UOT	UOT	%	Mean	UOT	%	Mean			
Product Attribute Attention	476	302	63.45	10.1	174	36.55	5.8	3.01	59	.01
Product Attribute Evaluation	425	320	75.29	10.67	105	24.71	3.50	5.43	59	.001
Questioning	73	55	75.34	1.83	18	24.66	.60	2.53	59	.01
Information Seeking	21	17	80.95	.57	4	19.05	.13	2.30	59	.02
Purchase Intention	28	21	75.00	.70	7	25.00	.23	2.31	59	.02

On a more micro level, the average number of units of thought coded for each of the aforementioned categories reaffirms the findings with participants indicating significantly more attribute attention, attribute evaluations, questioning, and information seeking responses when evaluating the interactive 3-D products than the static 2-D versions. Whether or not participants indicated they would purchase or not purchase the test products was also coded for when examining the data. Purchase intention is a widely used advertising and marketing effectiveness measure designed to gauge a behavioral intention. While only 28 units of thought were coded pertaining to this category, 75% of those were in the 3-D condition resulting in a significant difference compared to the 2-D condition.

Three activities of the associative aspects were examined for differences between the 3-D products and 2-D graphic advertising, and the results are in Table 3. Out of 110 units of thought

on self-involvement, 63% occurred when interacting with the 3-D products. Nevertheless, there were no significant differences detected for third person involvement or product attribute association between the 3-D and 2-D conditions for average number of units of thought coded.

Table 3. Results of Associative Aspects

	Interactive 3-D				Static 2-D			t	df	p <
	UOT	UOT	%	Mean	UOT	%	Mean			
Involvement - Self	110	83	75.45	2.77	27	24.55	.90	4.10	59	.001
Involvement – 3 rd Person	35	22	62.86	.73	13	37.14	.43	1.35	59	.18
Product Attribute Association	22	13	59.09	.43	9	40.91	.30	.81	59	.42

The experiential aspects included five activities, four of which were different between the 3-D products and the 2-D graphic advertising. The difference in expectation for richer experience was not significant between the two conditions although it was directionally consistent with other four activities.

The sensation of presence in computer-mediated environments is perhaps one of the most difficult characteristics of a virtual experience to establish. It is because the feeling of "being there" in the environment, or with the product in this instance, indicates a state of consciousness that the consumer normally perceives in the physical environment (Kim and Biocca 1997). Therefore, it is not surprising that only 24 units of thought were coded as indicating this sensation (see Table 4). Yet, this sensation occurred entirely in the interactive 3-D condition in terms of both physical and natural dimensions of presence. Perhaps it is the perception of

exerting control over the product combined with animation that stimulates an increase in the sense of presence.

Another possible indicator of the impact of interactive 3-D product visualization stems from the overwhelming finding that only 2% of the units of thoughts coded for enjoyment with interacting with a virtual product were for the static 2-D condition. Holbrook and Hirschman (1982) contend that product use should incorporate enjoyment and fun into what they call an "experiential view" of consumption. With 96 units of thought identified as indicating some type of enjoyment for the interactive 3-D condition, a virtual experience could potentially impact decision making.

Finally, while only 27 units of thought indicated some type of desire to touch or feel the products, 85% were coded from participants evaluating the interactive 3-D products. Although a 3-D product is able to simulate many aspects of a physical product, consumers who prefer the tactile affordances of a product may perceive a hindrance within a virtual experience.

Table 4. Results of Experiential Aspects

	Interactive 3-D				Static 2-D			t	df	p <
	UOT	UOT	%	Mean	UOT	%	Mean			
Natural Presence	16	16	100	.53	0	0	0	4.00	59	.001
Physical Presence	8	8	100	.27	0	0	0	3.25	59	.01
Enjoyment from Experience	98	96	96.96	3.20	2	2.04	.006	5.70	59	.001
Expectation of Richer Experience	38	26	68.42	.87	12	31.58	.40	1.43	59	.16
Affordances	27	23	85.19	.77	4	14.81	.13	3.01	59	.01

Summary and Discussion

This study compared the differences as currently verbalized by consumers who were exposed to either 3-D products or 2-D graphic advertising. Among the thirteen categories of psychological activities as manifested in an earlier experiment (Li, Daugherty and Biocca 2001), differences existed in ten activities between the two advertising conditions. The three activities with insignificant differences were third-person involvement, product attribute association, and expectation for richer experience.

A closer examination of these three activities suggested three issues. First, units of thought for these three activities were relatively small; the sum of both conditions was 35 for

third-person involvement, 22 for product attribute association, and 38 for expectation for richer experience. Second, although they were not significant, the differences were consistent, with higher occurrences in interacting with 3-D products. Third, individual differences may have played a role, which were not measured in this study. For instance, imaginative individuals are more likely to associate what they see with other objects in their knowledge. In the same sense, some individuals may prefer richer experience regardless what kind of advertising they see. A small sample as in this study may not be able to neutralize these individual differences solely with random assignment to conditions. We realize the need for measurement and control of individual differences in further research.

This study classified the thirteen psychological activities into three broad aspects—cognitive, associative and experiential aspects. We see some theoretical potential of this new classification. Although abundant literature is available for cognitive and associative aspects of consumer learning, little is known about the experiential aspect (Hirschman 1984). This study serves a call for more research in this area.

The most important finding of this study was the superiority of 3-D products over 2-D graphic advertising in terms of consumer learning about products. The study confirmed early research on virtual experience as active, vivid, involving and affective psychological states. These characteristics of a virtual experience are more salient compared to indirect experience as generated from 2-D graphic advertising.

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