

## **Changes in Logo Designs: Chasing the Elusive Butterfly Curve**

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### **ABSTRACT**

Some logo designs are changed or updated on a regular basis while others remain unchanged for decades. If a two-factor model of exposure effects and the discrepancy hypothesis applied to preference for changes in logo designs, periodic incremental changes would be optimal. A series of empirical studies, however, discovered that the preference for changes in logo designs was better explained by social judgment theory, such that no change is preferred, but slight changes are well tolerated.

Well-known trademarks, logos and other corporate identity designs (all of which will be referred to as “logos” in this study for the sake of simplicity) are valuable assets of the companies that own them and an integral part of the persuasion efforts. Many companies concern themselves with maintaining the value of these visual assets.

Logo designs appear on advertisements, packaging, annual reports, letterhead, business cards, signs, and are incorporated into the designs of the products themselves (Henderson and Cote 1998). Identifying the brand of a product by recognizing the logo is a major aspect of the purchase process (Wilson 1994) and is a particularly important function in this age when so many brands and promotional messages compete for consumer attention. The logo serves as a visual cue for the recall of information previously received.

In addition to the cognitive responses of identifying the brand and remembering information, the logo can also elicit affective responses. It may activate affectively charged memories of experiences with the brand or with promotional activities of the brand, such as appealing advertising. The logo may also represent the image of the brand. “As an example, Apple Computer’s logo...communicates without words, an image of quality recognized by computer consumers internationally (Wilson 1994).” If a logo is particularly effective in its design, it may not only represent the image of the brand, but also help to formulate that image. For example, Lucent Technologies adopted an “innovation circle” logo in hopes that it would help to create the desired image of a “bold and innovative” company (Barboza 1996, page D3). Less effective logos, on the other hand, may actually detract from the image of the brand (Elliott 1994).

In some cases, the logo may not only represent the image of the brand, but also the image of the consumer. Logos provide a means for consumers to display their personal identification with a brand, beyond consumption of the brand or service (Holman 1980). An example is when a consumer wears a t-shirt or baseball cap bearing a logo design to publicly show a personal association with the represented brand. Sunset magazine discovered just how attached customers can become to a logo when they changed theirs and received letters of complaint. One reader stated, “The old logo was an especially valued symbol to us baby boomers (Sunset 1996b, page 10).” Another compared changing the logo to changing “Half Dome, the Grand Canyon, and Mount Rushmore (Sunset 1996a, page 10).”

Commonly, companies try to take advantage of familiarity effects (Zajonc 1968) in order to develop greater preference for the logo and the brand, through repeated exposures of the logo. Some logos, such as the Arm and Hammer trademark, have remained the same for decades. Many companies, however, also wish to take advantage of novelty effects (Berlyne 1971) or to avoid boredom effects. Consequently, many logos, such as Mr. Peanut, Betty Crocker, and the Prudential rock (Morgan 1986), have evolved over the years through successive changes.

Given that some logos are changed while others are not, theorists and practitioners would benefit from research that offered appropriate insights regarding how to best to approach this problem.

## **Literature Review**

The incremental changing of logo designs is consistent with the two-factor model of exposure effects (Berlyne 1970; Bornstein 1990) and with the discrepancy hypothesis

(Haber 1958; Hansen 1972). According to the two-factor model, objects presented for the first time are perceived as threatening (Zajonc 1968). The threat is reduced with repeated exposures to the stimulus (stimulus habituation) and liking is increased. Too many exposures, however, result in boredom effects such that liking decreases with additional exposures (Berlyne 1970; Bornstein 1990). Accordingly, consumers would be expected to become bored with logo designs to which they were exposed too often.

The discrepancy hypothesis (Haber 1958; Hansen 1972) allows for familiarity effects and boredom effects, as well as novelty effects. According to this hypothesis, once an individual has become adapted to a stimulus, slightly altered versions of the stimulus (e.g., logo) would allow for novelty effects and would be preferred over the current version. If the stimulus is changed too much, however, it is perceived as a new image and is preferred less than the current version. Haber (1958) demonstrated results consistent with the discrepancy hypothesis, using water of different temperatures as stimuli. These results are described by the distinctive *butterfly curve* (Figure 1). Connors (1964) reported similar results using incrementally altered versions of abstract geometric designs as stimuli. His results did not, however, exhibit the discrepancy hypothesis as clearly as did those of Haber (1958). Thus, psychological phenomena only partially replicate results obtained with psychophysical stimuli.

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Figure 1 about here

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There is an alternative model that would also be consistent with incremental logo changes. According to social judgment theory (Sherif 1961), a slightly altered logo may fall within the latitude of acceptance while an altered logo may be sufficiently different as to fall within the latitude of rejection. If this theory holds in the case of preference for logo designs, slight changes are tolerated rather than preferred. An inverted-U rather than a butterfly curve describe the results (Figure 2).

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Figure 2 about here

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In what follows, six studies are summarized and a discussion is developed to present our view of the theoretical basis and implications of preferences for visual images and changes to logo designs.

### **Study 1—Exploratory Examination of Consumer Preference for Visual Images**

Henderson and Cote (1998) investigated preference for various design elements of logos. Previous academic research regarding preference for visual images had been characterized by tightly controlled experiments. These studies examined very specific

variables such as the effect of time of day on preference for colors (Zuber & Ekehammar, 1988), and the relative preference for pictures of animals depending on whether the animal appears to be staring at the subject or averting its gaze (Coss & Towers, 1990).

Although our research specifically addresses preferences for changes in logo designs, we started by setting logos aside and doing an exploratory examination of preferences for representational images that are not connected to specific brands. In Study 1 (Pimentel 1996), we used qualitative methods in order to gain a broad view of how consumers view visual designs, allowing for emergent findings. In this study we investigated the basic question of whether individuals form preferences for visual images. We also sought a basic understanding of the relative importance of the *visual attributes* versus the *subject matter* for preference for visual images. This is similar to the distinction between *esthetic or hedonic value* and *social or status-enhancing value* made by Bell, Holbrook, and Solomon (Bell, Holbrook, & Solomon, 1991) and the distinction made by Winston and Cupchik (Winston & Cupchik, 1992) between *esthetic value* and *meanings*. We also sought to examine whether preferences for visual images involve cognitive processes, affective responses, or both. Gaining a broad view of preference for visual designs provided a basis for comparison with the results from the following studies that involve logos more specifically.

Respondents for Study 1 were taken from Marketing Principles classes at a major southwestern university. They included 24 business students and 2 architecture students.

Stimuli consisted of 11 color photographs were selected to represent various possible criteria for preference. Some were selected for strong visual effects, others for potential meaning. An individual interview was conducted with each participant and recorded on audiotape. Participants were asked to examine the set of 11 randomly ordered color photographs, indicate liking or disliking for each, and explaining their preference criteria.

Participant comments were coded as being either positive or negative and as regarding either visual characteristics or subject matter. The comments indicated that the respondents did have preferences that they were willing to discuss, sometimes reflecting affective responses and stated in strong terms such as “love,” “means a lot to me,” “hate with a passion,” or “pitiful.” The preferences were different from individual to individual, as were the criteria for the preferences.

Respondents cited subject matter of the image more often than visual attributes as a criterion for preference (167 times versus 69 times). The emphasis on subject matter was great enough that some of the respondents persisted in speaking in terms of the content or meaning of the image even when being asked specifically about the visual quality.

Subject matter was acknowledged at various levels. Many of the comments reflected conditioned responses to the stimuli. Examples include: “I love chocolate ice cream,” “I like to play golf,” and “I like beer.” Some included an emotional aspect in the response, using terms such as “serene,” “happy,” and “proud.” A few of the comments reflected antecedent states. Some of the respondents reported liking the image of chocolate ice cream, because they were hungry. Another expressed dislike for the image of a mug of beer, because of a recent over-indulgence in alcohol at a wedding. Other comments reflected deeper meaning and/or autobiographical memories such as: “my

mother and grandmother made quilts,” “makes me think of my boyfriend because he’s a roper,” and “reminds me of growing up in Nebraska.”

While most comments were in regard to subject matter and personal meaning, there were some comments regarding visual attributes of the images. Most of these comments were somewhat superficial: “pretty picture with the sun coming up,” “kind of cool looking,” and “very colorful.” An important exceptional case to the emphasis on subject matter was the approach of one of the two architecture students. He described preferences exclusively in terms of visual attributes, using expert terms such as “composition,” “balance,” and “unity.” The influence of an individual’s background in design was examined further in Studies 5 and 6.

Bell, Holbrook, and Solomon (1991) indicate that both esthetic value and social value “may operate simultaneously, to relative degrees, within the same consumption context (page 246).” The results of Study 1 support this idea, with visual aspects and subject matter (especially the latter) both affecting preferences for visual images. There are important implications of this finding for logo designs. If the results of Study 1 can be generalized to include logo designs, they would indicate that the meaning associated with the logo is of primary importance. They also suggest that consumers will be generally satisfied with the esthetics of the logo as long as it is attractive at a basic level.

The second study tested to discover if the findings of Study 1 apply to logo designs, and more specifically, to changes in logo designs. The influence of visual aspects of the image on preference may allow for some increased preference for an image that is changed in a way that makes it more esthetically pleasing. The stronger emphasis on subject matter, however, might indicate that individuals would not like changes in meaningful visual images that change or obscure the meaning of the image. The combination of these influences might suggest that changes, if any, should be small. Such a recommendation could be consistent with either the discrepancy hypothesis or social judgment theory. The second study tested between the two concepts, to determine if consumers prefer changes in familiar logo designs, or no changes. We also tested to see how much change is preferred, if changes are preferred, or how many changes are tolerated if they are not preferred.

### **Study 2—Changes in Logo Designs, Preferred or Tolerated?**

Familiar logo designs served as the stimuli in the second study (Pimentel 1997). Incrementally altered versions of well-known logos were tested for consumer preference. A series of involved pretests were needed for the development of the stimuli for the study.

Logos were selected that were familiar enough so that the respondents had become adapted to them. Logos were also selected with respect to two additional variables: the level of meaning associated with the design, and the level of preference for the design at the adaptation level. Different levels of these variables were represented in the stimuli that were selected—two logos for each of four cells: high meaning/high preference, high meaning/low preference, low meaning/high preference, and low meaning/low preference.

	<b>Low Meaning</b>	<b>High Meaning</b>
<b>High Preference for AL</b>	Brand A	Brand C
	Brand B	Brand D
<b>Low Preference for AL</b>	Brand E	Brand G
	Brand F	Brand H

The selected stimuli are identified only as Brands A-H because the represented companies did not give permission for their logos to appear in a publication. All of the companies are familiar to consumers. Each of the logo designs in the study is based on an animal or human form. As examples of the logos in the various cells, Brand B is the logo for a manufacturer of agricultural and landscaping equipment. The respondents reported high preference for the design of the logo in its current (adaptation level) form, but relatively low levels of meaning associated with it. Brand C, which scored high on both preference and meaning, is the cartoon character symbol of a breakfast cereal that has been popular for decades. Brand H had a high level of meaning for respondents, but the design of the logo was not well preferred. The stimulus is a symbol for a manufacturer of office and school supplies. Brand F, low in both meaning and preference, is a cartoon character that is the symbol for a chain of restaurant/amusement facilities that is targeted at families with young children.

Stimuli were created as pen and ink renderings. First the actual logo was rendered in pen and ink (traced) so that its quality of execution was the same as the other stimuli. The other stimuli were created as progressive changes from the adaptation level, becoming progressively more abstract or more naturalistic. This process is illustrated in Figure 3, for a fictional logo (for the fictional brand: Sophie Dog Treats) which was created to illustrate the process.

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Figure 3 about here

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Abstraction was chosen the variable to manipulate to create change because it represents a trend in changes to logo designs over the past century (Morgan 1986).

The experiment required to test between theories was of mixed design. Interval data were collected between subjects. Each participant rated seven different stimuli on a semantic differential (“liking”) scale, each at a different level of abstraction, and each from a different logo. Each unique stimulus was rated by 16-21 respondents. Ordinal data were collected within subjects. They were given a pile of cards on which were

printed the various stimuli from a single brand. They were asked to place them in order of preference. The sample size for each brand was 32-42.

If the discrepancy hypothesis applied in this case, it could be predicted that those versions of the logo that represented slight changes from the version currently in use (the adaptation-level version) would be most preferred. Ordinal data showed, consistently through the brands, however, that it was the current version that was most preferred (Figure 4 gives Brand D as an example). Interval data showed that the difference between the preference for the current version and the preference for those most closely resembling it was generally small, and in many cases, not statistically significant (Figure 5). This indicates that rather than preferring small changes in the logo, the respondents merely tolerated them. These results support the applicability of social judgment theory over the discrepancy hypothesis for preference for changes in familiar logo designs. They also indicate that the two-factor model of exposure effects is not appropriate in this case, as there were no boredom effects found.

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Figure 4 about here

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Figure 5 about here

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The results of Study 2 are in contrast to the findings of Connors (1964) which found boredom effects and supported the discrepancy hypothesis for preference for changes in visual images. There were a number of differences, however, between the studies which were explored in Study 3.

### **Study 3—An Attempt to Reconcile Results**

Some of the differences between Study 2 and Connors' (1964) study are important in terms of potential exposure effects. Bornstein (1989) conducted a meta-analysis of 20 years of exposure effects research beginning with Zajonc's 1968 study. More recently, Harmon-Jones (1995) developed a succinct listing of the seven factors that have shown the most robust familiarity effects. Three of these factors represent differences between Study 2 and the Connors (1964) study. In contrast to Connors' (1964) study, Study 2 featured the following:

- There is a heterogeneous rather than a homogeneous exposure sequence of stimuli (the various stimuli are mixed together in the sequence rather than doing all the exposures of the first stimulus before moving to the next).
- There is a delay between the exposures and ratings of the stimuli.
- Stimuli are complex rather than simple.

These differences suggest that the conditions of Study 2 allowed for greater familiarity effects—more improved liking for stimulus with repeated exposures. In addition, Conners' (1964) stimuli were intentionally non-representational and not meaningful, while the Study 2 stimuli were clearly representational had meaning attached. This raises the possibility that boredom effects were found by Conners (1964) but not in Study 2 because the familiarity effects in Study 2 were stronger due to the conditions of exposure or because of the meaning associated with the stimuli. If the differences between the studies can be explained thus, it would mean that boredom effects could possibly be averted by providing for exceptionally strong familiarity effects or by attaching sufficient meaning to the stimulus. Study 3 tested to see if these differences between the two studies would account for the difference in results. In order to do so, the third study used Conners' (1964) stimuli, but manipulated their meaningfulness and the manner of exposure.

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Figure 6 about here

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Conners' (1964) stimuli consisted of seven eight-sided polygons (Figure 6) that represent a series of progressive changes. In Conners' (1964) experiment, subjects were instructed to concentrate on the first stimulus for a given length of time. They were then shown two stimuli from the set and asked to state their preference between the two. Conners (1964) created stimuli that were intended to have no associated meaning. In fact, he made alterations to some of the designs when subjects referred to them as looking like familiar objects. Study 2 utilized familiar logo designs that pretests showed to be recognizable and meaningful. While Conners' (1964) stimuli were used in Study 3, "associated meaning" was manipulated by reciting a narrative about the one of the stimuli that associated meaning with it. The narrative identified one of the experimental stimuli as being a representation of a small dog who is courageous, creative, and tenacious, and consequently, a good marketer.

Study 3 followed a 2x2 between-subjects design. The two dimensions were associated meaning (or no associated meaning), and exposure conditions (homogeneous exposure with no delay, or heterogeneous exposure with delay). "Homogeneous exposure with no delay" means that the subjects viewed only the stimulus presented, then went directly to the preference evaluation task without interruption or display of other stimuli. This is the type of exposure utilized in the Conners (1964) experiment. Study 2 utilized the subjects' experiences in the marketplace as exposure to the stimuli. This would be classified as "heterogeneous exposure with delay." In such cases, the experimental stimulus is viewed at various times, with subjects viewing other stimuli between times and between the final viewing of the stimulus and the preference evaluation task.

None of the four experimental conditions reproduced Conners' (1964) results, not even Group 3 (Figure 7) which had conditions most similar (no associated meaning, homogeneous exposure with no delay). Although Conners (1964) reported support for

the discrepancy hypothesis, it was not represented by a butterfly curve. Unlike Haber (1958) who altered his water temperature stimuli in two directions (warmer and cooler), Conners (1964) started with one stimulus and altered it in seven progressive steps, in one direction. His results were depicted more as half a butterfly curve—just on wing. Consequently, since it is also representing only half a curve, Figure 7 slopes in one direction instead of being an inverted-U.

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Figure 7 about here

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Conners (1964) found the greatest preference for stimuli that were altered slightly from the adaptation-level version. In Study 3, however, as found in Study 2, respondents most preferred the stimulus to which they had become adapted. They did not display the boredom effects. One explanation might be that Conners' (1964) results were an artifact of his specific lab and his small sample size. Study 4 explored that possibility.

#### **Study 4—An Effort to Replicate Results**

The fourth study replicated Conners' (1964) experiment to see if the same results would occur, or if Conners' (1964) results are an anomaly facilitated by a small sample size or extreme experimental conditions. The conditions of this final experiment were the same as for Group 3 in Study 3, but were accomplished in a different manner. Instead of viewing the experimental stimulus for one extended period and then ranking all the stimuli at once, Conners (1964) had subjects view the experimental stimulus for 40 seconds and then express preference between just two of the stimuli from the set. This process was repeated 20 times with the same experimental stimulus and different pairs of stimuli for the preference task. Study 4 tested to see if these activities were oppressive to subjects and if the results were reactions to extreme experimental conditions.

While duplicating Conners' (1964) experiment, a few adjustments were made to allow for efficiencies due to technological advances. For example, subjects viewed the stimuli on a computer screen, instead of in a plywood box with mechanically-operated slide viewers.

The experiment was conducted in 16 sessions that ran through the summer and fall of 1999. Subjects were students in the introductory Marketing course at a large southeastern university. They used computers in the business school computer lab. A total of 528 subjects participated. This was enough to allow for an assumption of normal distribution for each of the 18 versions of the experiment, for conducting non-parametric signs tests on the data. In contrast, Conners (1964) had a total sample size of 18, one for each version. The different versions allowed for a control group and for different subjects to have different stimuli for the adaptation-level stimulus and different random orderings of preference tasks.

Conners' (1964) results were not replicated. Once again there were no boredom effects and no support for the discrepancy hypothesis (Figure 8). Thus, neither

conceptual nor exact replication of Connors' (1964) experiment produced results consistent with those he reported.

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Figure 8 about here

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### **Study 5—Expertise**

The fifth study followed up on an emergent finding from the first study, that a student with more visual design background evaluated visual images differently from those with less background in visual design. This is consistent with the research of Winston and Cupchik (1992) who used paintings as stimuli and found differences in the way naïve and trained viewers process artworks, at both perceptual and experiential levels. Responses of naïve viewers tend to be subjective with a strong preference for familiar subject matter. They prefer “popular art” that has broad appeal and induces pleasant feelings. Subject matter also has a strong effect on experienced viewers. These viewers, however, also objectively consider the visual attributes of the work. They prefer “high art” that is challenging to the viewer and involves a deep expression of the artist.

To investigate the relationship between expertise and preference for visual images, Study 1 was repeated with a new set of 26 respondents, from the next semester of the Marketing Principles classes. They participated in interviews using the same visual stimuli (the 11 color photographs). These respondents, however, were also asked to report on their background in visual design. Based on their self-reports, they were ranked in terms of visual design expertise. Those who were ranked above the median were compared with those ranked below the median.

Many of the findings of concerning preference for paintings (Winston and Cupchik 1992) were supported for preference for photographic images, by the results of this study. The set of comments for each respondent was rated on a scale of 1 to 18. A rating of 1 indicates that the respondent gave only comments regarding visual aspects and a rating of 18 indicates that there were only comments about subject matter. Those respondents with a level of visual design expertise above the median had a mean rating on the comment scale of 10.5 which means that they were much more likely to use visual aspect criteria for preference than those below the median level of expertise, who had a mean score of 15.2. These scores also indicate that some of those with lower levels of expertise also mentioned visual aspects, but consistent with Winston and Cupchik (1992), the criterion in most cases was color, not other design principles that are acknowledged by experts. Comments included, “more colorful,” and “the blue water is very pretty.” Color was also an important criterion for the more expert viewers, but other factors such as composition, contrast, and lighting were also cited.

The visual/subject matter scores also indicate that both those with high levels of experience and those with low levels gave much importance to subject matter criteria for preference determination. Those with more experience were more likely to add cognitive, objective visual evaluations to the criteria, while the naïve viewers tended to rely more exclusively on affective, subjective responses to subject matter.

The fifth study added to our understanding of expert versus non-expert preferences for visual images. The sixth study applies these findings to our focus—preference for changes in familiar logo designs.

### **Study 6—Expertise Continued**

In order to determine the effect of expertise on preference for changes in visual images, specifically, familiar logo designs, Study 2 (using versions of familiar logos as stimuli) was repeated, but with professional graphic designers and advanced graphic design students as respondents, instead of business students. Also, only ordinal, within-subjects data were collected. Professional graphic designers were recruited by phone and by email. Leads were obtained from referrals, a website search, and directories. The questionnaires were sent and returned by mail. A total of 55 usable questionnaires were completed from the 127 that were sent (43.3%). In addition to the professionals, 40 students from advanced graphic design classes at a large southeastern university also participated. A total of 95 respondents participated. This allowed for a sample size of 68-74 for each brand represented by stimuli in the study. Including or removing the students from the sample did not alter the results in any significant way.

As with the business student respondents in Study 2, the experts of this experiment also failed to show boredom effects—no butterfly curve, no support for the discrepancy hypothesis. Figure 9 shows the results for Brand D. A comparison with the results for Brand D in Study 2 (Figure 4) shows that the pattern is the same. Once again, the current (adaptation level) version of the logo was the most preferred.

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Figure 9 about here

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The expert respondents of the fifth study were asked for their opinions regarding when a logo design should be changed. The results of our studies are important because experts cannot agree in this matter. While the majority of respondents (54%) disagreed with the notion that logos and other trademarks need to be updated on a fairly regular basis, 29% felt that logos should be changed for the sake of change alone. This latter group expressed an opinion that is not supported by the results of our studies.

### **Discussion**

Our interpretation of the results is that the discrepancy hypothesis is not a correct representation of consumer preference for changes in familiar logo designs, nor does it represent the preferences of graphic design experts. Discrepancy theory is more applicable to the realm of psychophysical stimuli, such as Haber's (1958) water temperatures, than to psychological phenomena such as investigated by Connors (1964) and our studies.

One of the important findings of this series of six studies is the importance of associated meaning for preference for visual images. This concept is aptly illustrated by an excerpt from Mark Twain's (1869) *Innocents Abroad* in which he and his traveling

companions deliberately ignored the attached meaning of an artifact in order to amuse themselves by tormenting a tour guide. In Genoa, a particularly excited guide showed them a document that had been written by Christopher Columbus. To the guide's horror, and much comic effect, they feigned no interest in Christopher Columbus and instead proceeded to evaluate the document on the basis of the quality of the handwriting, which they found wanting.

Clearly, as with a manuscript penned by Columbus, the meaning attached to a logo design must be considered of greater importance than the esthetic value of the logo. The authors expected to find that associated meaning would enhance familiarity effects and delay boredom effects. The findings indicate that there are familiarity effects, but not boredom effects, for visual designs, regardless of the level of meaning. Consequently, if a logo is to be changed, it should be changed for a specific compelling reason and not a concern that consumers are becoming tired of it.

A deliberate effort to change the image of a brand may be a compelling reason to change a logo design. Such a change was made when Xerox changed its logo along with its name when trying to change the image of the company from being a "copier company" to being a "document company (Collins 1994)." It is our interpretation of our data; however, that if a change in image is needed, in many cases it would be wise to attempt to improve the associated meaning of a logo without changing the logo design.

In cases in which the logo must be changed, our data indicate that social judgment theory applies. This means that changes will be tolerated by consumers as long as the changes are slight enough so that the new logo design falls within the consumers' latitude of acceptance.

The majority of graphic designers would not be surprised by the results of these studies—that consumers prefer no change. The 29% that believed in changing logos for the sake of change alone, however, may not be serving their clients optimally. Moreover, the majority of graphic designers reported that the decision to change a logo comes from the client and not the designer. These results aid practitioners in determining when and why to alter their logos and they provide theoretical support for social judgment theory in yet another domain.

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Figure 1

Butterfly Curve

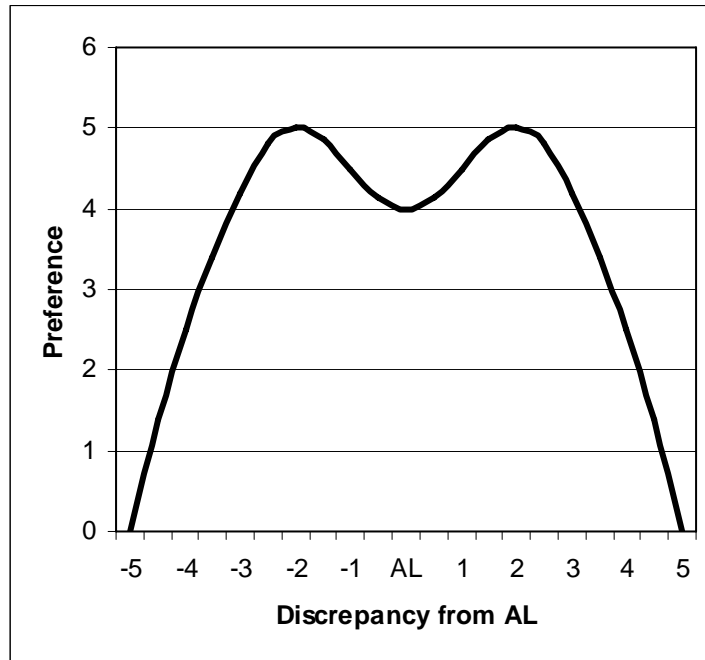


Figure 2

Inverted-U

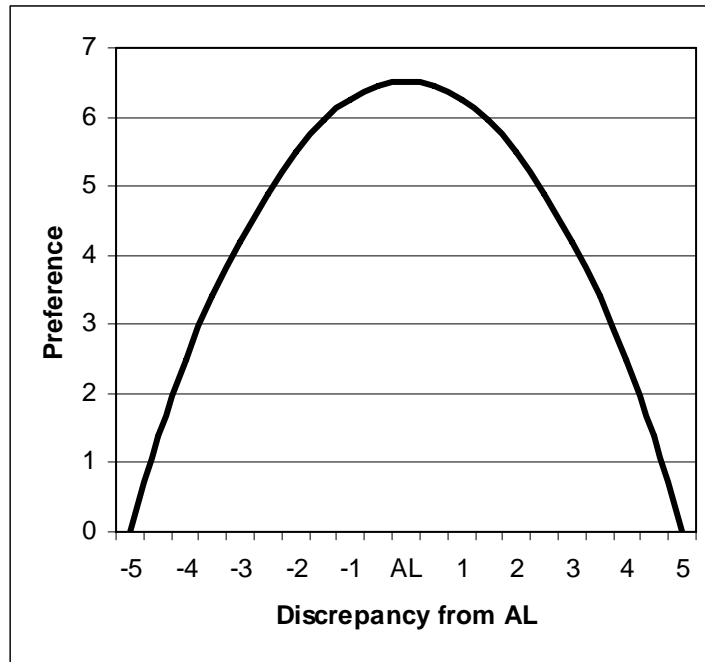


Figure 3

Stimulus Creation—Sophie Dog Treats Brand



-3 Version  
(3 steps more naturalistic than AL)



-2 Version



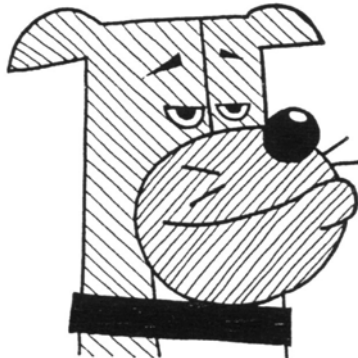
-1 Version



Adaptation Level (Current In-Use) Version



-1 Version  
(1 step more abstract than AL)



-2 Version



-3 Version

Figure 4

Brand D  
Ordinal Data—Within Subjects

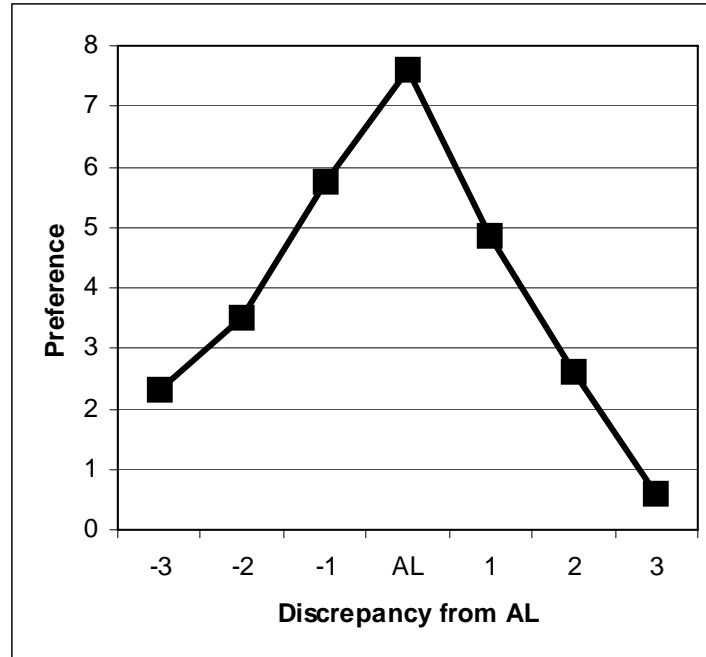


Figure 5

Brand D  
Interval Data—Between Subjects

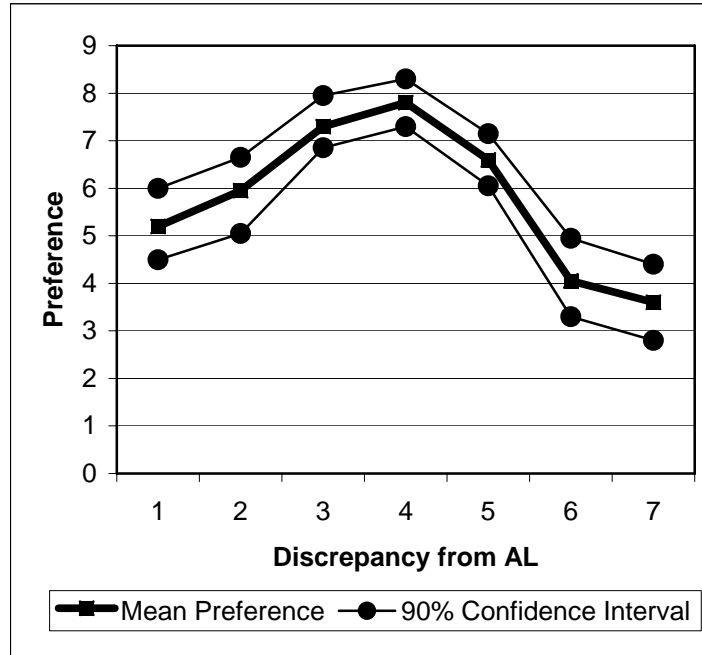


Figure 6

Stimuli from Conners (1964) Experiment

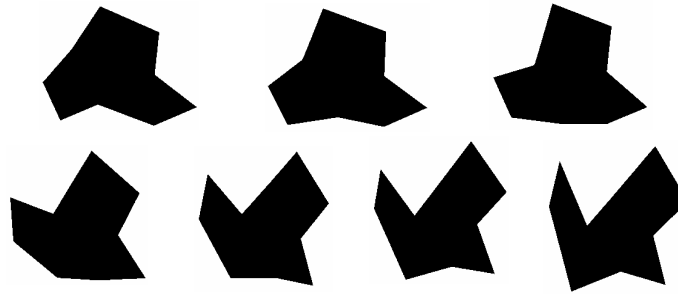


Figure 7

Group 3  
Homogeneous Presentation, No Meaning

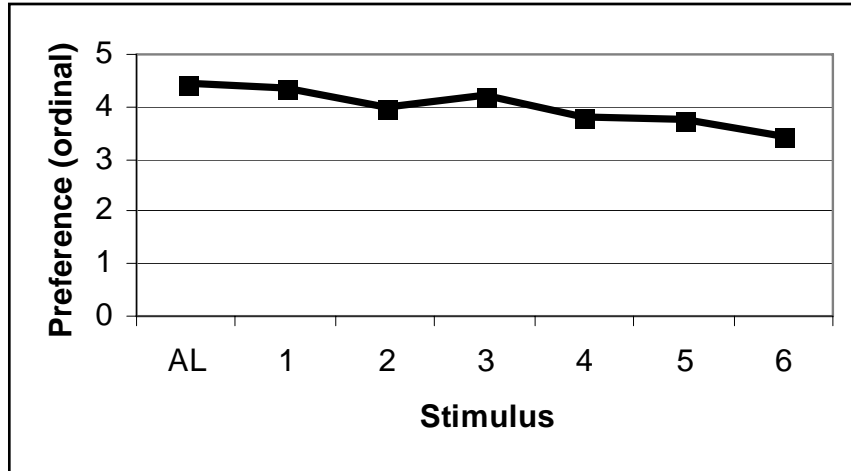


Figure 8

Replication of Conners (1964) Methods,  
But Not the Results

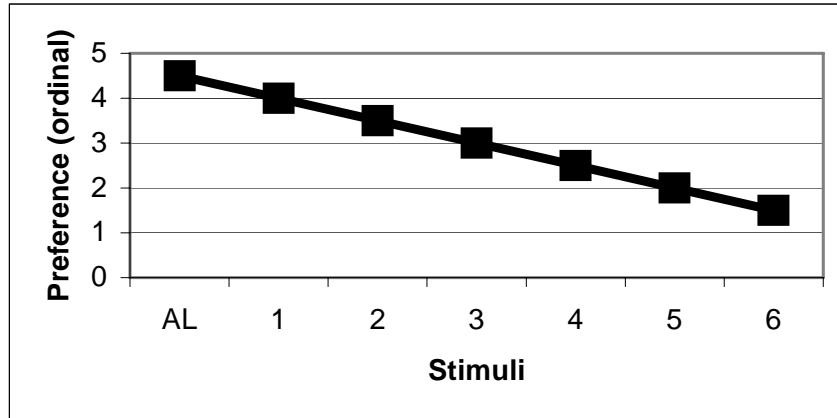


Figure 9

Brand D  
Expert Respondents  
Ordinal Data—Within Subjects

