Of Frog Wines and Frowning Watches:

Semantic Priming of Perceptual Features and Brand Evaluation

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Three experiments show that semantic priming can enhance perceptual fluency, resulting in higher liking of the perceived product. Specifically, semantic primes that relate to the visual identifier of one of two products (e.g., a bottle of wine with a frog shown on the label) increase preference of the prime-compatible target over another target (e.g., a wine without a frog on the label). This is observed even when exposure to the target is limited to levels associated with perceptual encoding of the target (exp 1). Semantic priming of constructs that fit versus do not fit with perceptual features of the target increases liking of the target (exp 2 and exp 3), and increased liking of the target is mediated by the target's increased visual appeal (exp 3).

Among marketers, there has been a growing trend to employ unusual visual identifiers that have little, if anything, to do with the product. For example, designer clothing is sold with the insignia of an arrow or a crocodile, and ACNielsen reports that 18% (nearly one in five) of the 438 viable table-wine brands introduced in the last three years feature an animal, from a hippo to a frog to a penguin, on the label (see http://www.winelabels.org/ for some unique labels). Sales of such "critter" wines are now more than $600 million, and according to some, "the critter craze is merely a subset of the more widespread growth of clever or outright gimmicky wine branding strategies (like Sogno Uno, a 2004 vintage featuring a blend of Italian grapes and a picture of a porn star on the label)."[1] One advantage for marketers of including distinct visual identifiers in the design of their logo or label is that such features help garner consumer attention. Also, over time some of these symbols may possibly become part of a brand's equity. In the current research, we suggest an additional route by which such visual identifiers may confer product preference. Building on psychological research on processing fluency, we contend that liking of a product is based, in part, on the ease of processing its perceptual features, including such visual identifiers. Further, these perceptual features can be semantically cued, and the semantic cueing of these features enhances product preference by increasing the ease of perceptual processing of the target.

Suppose, for example, that a consumer is buying wine online and encounters a bottle that features a label with the image of a frog. Would the consumer prefer this wine over other wines if she just saw Kermit the frog while watching the Muppets show with her young son? Neither Kermit nor other frogs have much to do with wine and it is unlikely that increased accessibility of frog-related concepts in memory will influence the consumer's interpretation of the information provided about the wine or the fluency with which the verbal description can be

[1] Quoted from "Animal Pragmatism" by Rob Walker in *Consumed* (April 23, 2006).

processed. Nevertheless, previous exposure to Kermit may facilitate the visual processing of a label that features a frog, thereby increasing its aesthetic appeal (Reber, Schwarz, and Winkielman 2004). This increased appeal of the label, in turn, may increase the consumer's preference for the "frog wine" over a wine that features a different label. In more general terms, we suggest that the semantic accessibility of constructs that match the perceptual features of the target make the target easier to process visually, thereby increasing its aesthetic appeal and liking of the target.

This paper adds to the growing marketing literature on fluency effects on affective judgment (e.g., Janiszewski and Meyvis 2001; Labroo and Lee 2006; Lee 2002; Schwarz 2004; Whittlesea 1993). A general consensus among researchers is that direct priming (prior exposure) increases the ease of perceptual and conceptual processing of a target and indirect (semantic) priming increases the ease of conceptual processing, and targets that are easy to process are also liked more. By associating unusual visual identifiers with a target with which they do not have preexisting meaningful associations, we isolate an effect of semantic priming on perceptual fluency that has not been previously demonstrated in the fluency literature. In fact, this effect has been difficult to identify in the extant studies because most often the perceptual features of a target are also meaningfully associated with the target. Accordingly, semantic priming has typically been assumed to facilitate conceptual processing of the target. Going beyond this observation, our studies show that semantic priming can also facilitate visual processing. Hence, our findings imply that effects of semantic priming that have been previously attributed solely to enhanced conceptual fluency may also include effects of enhanced perceptual fluency. Both effects are difficult to disentangle when perceptual features are associated meaningfully with the target, as has been the case in previous studies.

From a managerial perspective, our findings suggest that if marketers choose meaningful identifiers for their products, cuing people semantically with these cues will be highly effective because a single semantic cue can increase both conceptual and perceptual fluency, and these two sources of fluency exert additive effects on preference judgments (e.g., Lee and Labroo 2004). Associating unusual identifiers with a product can additionally benefit a marketer by giving the marketer more cues with which to enhance the perceptual fluency of the product. More importantly, whereas semantic priming with product category cues is likely to also benefit other brands as well (e.g., Lee and Labroo 2004), semantic priming of visual identifiers such as distinct logos, packaging, or mnemonics will result in brand specific perceptual fluency effects.

THEORETICAL BACKGROUND

Numerous studies have now established that contextual primes and situational cues affect consumer judgment and choice by changing not only *what* information is accessible in memory, but also how *easily* that information comes to mind and can be processed (e.g., Janiszewski 1993; Janiszewski and Chandon 2005; Labroo and Lee 2006; Lee 2001; Reber, Winkielman, and Schwarz 1998; Schwarz 2004; Shapiro 1999; Shapiro, MacInnis, and Heckler 1997). For example, Zajonc (1968) reported that mere exposure to simple stimuli, such as line drawings or nonsense words, enhanced liking of those relative to other stimuli that participants had not been exposed to previously. Similarly, (non-Turkish) participants exposed to a set of Turkish characters on one occasion preferred that subset of characters over other Turkish characters at a later occasion. Interestingly, in those experiments, recognition of the previously seen characters was no more than chance, suggesting that mere exposure increased preference for the characters by increasing the ease of perceptual processing without affecting meaningful elaboration of the characters. Direct exposure to the stimulus enhanced the ease with which the perceptual features

of that stimulus were encoded in later exposures, and the target appeared clearer, brighter, more attractive and eye-catching, even when it was presented at precognitive levels (e.g., less than 50 msec; see Bornstein 1989, also see Zajonc 1980).

More recently, it has been suggested that the influence of all variables known to affect the aesthetic appeal of pictorial stimuli, from figure-ground contrast to symmetry and the laws of Gestalt psychology, can be traced to their impact on perceptual fluency (Reber, Schwarz, and Winkielman 2004). Research suggests that any variable that facilitates perceptual processing of a stimulus enhances liking of the stimulus, even under conditions of a single exposure to the target (Reber, Winkielman, and Schwarz 1998).

Conceptual fluency and affective response

Processing ease can arise not only from facilitation in perceptual processing of the target (perceptual fluency) as just described, but also from semantic priming of meaningful associates of the target (conceptual fluency; e.g., Lee and Labroo 2004; Whittlesea 1993; Winkielman and Fazendeiro 2003). For example, Whittlesea (1993) reported that liking of a target word (e.g., "BOOK") was greater when it appeared in an associated context (e.g., "the librarian reached for the BOOK") than not (e.g., "the neighbors gathered to talk about the BOOK"). Similarly, Winkielman and Fazendeiro (2003) showed that liking of a visual stimulus (e.g., picture of a lock) was higher when the stimulus was preceded by a matching word (e.g., lock) or a related word (e.g., key) than an unrelated word (e.g., snow). Lee and Labroo (2004) also reported that people who evaluated an ad for mayonnaise (versus those who evaluated an ad for multivitamins) indicated higher liking of ketchup. They suggested that as long as the prime (e.g., mayonnaise) is meaningfully related to the target (e.g., ketchup) and the two belong to a common

associative network (e.g., condiments), the prime indirectly activates the target in consumers' memory, making the target easy to encode.

Conceptual fluency effects have been demonstrated with direct priming, semantic priming, or predictability manipulations (e.g., Lee and Labroo 2004; Whittlesea 1993; Winkielman and Fazendeiro 2003). In all these instances, preference for the target increases only when the prime and the target belong to a common associative network in memory and have preexisting meaningful associations (e.g., mayonnaise and ketchup; key and lock). When the prime and target do not belong to a common associative network and are not associated meaningfully, fluency is not enhanced by priming. For example, Lee and Labroo (2004) demonstrated that priming mayonnaise increased liking of ketchup, but did not increase liking of an associatively unrelated filler product (an alkaline battery). In summary, the effect of semantic priming on liking is based on conceptual ease of processing the target. An interesting question is whether semantic priming can also increase product liking by enhancing the perceptual ease of processing.

Semantic priming of perceptual features

Past research is ambiguous on the ability of semantic primes to enhance perceptual fluency. Some authors suggest that it is unlikely that semantic priming will increase perceptual fluency, whereas other authors suggest that this is possible. On the one hand, perceptual fluency effects are known to be highly stimulus specific and sensitive to an exact perceptual match between the prime and the target (e.g., Jacoby and Dallas 1981; Mandler, Nakamura, and Van Zandt 1987). Thus, semantic cues should not increase perceptual fluency of the target and perceptual fluency should be enhanced only by direct priming, where the perceptual features of the prime and target match exactly. On the other hand, as just reported, an increasing amount of

data suggests that all variables that facilitate perceptual processing of the stimulus will enhance liking of the target (e.g., Reber et al. 2004; Schwarz 2004). Thus, perceptual fluency is enhanced not only by direct priming, but also by presentation variables like figure-ground contrast, visual clarity and good form (e.g., Reber et al. 2004). Several studies also suggest that perception can benefit from prior semantic activation (e.g., Allport 1955; Bruner and Goodman 1947; McDermott 1997; Bruner and Minturn 1955), although it is not clear from those studies whether perception will translate into increased liking. For example, Bruner and Minturn (1955) reported that participants primed with the letter "B" versus those who were not primed were subsequently more likely to misidentify the number "13" as "B."

In three experiments, we test whether semantic priming will enhance perceptual fluency. In experiment 1, we investigate whether the semantic priming of a visual identifier (e.g., a frog) that has no preexisting meaningful relation with a product category (e.g., wine) will increase preference for a product that displays the visual identifier (e.g., a wine label that features a frog). To enhance subsequent visual processing, we asked participants in experiment 1 to visualize the word that served as a semantic prime (e.g., to imagine a frog in response to the word "frog"). As expected, this procedure resulted in a higher preference for wines that featured the primed visual identifier. This effect was particularly pronounced under exposure conditions (16 milliseconds) where participants had to rely on perceptual processes to make judgments, but was also observed, in attenuated form, under longer exposure conditions (3 seconds). Experiments 2 and 3 provide additional tests of this phenomenon, without visualization instructions, and illuminate the underlying process. Experiment 2 manipulates the extent to which the semantic primes match the specific visual characteristics of the target. Previous research indicated that perceptual fluency effects are highly stimulus specific and that features of visual primes must closely match

the perceptual details of the target (e.g., Mandler et al. 1987). Experiment 2 shows that the semantic priming of perceptual features benefits from similar specificity. The influence of semantic primes is more pronounced the more fully the primes match the perceptual characteristics of the target. Experiment 3 further explores the compatibility between the semantic prime and the perceptual characteristics of the target and shows that a conflict between the two reduces liking of the target. In combination, these experiments establish that semantic priming can affect consumers' preferences by enhancing perceptual fluency, even in the absence of instructions that encourage a visualization of the prime.

EXPERIMENT 1

Experiment 1 was designed to investigate whether the semantic (indirect) priming of visual identifiers of a product affects product preference. The experiment employed a 2 (prime: image-compatible vs. control) x 2 (target exposure: 16 msec vs. 3 sec) between-subjects design, with twelve within-subject trials of different prime-target pairs. Each trial followed a two-stage procedure. In phase1 participants were exposed to a semantic prime (relating to a visual identifier or to a control prime) and asked to visualize the word presented to them. In phase2 participants made a choice between two products, one of which featured the visual identifier. In all trials that a given participant was exposed to, the phase 2 exposure to the products was either at pre-cognitive levels (16 milliseconds), associated with the physical encoding of the products, or for a longer duration (3 seconds) that has been shown to enhance stimulus representation. We expect that priming of the visual identifier will increase preference for targets that include the identifier, even when exposure is limited to 16 msec. The effect may persist with the longer exposure, or may be reduced due to contrast effects or correction processes.

Method

Stimulus development. Twenty-four unusual wine labels with images that had no connection with wine (e.g., ship, frog, bicycle, hippo, etc.) were collected from wine-label images available on the internet (e.g., http://www.winelabels.org/) or from actual labels that were removed from wine bottles and scanned. The images were modified and edited using Adobe Photoshop to remove any additional images that could be associated with wine or with the country of origin (e.g., "South African Shiraz" was modified to "Shiraz"). The labels were then paired based on type of grape (e.g., within a pair, if one wine was a Shiraz, the other was also a Shiraz). The labels were further matched for similarity of colors and contrasts (e.g., if one label in a pair had a light background, the other label also had a light background) and for overall appearance (e.g., if one label appeared vintage, then the other label also appeared vintage). The labels were then merged onto bottles of red or white wine using Adobe Photoshop. This resulted in twelve pairs of wines. For each pair, an additional counterbalancing pair of wines was created in which the visual identifiers were switched. Four of the twelve pairs of wines were randomly selected for practice trials and the remaining eight pairs were used as test trials (see appendix for sample stimuli).

Procedure. One hundred ten undergraduate students at a Midwestern university who indicated that they were native speakers of English and occasionally consumed wine were each paid $4.00 to participate in a 15-minute experiment on consumer decision making. The experiment was run on computers, using MediaLab. All participants were seated at individual workstations and the experiment comprised of twelve trials. First, four practice trials were presented in random order, then the eight test trials were presented in random order. Each trial comprised of a priming phase in which participants were asked to visualize a word and a test phase in which participants were presented with images of two wine bottles and asked to indicate

which one they preferred. Conditions were run to counterbalance whether a bottle appeared on the right or the left in a pair, and whether the prime related to the visual identifier shown on the bottle on the right or on the left; in the control condition, the primes related to neither or both wines (e.g., “circle”/“grapes”).

Participants were told that the purpose of the experiment was to investigate how visual attention affects consumer choice, and that they would see images of several pairs of wines. The images of the wines would be presented for a brief duration, and their task was to indicate which of the two wines they preferred in each pair of wines. Participants were instructed to pay attention to the screen; even if the exposure to the target was very brief, they should indicate which of the two wines they thought they preferred. Also, in order to orient participants’ attention to the place where the two wines would appear on screen and to ensure that they were paying attention, participants were instructed that before each wine-choice trial they would see a filler trial in which a word would appear in the center of the computer screen. They would be asked to visualize the word and rate how easy the word was to visualize. The wine-choice trial would appear immediately after the filler word-visualization trial.

In a between-subjects design, participants were asked first to visualize either a control word or to visualize a word (e.g., visualize frog) that related to one of the two wines in that particular trial (one of the two target labels had the picture of a frog). This prime comprised of a single word that appeared in the center of the screen for 1 second, and was preceded by a series of #### that were shown for 100 msec. After that, participants indicated how easy the word was to visualize (1 = *not at all easy to visualize*, 7 = *very easy to visualize*). Participants were then instructed that the consumer choice task was about to commence, after which they again saw a series of #### for 100 msec, replaced by a pair of wines for 16 msec or for three seconds.

Participants then indicated preference toward one of the two wines by pressing either the "Z" or the "/" key. Once all the trials were completed, participants indicated how involving the task was (1 = *did it quickly, not at all involved*; 7 = *paid a lot of attention, very involved*), how much they liked wine (1 = *not at all*, 7 = *very much*), and how they felt at that moment (1 = *bad mood*; 7 = *good mood*). After this, as a suspicion check, participants were asked to write down what they thought the experiment was about and to provide demographic information. They were then thanked and debriefed.

Results

Manipulation checks. In order to rule out differences in overall liking of wine across different groups of subjects, a two-way ANOVA was conducted with prime (image-compatible vs. control) and target exposure (16 msec vs. 3 sec) as the independent factors and liking of wine as the dependent variable. Neither the main effects nor the interaction were significant (all F's < 1). Further, a 2 (prime) x 2 (exposure) ANOVA conducted on an index of the average of the two measures of involvement (*alpha* = .87) also revealed no significant effects (F's < 1, except exposure F (1, 106) = 1.58, $p > .20$). Also, the 2 (product) x 2 (prime) ANOVA conducted on the mood measure revealed no significant effects (all F's < 1). Finally, for each participant, an averaged score was calculated for ease of visualization of all the priming words in the eight target trials. The ANOVA conducted on the ease of visualization measure using prime as the independent variable revealed no differences in the ease of visualizing primes across conditions ($F < 1$); participants generally indicated that the words were easy to visualize ($M = 6.52$).

Hypothesis testing. The responses of participants were coded for each trial (experimental conditions: prime irrelevant wine = 0, prime relevant wine = 1; control conditions: "Z" = 0, "/" =

1) and summed across the eight test target trials.[2] A 2 (prime) x 2 (exposure) ANOVA was conducted on this score.

As expected, participants who were provided with a visualization cue that was compatible with the physical features on the label of one of the two wines chose the target wine more often (M = 5.30) than control participants (M = 3.90), $F(1, 106) = 23.01$, $p < .01$, for the main effect of prime. Moreover, control participants chose the target wine at chance levels and about half the time (3.90 times out of 8), whereas participants exposed to prime that matched the visual identifier chose the target wine significantly more often than chance (5.30 times out of 8; $t(69) = 8.01$, $p < .01$).

The ANOVA further revealed a marginal effect of exposure (Mshort vs. long = 5.05 vs. 4.45, $F(1, 106) = 3.45$, $p < .07$), indicating that the target wine was chosen somewhat more often when exposure duration was short rather than long. Both main effects are qualified by a marginally significant interaction between prime and exposure ($F(1, 106) = 2.93$, $p = .09$). This interaction indicates that exposure to the target-relevant primes affected participants' preference under both exposure conditions, but that the effect was more pronounced under short (Mimage-compatible cue vs. not = 5.76 vs. 3.92, $t(106) = 5.03$, $p < .01$) than under long exposure (Mimage-compatible cue vs. not = 4.75 vs. 3.88, $t(106) = 2.04$, $p < .01$). Identifier-primed participants were especially likely to choose the target wine when exposure to the target was short rather than long ($t(106) = 2.98$, $p < .01$), whereas exposure time did not affect participants' preferences under control conditions ($t < 1$).

The observed effects were not more pronounced for those who had an easier time forming an image of the prime in phase 1, suggesting that it was not the ease of forming an

[2] Unfortunately, due to a programming error, the responses to the four practice trials were not recorded for any participant.

image of the prime that enhanced liking of the target. Recall that the ANOVA conducted on the ease of visualization measure using prime as the independent variable revealed no differences in the ease of visualizing primes across conditions and that participants in general indicated that the words were easy to visualize ($M = 6.52$, $F < 1$). An additional ANOVA conducted on the choice score of participants who received a semantic prime that was compatible with the perceptual feature of the target, with exposure time as the independent variable and ease of visualization measure as covariate, revealed only a main effect of time (Mshort vs. long = 5.76 vs. 4.75; $F(1, 67) = 10.97$, $p < .01$) and a non-significant effect of ease of visualizing the prime ($F < 1$). It therefore appears that the ease with which the semantic prime was processed did not affect judgment; in contrast, semantic priming of a perceptual feature of the target enhanced processing of the target.

Discussion

In sum, experiment 1 demonstrates that visual identifiers that have no preexisting meaningful relationship to the product on which they are displayed can enhance preference for the product, provided that the visual identifier is easy to process. To our knowledge, this is the first experimental demonstration of the beneficial effects of unique visual identifiers that are not meaningfully related to the nature of the product. As expected, the influence of priming a visual product identifier was most pronounced when exposure to the target product was limited to precognitive levels (16 msec) and attenuated when a longer exposure (3 sec) allowed for cognitive elaboration. The observed effect is not due to different levels of mood or task involvement across conditions, and does not reflect differences in the ease with which the primes could be visualized.

However, an important ambiguity is worth noting. We manipulated the ease with which the visual identifier could be processed by exposing participants to a semantic prime, which they were to visualize. This manipulation blurs the line between semantic and visual priming. Experiments by Shepard and colleagues show that seeing actual images and being asked to generate those images involves similar operations and brain areas (Podgorny and Shepard 1978; Shepard 1978). Experiments 2 and 3 will address this ambiguity by relying solely on semantic priming, without visualization instructions.

EXPERIMENT 2

Experiment 2 further investigates whether semantic priming of visual identifiers enhances the affective response toward the target product. This experiment relies solely on semantic priming, without visualization instructions. In addition, experiment 2 tests how closely a semantic prime needs to match the specific visual features of the target. Experiments that employed direct visual priming of perceptual features suggest that perceptual fluency effects require close visual matches (e.g., Mandler et al. 1987). Partial presentation of an image does not increase perceptual fluency of the target. Of interest is whether the same specificity applies to semantic primes, as described below.

In order to extend the generalizability of our findings, we changed the target product from a wine to a watch. An advantage of using watches as stimuli is that the hands form a distinct visual identity. Practitioners (e.g., see http://www.ubr.com/clocks/faq/1010.html) and researchers in anthromorphism (e.g., Guthrie 1993) have suggested that setting the hands of a watch at 10:10 makes the watch appear to smile, whereas setting the hands at 8:20 makes the watch appear to frown. To manipulate the visual feature identified with the watch, time on the face of the watch was set either at 10:10 or at 8:20.

Pretest participants (n = 10) rated the extent to which watches set at 10:10 or 8:20 appear to smile or to frown (each rated 1 = not at all, 7 = very much, with watches presented in counterbalanced order). As expected, participants were more likely to report that a 10:10 watch appears to smile rather than frown (*M*smiling vs. frowning = 4.50 vs. 2.20, $t(9) = 4.87$, $p < .01$), and that an 8:20 watch appears to frown rather than smile (*M*smiling vs. frowning = 1.80 vs. 5.00, $t(9) = 5.78$, $p < .01$). Also, participants were more likely to rate a 10:10 rather than an 8:20 watch as smiling ($t(9) = 6.82$, $p < .01$), and to rate an 8:20 rather than a 10:10 watch as frowning ($t(9) = 6.00$, $p < .01$).

The specificity of the match between semantic primes and the target image (a watch set at 10:10 or at 8:20) was manipulated at two levels. First, some participants were exposed to four watch-related words (watch, clock, time, dial), whereas others were exposed to control words (desk, door, chair, table). If priming the product category is sufficient to facilitate the processing of a picture of a watch, participants primed with category concepts should evaluate a watch more favorably than participants primed with control words, independent of whether the hands of the watch are set to 10:10 or 8:20. Second, we crossed this manipulation with semantic primes related to smiling (smile, grin, happy, elated) or frowning (frown, sad, gloomy, scowl). If a partial match between the semantic prime and visual features of the target is sufficient to enhance liking, participants should like the "smiling" 10:10 watch more when primed with "smile" than with "frown," whereas the reverse will hold for the "frowning" 8:20 watch, independent of whether they were exposed to watch-related primes or to control primes. In contrast, if enhanced liking requires a close match between the semantic primes and the perceptual features of the target, participants should only like the "smiling" 10:10 watch more

when primed with “watch” + “smile” words, but not when primed with “watch” + “frown” words; the reverse should hold true for the “frowning” 8:20 watch.

Note that these perceptual match predictions differ from the more familiar assumptions of prime-congruent encoding or prime-congruent evaluation (for a review see Higgins 1996). According to the prime-congruent encoding hypothesis, ambiguous stimuli are encoded in terms of the most accessible applicable concept. Participants who are primed with smile-related words should therefore be more likely to perceive the 10:10 watch as smiling and should evaluate it more positively. Conversely, participants who are primed with frown-related words should be more likely to see the 8:20 watch as frowning and should evaluate it more negatively. In contrast, our perceptual fluency hypothesis predicts a positive effect of frown-related primes on the evaluation of the 8:20 watch. Finally, according to the prime-congruent evaluation hypothesis, participants who are primed with smile-related words should provide more positive evaluations than participants who are primed with frown-related words, independent of whether the watch is set to 10:10 or 8:20. To further address this possibility of a general influence of evaluative primes, participants also evaluated a control product that lacked any perceptual matches (a bottle of water).

In sum, experiment 2 follows a 2 (category prime: control versus category words) x 2 (identifier prime: smile versus frown related words) x 2 (target watch: 10:10 versus 8:20) between-subjects design.

Method

Procedure. Eighty-three undergraduate students (48 female, 34 male, 1 unreported), all of whom indicated that they were native speakers of English, participated in the study for $2 compensation each. All participants completed an answer booklet that consisted of a priming

phase and a test-phase. Experimental participants first completed a word-jumble task (priming phase) and then reported their attitudes toward various consumer products including one of two target watches (10:10 vs. 8:20). The priming procedure was adapted from Srull and Wyer (1979) and participants were asked to find and circle each of eight words hidden in a word-jumble puzzle and then to write each those words next to the jumble. Four words were either control words (desk, door, chair, table) or category cues relating to the target (watch, clock, time, dial). The remaining four words in the word-jumble task were designed to activate the visual identifier ("smile" or "frown") associated with one of the two target watches (10:10 or 8:20). The four words relating to the visual characteristics of the 10:10 watch were smile, grin, happy, and elated, and the four words relating to the visual characteristics of the 8:20 watch were frown, sad, gloomy, and scowl.

Once participants had circled and listed the eight hidden words, they evaluated the jumble on two 7-point scales (1 = *dislike; puts me in a bad mood,* 7 = *like; puts me in a good mood*). Subsequently, participants proceeded to the test phase in which they evaluated a filler product (water; 1 = *dislike very much,* 7 = *like very much*), the target product (watch with its time set at either 10:10 or 8:20; 1 = *dislike very much; unlikely to buy; puts me in a bad mood,* 7 = *like very much; likely to buy; puts me in a good mood*), and responded to miscellaneous demographic questions.

Results

Manipulation Checks. In order to rule out differences in initial liking of the jumble, a three-way ANOVA was conducted with category prime (control vs. watch), perceptual prime (smile vs. frown), and target (10:10 vs. 8:20) as the independent factors and the liking of the jumble (1 = *dislike*, 7 = *like*) as the dependent variable. A main effect of category prime

(*M*control vs. watch = 4.39 vs. 5.02; $F(1, 75) = 4.52$, $p < .05$), of perceptual prime (*M*smile vs. frown = 5.00 vs. 4.56; $F(1, 75) = 4.11$, $p < .05$), and an interaction between category prime and perceptual prime ($F(1, 75) = 4.82$, $p < .05$) emerged (all other *F*'s < 1). Importantly, the three way interaction among category prime, perceptual prime, and target was not significant. This indicates that although participants preferred the watch jumble to the control jumble and the smile jumble to the frown jumble, these preferences were independent of the target that participants finally evaluated.

Furthermore, the three-way ANOVA investigating the effect on the self report of mood measure that participants provided after completing the jumble (1 = *puts me in a bad mood*, 7 = *puts me in a good mood*) revealed only a main effect of smile vs. frown words (*M*smile vs. frown = 5.17 vs. 4.10; $F(1, 75) = 12.04$, $p < .01$). In addition, the three-way ANOVA investigating the effect on a second mood measure that participants provided after evaluating the target watch (1 = *puts me in a bad mood*, 7 = *puts me in a good mood*) revealed only a marginal effect of smile vs. frown words (*M*smile vs. frown = 4.04 vs. 3.58; $F(1, 75) = 3.47$, $p < .07$). Finally, the three-way ANOVA on participant's evaluation of the filler product (water), provided prior to the target evaluation, showed no significant effects (all *F*'s < 1, except perceptual identifier prime: $F(1, 75) = 1.31$, $p > .25$). These null effects of the manipulations on the evaluation of the filler product allow us to interpret the results of semantic priming on the target watches with more confidence.

Hypotheses Testing. An index of attitude toward the target was computed by averaging the two measures (1 = *dislike*; *unlikely to buy*, 7 = *like*; *likely to buy*) indicating liking of the target ($\alpha = .73$). A three-way ANOVA, with category prime (control vs. watch), identifier prime (smile vs. frown), and target (10:10 vs. 8:20) as the independent factors, and liking of the jumble as a covariate, and the attitude index as the dependent variable, was conducted. This revealed a

main effect of category prime ($F(1, 75) = 4.66$, $p < .04$), with participants exposed to watch-related words liking both watches more ($M = 3.48$) than participants exposed to control words ($M = 2.82$). This main effect indicates that exposure to category primes is sufficient to enhance liking for a category exemplar, reflecting a fluency effect. Importantly, this main effect was qualified by the predicted three-way interaction ($F(1, 75) = 3.62$, $p = .06$)[3], which is shown in figure 2.

Insert figure 2 here

Additional analysis revealed that control participants, who were primed with desk-related words, liked both target watches more after they were exposed to smile-related words ($M = 3.15$) rather than frown-related words ($M = 2.43$; $F(1, 27) = 2.87$, $p = .10$, for the simple effect of identifier prime). No other effect reached significance (all $F < 1$). This pattern is compatible with a general evaluative effect of the increased accessibility of affectively positive (smile) or negative (frown) concepts. However, the marginal significance of this effect, and the fact that it was not observed on evaluations of the filler product ($F(1, 75) = 1.31$, $p > .25$), suggest that it should be interpreted with some caution.

More important, the liking judgments of participants who were primed with watch-related words provide strong support for the hypothesized relevance of the perceptual match between semantic primes and visual targets. These participants liked the target watch more when the identifier primes (smile vs. frown related words) matched the watch's visual features (10:10 vs. 8:20) than when they did not; $F(1, 48) = 8.36$, $p < .01$, for the simple interaction of identifier prime x target watch. The bottom panel of figure 2 shows the resulting cross-over interaction. No other effect reached significance (all $F < 1$).

[3] Similar effects are observed if liking of the jumble is not taken as a covariate

Planned contrasts further revealed that participants liked the 10:10 watch more when they were exposed to semantic primes that fully matched the target (watch + smile primes; $M = 3.97$) than when they were exposed to any other combination of primes (watch + frown primes: $M = 2.96$, $t(75) = 2.43$, $p < .05$; control + smile primes: $M = 3.16$, $t(75) = 1.76$, $p < .05$). These effects were replicated with the 8:20 watch. Again, the 8:20 watch was liked more when participants were exposed to semantic primes that fully matched the target (watch + frown primes; $M = 3.79$) than when they were exposed to any other combination of primes (watch + smile primes: $M = 3.09$, $t(75) = 1.69$, $p < .05$; control + frown primes: $M = 2.21$, $t(75) = 3.17$, $p < .05$). In short, participants liked the 10:10 watch most when they were previously exposed to the watch + smile primes ($t(75) = 8.49$, $p < .001$, for this condition vs. all other ratings of the 10:10 watch), and liked the 8:20 watch most when they were previously exposed to watch + frown primes ($t(75) = 6.99$, $p < .001$, for this condition vs. all other ratings of the 8:20 watch).

Discussion

In sum, we observed two fluency effects. First, exposing participants to category related semantic primes (watch-related words) enhanced liking of watches relative to a control condition with unrelated semantic primes. Second, combining the category primes (watch-related words) with identifier primes that matched specific perceptual features of the target watch (smile or frown related words) further enhanced liking of the matching watch. These effects were obtained without visualization instructions and demonstrate that semantic primes can facilitate the processing of visual stimuli, giving rise to perceptual fluency effects. As expected (e.g., Mandler et al. 1987), these facilitation effects are more pronounced, the more fully the semantic primes match the perceptual characteristics of the target.

Note that these fluency effects are in stark contrast to predictions suggested by the knowledge accessibility literature. For example, the prime-congruent encoding hypothesis (see Higgins 1996; Higgins, Rholes, and Jones 1977) holds that ambiguous stimuli are encoded in terms of the most accessible concept applicable to the stimulus, resulting in more positive judgments when positive rather than negative concepts are primed. From this perspective, "smile" primes should have increased the likelihood that the 10:10 watch is perceived as smiling, resulting in more favorable evaluations of the "friendly" watch. Conversely, "frown" primes should increase the likelihood that the 8:20 watch is perceived as frowning, resulting in less (not more) favorable evaluations. In contrast, the logic of fluency effects holds that the crucial variable is the match between the prime and the target. Hence, matching prime-target combinations should result in enhanced liking (even when the primes emphasize the frowning expression of the target), whereas mismatching prime-target combinations should result in reduced liking (even when the primes emphasize the smiling expression of the target), as observed. Similarly, a prime-congruent evaluation hypothesis (Higgins 1996) holds that evaluative primes may result in prime-congruent evaluations, even when the target is not ambiguous. Compatible with this prediction, participants in the control condition, who were not exposed to watch-related words, evaluated either target watch more favorably when they were primed with smile rather than frown related words. However, this effect was marginally significant and not observed on a control product.

We therefore conclude that semantic primes can influence evaluative judgment in ways that have not been addressed in the knowledge accessibility literature: Semantic primes that match visual characteristics of the target facilitate fluent processing. Fluent processing, in turn, is experienced as affectively positive (as captured by psychophysiological measures; Winkielman

and Cacioppo 2001), which gives rise to more positive target evaluations (Reber et al. 2004), consistent with the extant literature on affective influences on judgment (for reviews see Pham 2004; Schwarz and Clore 1996).

EXPERIMENT 3

Experiment 3 was designed to investigate further whether the semantic priming of perceptual features of a target product enhances the affective response toward the product and to gather direct evidence of the underlying process. An additional objective was to investigate whether a conflict between the semantic prime and the visual identifier of the target suppresses liking of the product. In particular, Anderson and his colleagues (e.g., Anderson, Green, and McCulloch 2000) have suggested that when two constructs (e.g., dog and cat) belong to the same category (e.g., common pets) and have similar levels of association with that category (i.e., both are common exemplars of the category), then enhanced activation of one of the two constructs is accomplished by suppressing the other construct. For example, Anderson, Bjork, and Bjork (1994) demonstrate that priming a typical exemplar of a category inhibits other typical exemplars of that category in a subsequent recall task, and Anderson and Spellman (1995) argue that such inhibitory processes are used to resolve problems of selection common to memory retrieval. Thus, it is possible that if a target product (e.g., pet shampoo) is equally likely to be associated with more than one product feature (e.g., image of a dog vs. cat on a label), then priming one of the two features (e.g., cat) will suppress liking of the target product when it includes the alternative feature (picture of a dog), relative to a condition in which neither of these features is shown. Experiment 3 explores this possibility. Note that experiment 2 did not include a control target watch (set at a time other than one that appears to smile or frown), and therefore it was not

possible to discern clearly the extent to which the effects are a result of enhanced liking from compatibility or from reduced liking from conflict between the prime and the target.

A bottle of "MagicCoat" pet shampoo, which featured either an image of a collie or no pet image on its label served as the target product in experiment 3. Prior to the evaluation of the product, participants were either primed with words compatible with the image in the label (i.e., dog-related words) or with words that conflicted with the image in the label (i.e., cat-related words). These manipulations result in a 2 (target product: image present vs. absent) x 2 (semantic prime: image-compatible vs. image-conflicting) between-subjects design in which participants' evaluation of the pet shampoo served as the dependent variable.

Method

Participants. Forty-four undergraduate students who indicated that they were native speakers of English were each paid $2.00 to participate in this study. Participants were instructed that they would be participating in two short paper-and-pencil studies, that the first study was comprised of a word-jumble task, and that the second study was about consumer attitudes regarding various products.

Procedure. All participants completed an answer booklet that consisted of a priming phase and a test-phase. The priming procedure was adapted from Srull and Wyer (1979) and was similar to that used in experiment 2. Participants were first asked to find and circle eight words hidden in a word-jumble puzzle and then to write each of those words next to the jumble. Four of the words were common across conditions (pet, grooming, bottle, label). The remaining four words were either image-compatible (dog, collie, puppy, woof) or image-conflicting (cat, feline, kitten, meow). Once participants had circled and listed the eight hidden words, they evaluated the jumble on four 7-point scales (1 = *dislike, negative, puts me in a bad mood, difficult,* 7 = *like,*

positive, puts me in a good mood, easy). They also indicated how they processed the jumble (1 = *did it quickly, not at all involved*; 7 = *paid a lot of attention, very involved*) and how they felt at that moment (1 = *depressed, bad mood*; 7 = *uplifted, good mood*).

Subsequently, participants completed the test phase of the experiment in which they were presented with pictures of different consumer products and asked to evaluate each product. Each participant first evaluated a filler product (alkaline batteries; 1 = *dislike very much, very unfavorable, ineffective, not likely to buy;* 7 = *like very much, very favorable, effective, very likely to buy*). They also completed questions designed to measure the perceptual ease (1 = *not at all attractive, not at all eye-catching*; 7 = *very attractive, very eye-catching*) of processing the filler and the subjective ease of processing the filler product (1 = *difficult to process*; 7 = *easy to process*). After this, each participant evaluated MagicCoat pet shampoo.

Participants were randomly assigned to a condition in which they evaluated Magic Coat pet shampoo with a label that either included a picture of a collie or did not include any picture in the label. In the two conditions, the image and bottle of MagicCoat pet shampoo was identical, except that the picture of the collie was blanked out (using Adobe Photoshop) in the control condition. Participants indicated their attitude toward the pet shampoo (1 = *dislike very much, very unfavorable, ineffective, not likely to buy;* 7 = *like very much, very favorable, effective, very likely to buy*), and then completed questions designed to measure the perceptual ease of processing the target (1 = *not at all attractive, not at all eye-catching*; 7 = *very attractive, very eye-catching*), and the subjective ease of processing the target (1 = *difficult to process*; 7 = *easy to process*). After this, participants responded to miscellaneous demographic questions and were then funnel debriefed (e.g., Bargh and Chartrand 2000).

Results and Discussion

Manipulation Checks. In order to rule out differences in the initial liking of the jumble, a two-way ANOVA was conducted with product (image present vs. absent) and semantic prime (image-compatible vs. image-conflicting) as the independent factors and an index of the average of the four measures of liking of the jumble (alpha = .90) as the dependent variable. Neither the main effects nor the interaction were significant (all *F*'s < 1). A 2 (product) x 2 (prime) ANOVA conducted on an index of the average of the two measures of processing of the jumble (alpha = .70) also revealed no significant effects (all *F*'s < 1). Also, the 2 (product) x 2 (prime) ANOVA conducted on an index of the average of the two mood measures (alpha = .92) also revealed no significant effects (all *F*'s < 1), suggesting that the jumble did not affect mood differently across conditions.

In addition, a two-way ANOVA on the average of the four measures reflecting participant's evaluation of the filler product (alkaline batteries; alpha = .83) showed no significant effects (all *F*'s < 1, except prime: $F(1, 40) = 1.73$, $p = .20$). The two-way ANOVA on an index of average of the three measures reflecting participant's ease of processing the filler product (alpha = .90) also showed no significant effects (all *F*'s < 1, except prime: $F(1, 40) = 2.03$, $p > .15$). These null effects of the manipulations on the evaluation of the filler product allow us to interpret the results of semantic priming on the target shampoo with more confidence.

Hypotheses Testing. An index of attitude toward the target was computed by averaging the four measures indicating liking of the target (1 = *dislike very much, very unfavorable, ineffective, not likely to buy;* 7 = *like very much, very favorable, effective, very likely to buy;* α = .82). A 2 (product) x 2 (prime) ANOVA conducted on this attitude index, with liking of the jumble as a covariate[4], revealed only the predicted interaction between product and prime ($F(1, 40) = 9.53$, $p < .01$), shown in figure 3. Planned contrasts indicated, as expected, that participants

[4] Similar effects are observed if liking of the jumble is not taken as a covariate.

who were exposed to image-consistent semantic primes (dog-related words) liked the product more when its label featured the image of a dog (M = 4.35) than when featured no image (M = 3.25, $t(40) = 2.56$, $p < .01$), reflecting a fluency effect. In contrast, participants who were exposed to image-conflicting semantic primes (cat-related words) liked the product less when its label featured the image of a dog (M = 3.13) than when it featured no image (M = 3.13 vs. 3.95, $t(40) = 1.84$, $p < .05$), reflecting a disfluency effect due to the inhibition of the target. In addition, participants liked the image-present target more after they were exposed to image-compatible rather than to image-conflicting semantic primes ($t(40) = 2.90$, $p < .01$), whereas liking of the image-absent target was not significantly affected by the semantic primes ($t(40) = 1.53$, $p > .10$).

Insert figure 3 here

Ease of processing. A fluency index was computed by averaging the three measures (1 = *not at all attractive, not at all eye-catching, difficult to process*; 7 = *very attractive, very eye-catching, easy to process*) of subjective ease of processing the target (α = .70). A 2 (product) x 2 (prime) ANOVA conducted on this fluency index revealed only the predicted interaction between target product and prime ($F(1, 40) = 5.97$, $p < .05$). Planned contrasts indicated, as expected, that participants who were exposed to image-consistent semantic primes (dog-related words) found it easier to process the target when its label included the image of a dog (M = 3.39) than when it did not (M = 2.25; $t(40) = 1.89$, $p < .05$). In contrast, participants who were exposed to image-conflicting semantic primes (cat-related words) found it more difficult to process the target when its label included the image of a dog (M = 2.45) than when it did not (M = 3.45; $t(40) = 1.65$, $p = .05$). In addition, as expected, ease of processing the image target was lower when participants were provided with image-compatible versus image-conflicting semantic primes ($t(40) = 1.64$, $p = .05$). Unexpectedly, however, liking of the image-absent target was somewhat

higher when the image-conflicting (cat) versus image-compatible (dog) prime was provided ($t(40) = 1.68$, $p < .10$).

To further examine the semantic priming effect on evaluation, mediation analyses were conducted (Baron and Kenny 1986). First, the result of a regression analysis showed that the hypothesized prime × target interaction on brand attitude was significant ($b = .47$, $t(40) = 3.09$, $p <. 01$). A second regression analysis showed that the prime × target interaction on participants' perceived processing fluency was also significant ($b = .53$, $t(40) = 2.44$, $p < .05$). A final regression analysis with processing fluency included in the model as a predictor of brand attitude showed that the effect of processing fluency was significant ($b = .35$, $t(40) = 3.53$, $p <.01$), whereas the interaction between prime and target became marginally significant ($b = .29$, $t(40) = 1.98$, $p < .06$). The result of a Sobel test showed that the mediating effect of processing fluency on brand attitude was significant ($z = 2.01$, $p < .05$).

In sum, experiment 3 shows that semantic priming of visual features of a product enhances liking of that product and that the enhanced liking results from increased ease of processing of the product's perceptual features. Moreover, semantic priming of features that are in conflict with visual features of the target product reduces liking of the product, and the reduced liking is a result of reduced ease of processing the target product.

GENERAL DISCUSSION

The present research addressed a previously unexplored variable that facilitates fluent processing—the semantic priming of perceptual features. Earlier research showed that semantic primes can facilitate the perceptual processing of conceptually related visual stimuli. For example, Winkielman and Fazendeiro (2003) observed that exposure to the word "key" facilitated processing of a picture of a lock, resulting in more favorable evaluations of the lock.

Similarly, we observed in experiment 2 that exposure to category primes (watch-related words) increased liking of a category exemplar (a watch). In these cases, the semantic primes and the visual targets are part of a network of meaningful associations in memory.

Going beyond these observations, the present studies highlight that visual features that have no preexisting meaningful association with the target product (like a frog on a wine label) can enhance liking of the product, provided that they are easy to process. Moreover, our studies provide first evidence that matching semantic primes can facilitate the fluent processing of such arbitrary perceptual features (experiments 1-3), whereas conflicting semantic primes impair fluent processing (experiment 3). Because fluent processing is experienced as positive (Winkielman and Cacioppo 2001; Winkielman et al. 2003), fluently processed stimuli appear as more attractive and pleasing (Reber et al. 2004), resulting in enhanced liking of a product that displays the respective visual features. Thus, our experiments demonstrate that the prime and the target need not be meaningfully related if the prime matches the perceptual features of the target, in contrast to studies on conceptual fluency that suggest that the semantic prime and target must belong to a common associative network in memory.

Experiment 1 indicated that semantic priming of perceptual features increases affective response even when participants rely on perceptual processes to make judgments, i.e., when exposure to the target object is too brief for conceptual processing. Participants in experiment 1 preferred a wine that matched (vs. did not match) a semantic prime associated with its visual identifiers, and this effect was more pronounced when exposure to the two wines was brief (16 msec vs. 3 sec). While experiment 1 included visualization instructions, which blurred the distinction between semantic and visual priming, experiments 2 and 3 relied solely on semantic primes and provided additional tests of the underlying process. Experiment 2 investigated the

level of match between the prime and target that is required to facilitate subsequent perception of a target. In other research, perceptual fluency effects are known to require exact visual matches (e.g., Mandler et al. 1987), and similar to those effects, we found that the influence of semantic primes increased with the extent to which they matched the perceptual features of the target. In particular, liking of a 10:10 watch, which according to a pretest appears to smile to participants, was enhanced by prior exposure to smile + watch primes. Liking of an 8:20 watch, which according to a pretest appears to frown to participants, was enhanced by prior exposure to frown + watch primes. A smile or frown prime without the category prime failed to enhance processing fluency of the target and instead elicited a prime-congruent evaluation effect, as predicted by knowledge accessibility models or affective priming (see Higgins 1996). Experiment 3 triangulated on the effects observed in experiments 1 and 2 to also show that compatibility between the semantic prime and the perceptual characteristics of the target increases liking of the target. It further demonstrated that a conflict between the two reduces liking of the target, and that the perceptual ease of processing the target underlies the observed effects.

Our experiments add to the growing literature on processing fluency effects in several ways. First, they demonstrate a novel way in which perceptual fluency of a product may be enhanced--by semantic priming of its perceptual features. This extends previous observations that perceptual fluency is enhanced by prior exposure to the exact same stimulus (e.g., Zajonc 1968) or by presentation variables such as clarity and figure-ground contrast (e.g., Reber et al. 1998), and adds a new variable of managerial interest, as discussed below. Second, the observed effects also extend observations of the influence of conceptual fluency, which have been obtained with semantic priming and with manipulations of predictability of the target. Specifically, our data show that liking of the target is enhanced not only by priming concepts that

belong to the associative network of the target (e.g., librarian and book), but also by priming concepts that facilitate the processing of perceptual features that are not commonly associated with the target. Finally, experiment 3 further shows that semantic primes can impede processing fluency, resulting in reduced liking of the target. Specifically, exposure to cat-related semantic primes reduced the ease with which participants could process a target that featured a label with the image of a dog, resulting in a reduced product preference.

On theoretical grounds, we conjecture that semantic primes may often be more efficient in facilitating the processing of visual stimuli than perceptual primes. Specifically, the mere exposure literature showed that perceptual priming is sensitive to minor mismatches in visual detail between the perceptual prime and perceptual target (e.g., Mandler et al. 1987; Zajonc 1968). Accordingly, perceptual priming may require exposure to the exact target stimulus to enhance evaluations, whereas semantic priming can achieve this effect for previously unseen targets, as the present experiments demonstrate.

In addition to contributing to the fluency literature, our findings add to the knowledge accessibility literature (for a review see Higgins 1996) by qualifying the assumption that semantic primes exert an influence through prime-congruent encoding of ambiguous stimuli or through prime-congruent evaluation of unambiguous stimuli. Most notably, the prime-congruent encoding hypothesis predicts that priming with frown-related words increases the likelihood that a watch set to 8:20 (experiment 2) is seen as “frowning,” resulting in less favorable evaluations. Instead, frown-related words resulted in a more favorable evaluation of this watch. This suggests that the immediate affective reaction elicited by high processing fluency can override prime-congruent encoding effects, with affect trumping the semantic meaning of the target. This possibility deserves further investigation in other content domains.

Turning to the managerial implications of our findings, we note that associating products with unique visual identifiers can be beneficial, even when the identifier has no meaningful substantive association with the product. When the visual identifier is easy to process, the resulting fluency experience enhances product evaluation, as the present experiments illustrate. Moreover, unique arbitrary identifiers (e.g., a frog on a wine label) have a potentially important advantage over identifiers that are meaningfully related to the type of product (e.g., grapes on a wine label): they are not shared by competitors. Hence, increasing the fluency and familiarity of a unique and arbitrary identifier is likely to benefit the specific product, whereas similar efforts to increase the fluency and familiarity of meaningful identifiers may benefit the whole product category. Over time, the association of unique identifiers with a brand facilitates development of that particular brand's equity, whereas the association of meaningful identifiers runs the risk of contributing to brand dilution as they may also be readily applied to competing brands in the category.

However, with time, even arbitrary visual identifiers may become part of the brand's associative network and may therefore also be associated with the category to which the target brand belongs. For example, the Nike "swoosh" or MacDonald's Ronald MacDonald are a meaningful part of the brand's equity but are also likely to be part of the cognitive structures relating to shoes or fast foods. Once this happens, priming such identifiers may increase liking of all brands in the category.

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FIGURE 1

PREFERENCE FOR THE TARGET AS A FUNCTION IT'S DURATION OF EXPOSURE AND PERCEPTUAL COMPATIBILITY WITH THE SEMANTIC PRIME (EXP 1)

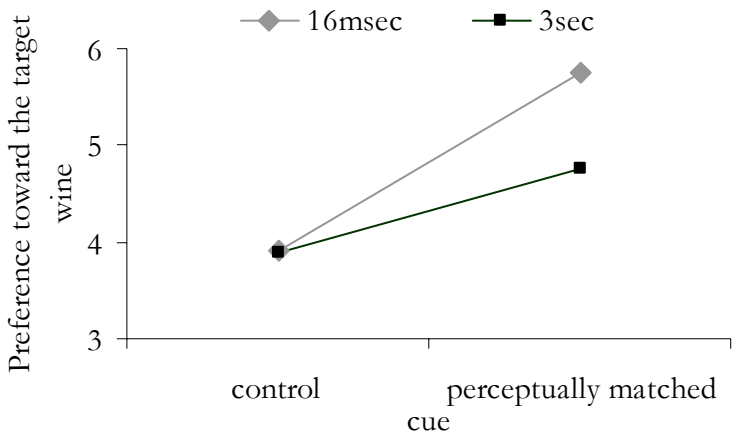


FIGURE 2

TARGET EVALUATION AS A FUNCTION OF

SPECIFICITY OF THE SEMANTIC PRIME (EXP 2)

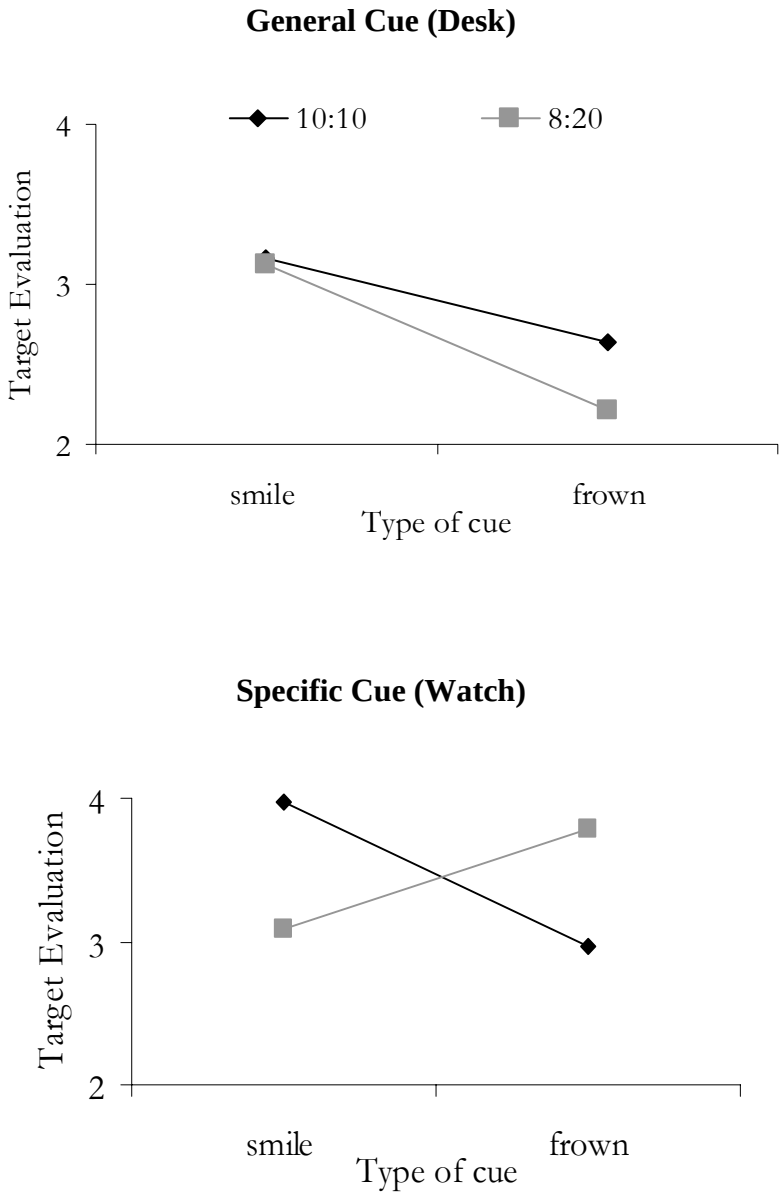
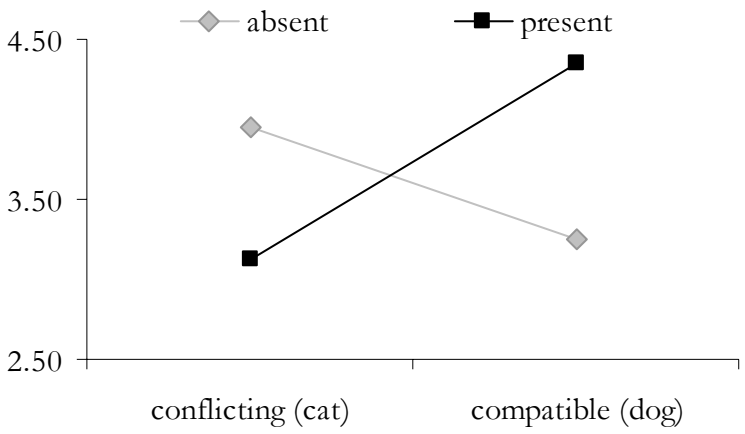


FIGURE 3

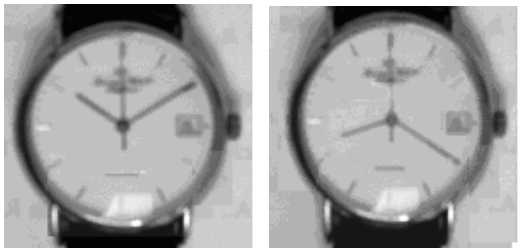
EVALUATION OF THE TARGET AS A FUNCTION OF SEMANTIC PRIME AND PRESENCE VERSUS ABSENSE OF THE COMPATIBLE PERCEPTUAL FEATURE ON THE TARGET (EXP 3)



APPENDIX: SAMPLE STIMULI

Experiment 1

Experiment 2



Experiment 3