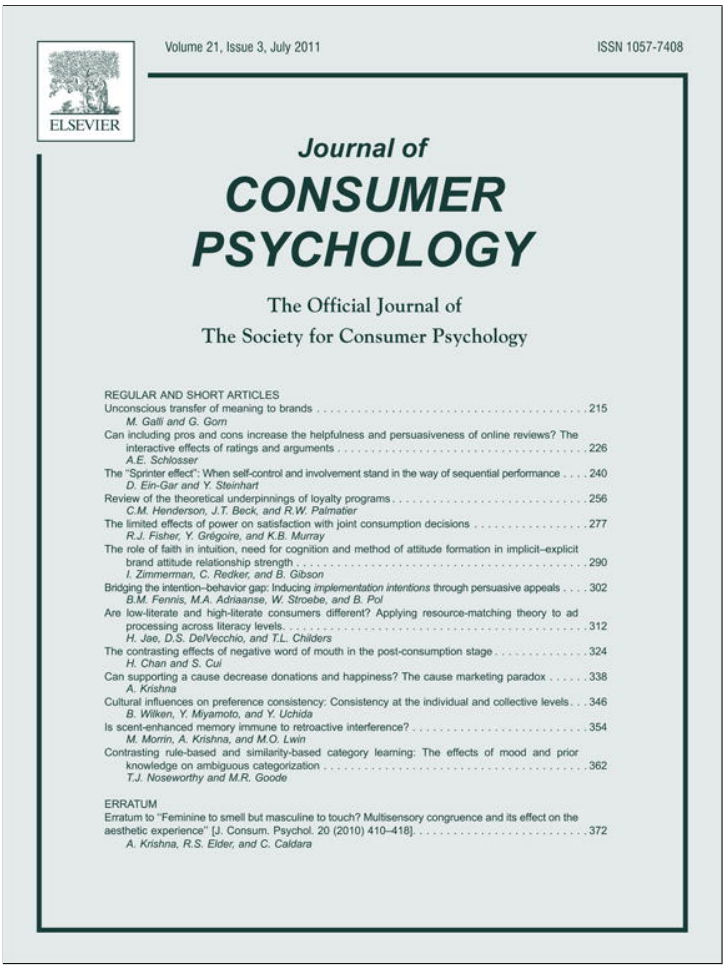

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# Unconscious transfer of meaning to brands☆

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**Abstract**

We examine semantic conditioning in a consumer context. We subliminally paired neutral ideographs with attributes. In experiment 1, the ideographs served as primes during a lexical decision task and slowed down response times to target words with the opposite semantic meaning. In experiment 2, the ideographs served as brand names of beverages, and attitudinal responses to them were less favorable when the associated attributes were incongruent with existing schemas. These results showed that semantic conditioning (1) can occur unconsciously, (2) can have significant and meaningful consequences for brand evaluation, and (3) influences subsequent attitudinal responses via conceptual disfluency processes.


*Keywords:* Semantic conditioning; Associative learning; Unconscious processing; Subliminal

## Unconscious transfer of meaning to brands

In the early 1990s, PepsiCo introduced a form of Pepsi, called Crystal Pepsi, which was clear in color. Crystal Pepsi was marketed as an alternative to normal colas, its clearness representing purity and health (Triplett, 1994). Except for its color, Crystal Pepsi did not differ significantly from the original Pepsi and tasted much like it. PepsiCo essentially introduced a new association, "clear," with an otherwise unchanged product. Although the attribute "clear" was evaluated positively, when it was associated with a cola drink, it was not received very well. Years of exposure to dark-colored cola-flavored sodas (Pepsi Cola, Coca Cola, etc.) had resulted in a strong association between the attribute "black" and cola, and violating this association generated avoidance: Crystal Pepsi tasted like Pepsi Cola, and colas *should* be black.

This example stimulated two questions that we ask in this research. Our first question relates to what psychological processes underlie the transfer of semantic meaning from an attribute (e.g., "clear") to a brand (e.g., Crystal Pepsi), through exposure to multiple pairings of the two. We will refer to both the procedure of pairing a brand with a meaningful attribute and to the outcome of that brand-attribute pairing as "semantic conditioning" (e.g., Janiszewski & Warlop, 1993).[1] Because in today's world of marketing communications, there are many elements that go by fleetingly and perhaps never enter a viewer's realm of awareness (Hawkins, 1970; Shapiro, 1999), an important question is whether semantic conditioning can happen *unconsciously,* namely without awareness. If it turns out that it can, then we cannot avoid its influence (Shapiro, 1999). Our second question is if semantic associations that are learned unconsciously rather than consciously, unlike in the Crystal Pepsi example, would still have significant (negative) consequences for brand evaluations.

We took the view that a subliminal procedure would be the best procedure to use to address our questions. It enables an unequivocal test of whether semantic conditioning can occur

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[1] Prior research has also used other terms to refer to the same phenomenon, for example, conditioning of denotative meaning (Staats, Staats, & Heard 1961) associative transfer of non-evaluative stimulus properties (Meersmans et al., 2005), and associative learning of non-evaluative covariations (Olson, Kendrick, & Fazio 2009).

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unconsciously since the issue of conscious learning becomes moot if at least one of the paired stimuli is not consciously perceived during the brand-attribute pairings. Scientific research on the plausibility of subliminal persuasion has been limited (Epley, Savitsky, & Kachelski, 1999), and to the best of our knowledge, in conditioning research, no one has attempted to use subliminal procedures for meaning transfer. We will use them to examine whether semantic meaning can be transferred unconsciously. This, however, presents a challenge. The unconscious transfer of meaning via subliminal procedures should be more difficult to demonstrate than unconscious transfer of affect, which has already proven to be difficult.[2] This is for two reasons. First, the cognitive interpretation of an attribute's semantic meaning should be slower than the affective response to it, presumably requiring a fair degree of higher-order, conscious processing. As an illustration, consider the attribute "clear." The cognitive interpretation of "clear" involves not only understanding that it denotes a specific color (as in "Crystal Pepsi is clear") but also appreciating the—likely various—meanings linked to it in memory (e.g., "transparent," "healthy," "good for the environment," etc.). Second, semantic meaning is less ambiguous than affect and thus less likely to be "misattributed" to a target (Jones et al., 2009; Olson, Kendrick, & Fazio, 2009; Pham, 2007; Sweldens et al., 2010). Given these reasons, a subliminal procedure represented a conservative, if risky, procedure to use in our investigation of unconscious meaning transfer.

We also test for downstream attitudinal effects of semantic conditioning. For example, if a brand has become associated with a color (even unconsciously), what evaluative implications does this have for the brand? Would the associated color impact brand evaluations positively or negatively, or would the effect be contingent on the specific product this brand represents? If the latter, it would mean that the brain can perform rather complex operations automatically. It would suggest not only that the brain *automatically* makes meaningful connections between an attribute and a brand but also, maybe more significantly yet, that the brain can even make an *unconscious yet meaningful* application of an association that was unconsciously learned.

Next, we review prior literature relevant to both the questions we are interested in.

## Conscious vs. unconscious conditioning

Research examining unconscious conditioning in recent years has focused on evaluative rather than semantic conditioning. Some researchers have used subliminal procedures in an attempt to show unconscious transfer of affect (e.g., De Houwer, Baeyens, & Eelen, 1994; De Houwer, Hendrickx, & Baeyens, 1997; Dijksterhuis, 2004; Krosnick, Betz, Jussim, & Lynn, 1992), but this research has been criticized on methodological grounds (e.g., see Lovibond & Shanks, 2002 ; and Pleyers, Corneille, Luminet, & Yzerbyt, 2007). Indeed, there remains an important ongoing debate in the conditioning literature about the possibility of unconscious (evaluative) conditioning, with some authors presenting evidence for unaware evaluative conditioning effects (e.g., Jones, Fazio, & Olson, 2009; Sweldens, van Osselaer, & Janiszewski, 2010) and others claiming that participants need to be contingency aware (e.g., Pleyers et al., 2007; Stahl, Unkelbach, & Corneille, 2009). Leading theorists claim that there is no convincing evidence for unaware conditioning effects at all, and the most likely theoretical account for conditioning effects in humans is propositional in nature or based on conscious thought (Hofmann, De Houwer, Perugini, Baeyens, & Crombez, 2010; Mitchell, De Houwer, & Lovibond, 2009; Shanks, 2010).

Some research has used conditioning procedures to study the transfer of semantic meaning, but with few exceptions (e.g., Olson et al., 2009), this research focused more on finding evidence of semantic conditioning than on underlying processes. There has been discussion of the role played by conscious vs. unconscious processes (e.g., Kim, Allen, & Kardes, 1996; Meersmans, De Houwer, Baeyens, Randell, & Eelen, 2005; Olson et al., 2009), and it is this discussion that motivated the use of a subliminal procedure in our research. As indicated, we use it to unequivocally test whether semantic conditioning can occur unconsciously, given that, as will be seen next in our review of the existing literature most relevant to our research, evidence of this, to date, is equivocal.

Prior research investigating semantic conditioning is relatively scarce. It includes early work by Staats, Staats, and Heard (1961) and more recent work as well. Meersmans et al. (2005) found that predictions of the gender of infants whose gender was not apparent from a picture were affected by repeatedly pairing the infant photos with pictures of clearly identifiable male or female infants. In an advertising context, Kim et al. (1996) showed that repeatedly pairing a brand of pizza delivery ("L Pizza House") with a picture of a race car increased the perception of L Pizza House as being "fast." The issue of the role of conscious vs. unconscious psychological processes was discussed in the latter two papers, but their investigation was not the main purpose of either piece of research. To the extent the data in both studies speak to the issue of conscious vs. unconscious processes, in Meersmans et al.'s (2005) experiments, evidence of semantic conditioning was found only when participants were aware that the gender neutral infant pictures had been paired with the clearly identifiable male or female infant pictures. Similarly, Kim et al. (1996) found that only participants who were aware of the L Pizza House–race car pairing acquired the belief that L Pizza House was speedy and developed more positive attitudes.

Two other studies suggest that semantic conditioning may be obtained unconsciously. In Janiszewski and Warlop's (1993) experiment 3, even though whether participants deliberately processed the contingency between the paired stimuli was not measured given that this research was concerned with other questions, the authors did suggest that the formation of

[2] Subliminal procedures have been used in evaluative conditioning research in attempts to show unconscious *affect* transfer (e.g., De Houwer, Baeyens, & Eelen, 1994; De Houwer, Hendrickx, & Baeyens, 1997; Dijksterhuis, 2004; Krosnick, Betz, Jussim, & Lynn, 1992), but as will be elaborated in the next section, this research is controversial.

associations may have occurred with little awareness, since "the conditioning procedures used were in no way transparent" (Janiszewski & Warlop, 1993, p. 185). More recently, Olson et al. (2009) paired Pokémon characters with pictures and words that conveyed either size or speed. For example, in one experiment, one Pokémon character was paired with pictures and words conveying "large" (e.g., a picture of a "hippo"), while another Pokémon character was paired with words and pictures conveying "small" (e.g., a picture of an ant). Participants then assessed the extent to which the two target Pokémon characters were large by rating them on a 7-point scale anchored by "extremely small" and "extremely large." Olson et al. (2009) found that perceptions of the size of the Pokémon characters were influenced by the pairings provided that the size dimension was made accessible beforehand through a priming manipulation.

Because the majority of participants in Olson et al. (2009) were found to be unaware of the contingencies, the authors interpreted the results of their experiment 2 as providing evidence of unconscious semantic conditioning. However, the particular awareness measure used in this research has been criticized by Pleyers et al. (2007). It consisted of general open-ended questions asking participants whether they had noticed anything in particular about the words and images presented with the two target Pokémon and what they thought the purpose of the experiment was. Pleyers et al. (2007) and others (e.g., Dawson & Reardon, 1973) suggest that, with recall-type rather than recognition-type measures, the risk of underestimating the number of people who are truly aware is significant. Because the awareness measure used by Olson et al. (2009) may not have been sensitive enough to pick up all of the participants who were aware of the pairings and of how they may have influenced their responses, more compelling demonstrations of unconscious semantic conditioning would seem to be called for. As will be elaborated shortly, our research contributes to Olson et al. (2009) by preempting the possibility of conscious semantic conditioning through the use of a subliminal paradigm and by including a measure of awareness as sensitive as possible.

In sum, the present research tests whether semantic conditioning procedures can result in the unconscious learning of brand-attribute associations. This is done by preempting the possibility of conscious perception of one of the two stimuli (e.g., the brand) through the use of a subliminal paradigm. To further minimize the possibility of awareness driving results, we depart from previous research on semantic conditioning and test for our effects using an indirect rather than a direct dependent measure (experiment 1). We also investigate the effects of (unconscious) semantic conditioning on subsequent brand evaluations (experiment 2).

## *Experiment 1*

Participants were exposed to a conditioning procedure (Pavlov, 1927) where two very rapidly (26 milliseconds (ms)) presented Chinese ideographs (pretested to be neutral) were paired with the attributes "black" and "white." That is, one ideograph was paired repeatedly with the word black and the other one repeatedly with the word white. To rule out demand, learning was assessed indirectly by having participants perform a lexical decision task.

In a lexical decision task, respondents see a string of letters and are asked to indicate, as quickly as possible, if the string forms a real word or not. The idea underlying the lexical decision task is that the perception of a specific word or set of words should activate in the individual's mind other words or concepts that are commonly associated with them (e.g., Anderson & Bower, 1973). If activation of one concept spreads to associated concepts, presenting a respondent with, for instance, "doctor" should subsequently make that respondent respond faster that "nurse" is a real word than, for instance, "circus."

To demonstrate (unconscious) semantic conditioning via a lexical decision task in our experiment, however, there was the following challenge. In a typical lexical decision task, the target words are concepts that are closely associated in memory with the primes, so closely associated that responses to them are facilitated (i.e., reaction times are shortened) by perception of the latter. Given the abstract nature of the primes ("black" and "white") in our experiment, however, it proved to be very difficult to come up with target words that would exhibit this pattern. In other words, what comes to mind automatically when one is primed with "black" or with "white?" Even though "black" would likely come to mind automatically when primed with, for instance, "soy sauce," "soy sauce" would less likely come to mind automatically when primed with "black."

Ultimately though, all we needed was target words that would elicit significantly different reaction times when preceded by one vs. the other attribute with which the ideographs were paired (i.e., black vs. white): To demonstrate semantic conditioning, it did not matter if the difference in reaction time was due to the ideograph previously paired with black (white) speeding up responses to target words possessing the attribute black (white) or if it was due, for instance, to that ideograph slowing down responses to target words possessing the "opposite" attribute, that is, white (black). The latter is, in fact, likely much easier to obtain. We generated two separate lists of potential target words. One list contained 10 concepts for which a very conspicuous attribute was their color black and the other list contained 10 concepts for which a very conspicuous attribute was their color white. We then conducted a pilot study to select the subset of words that would show the desired pattern.

### *Pilot study*

One hundred and seventeen undergraduates at a major university in Hong Kong, randomly assigned to conditions, participated for a small monetary incentive. Participants were recruited to participate in a word discrimination task. They were told that the researchers were interested in the speed with which students can distinguish real Chinese words from words that are not real Chinese words. They were instructed to respond to a series of Chinese words appearing on the screen by pressing a corresponding key, as quickly and accurately as possible. On each trial, a string of "++++" was presented first for 1000 ms.

This was followed by a 120 ms mask, which was in turn followed by either a real or a non-real (nonsensical) Chinese word that remained on the screen until the participant responded. To familiarize participants with the task, they first completed six practice trials. The 48 actual trials consisted of 30 targets and 18 fillers. Of the 30 target trials, 10 involved concepts possessing the attribute "black" (e.g., crude oil),[3] 10 involved concepts possessing the attribute "white" (e.g., rice),[4] and 10 involved non-real Chinese word(s). On each target trial, one of five different primes, in Chinese, preceded the mask. The prime was displayed for 26 ms to prevent participants from deliberatively processing it (Bargh & Chartrand, 2000). There were two target primes: (a) "black" and (b) "white"; and three control primes: the neutral Chinese ideograph representing the English letter "I," the neutral Chinese ideograph representing the English letter "G," and a string of "XXX." Filler trials involved neutral concepts (e.g., ball pen). There were no primes on filler trials. Each participant was exposed to each target word only once, preceded by only one of the five primes. For example, one participant would see "soy sauce" preceded by the prime "black," "rice" by the neutral prime "XXX," one of the non-words by the neutral prime "I," another non-word by the prime "white," and "ink" by the neutral prime "G." Another participant would see "soy sauce" preceded by the prime "white," "rice" by the prime "black," one of the non-words by the neutral prime "XXX," and so on. Thus, to obtain response times to all possible target word/prime combinations, a Latin-squares design was used to construct five between-subjects conditions whereby each prime preceded each target word in one of the five conditions. Across conditions, the trials were ordered so as to control for the mean serial position of each prime, each target word, and each prime-target word combination, to avoid a "practice effect."[5]

Before any analyses, 17 participants were excluded for committing a high number of errors (>20%) on the lexical decision task (Olson & Fazio, 2006). The mean response to each target word (after performing a log transformation) was determined under each priming condition. Visual inspection of the means revealed that, for 15 words, there was no difference in reaction times as a function of matched vs. mismatched prime (for one word, the effect even appeared to be in the opposite direction). For two words denoting white objects (rice and flour) and three words denoting black objects (crude oil, soy sauce, and ink), the mean reaction times exhibited the desired pattern (i.e., shorter latencies when preceded by a matched vs. mismatched prime). Analyses confirmed a significant effect of prime for the two white objects (rice: $F(4, 89)=2.49$, $p=.05$; flour: $F(4, 89)=2.44$, $p=.05$), as well as for two of the three black objects (crude oil: $F(4, 90)=2.36$, $p=.06$; soy sauce: $F(4, 89)=2.46$, $p=.05$; ink: $F(4, 85)=1.88$, $p=.12$). These four stimuli were thus selected as target words in the lexical decision task of experiment 1.

We also examined if the differences in reaction times to the four selected words were due to facilitation by primes of the matched color or to inhibition by primes of the mismatched color. We compared reaction times to the words when preceded by the neutral primes to reaction times to the words when preceded by the matched and mismatched primes. Rather unsurprisingly given our earlier speculation that inhibitive effects of a prime with the mismatched meaning would be easier to obtain than facilitative effects of a prime with the matched meaning, inhibition effects were significant ($t(60)=2.80$, $p=.01$), but facilitation effects were not ($t(39)=.05$, $p=.96$).

## Method

### *Participants and design*

One hundred undergraduates at a major university in Hong Kong randomly assigned to conditions participated in experiment 1 in exchange for course credit. The design was a 2 (primed color association: I–black and G–white vs. I–white and G–black) × 3 (lexical task target prime: I vs. G vs. XXX) × 2 (lexical task target word type: words denoting black objects vs. words denoting white objects) mixed factorial, with the first factor manipulated between subjects.

Participants were recruited to participate in "a series of computer studies." They were told that detailed instructions would appear on the computer screen and they were encouraged to ask the experimenter if anything was unclear.

### *Semantic conditioning task*

Participants were told that (a) they would see a series of Chinese words flashing on the screen, one by one; (b) two words, "black" and "white," would be repeated many times; and (c) their task was to press a corresponding key as quickly as possible each time one of these two words appeared. If another word appeared on the screen that was neither "black" nor "white" (e.g., "door"), they were not to press any key. These instructions served as a cover story for the semantic conditioning task to reduce hypothesis guessing. The computer provided feedback if they made any one of three types of error: (a) if the response was too slow (i.e., longer than 1500 ms); (b) too fast (i.e., shorter than 300 ms); or (c) incorrect (i.e., a key was pressed when it should not have been, or a wrong key was pressed).

The stimuli appeared in a light-blue font on a black background. Each trial began with a string of "++++" for 600 ms. A Chinese word followed, remaining on the screen until the participant responded, or for 1500 ms otherwise. On target trials, one neutral Chinese ideograph (i.e., either I or G, depending on the condition to which the participant was assigned) flashed very

[3] The 10 Chinese word(s) associated with the attribute "black" were universe, oyster sauce, western funeral, African, crude oil, ink, soy sauce, crow, sky at night, and sesame soup (which is black in color).

[4] The 10 Chinese word(s) associated with the attribute "white" were bridal dress, cotton ball, snow, flour, milk, refrigerator, cloud, rice, doctor's coat, and teeth.

[5] The five conditions kept the order of the target words constant. Thus, to be able to control for the mean serial position of each target word as well as (roughly) of each target word-prime combination, an additional set of 5 between-subjects conditions was created. This additional set of five conditions duplicated the original set in the ordering of the primes but reversed the ordering of the target words.

rapidly (26 ms) before the word "black," and the other neutral Chinese ideograph (i.e., either G or I) flashed very rapidly (26 ms) before the word "white." We expected that most participants would not be able to identify the Chinese ideographs that flashed and that, even if some did, they would not have sufficient time to deliberately process the contingencies, especially considering the fact that the task was designed to focus their attention solely on detecting the words "black" and "white" in order to quickly press the corresponding keys.

There were in total 65 trials: 20 target trials in which the assigned Chinese ideograph (either G or I) preceded "black," 20 target trials in which the other Chinese ideograph preceded "white," and 25 filler trials in which a neutral filler word was displayed not preceded by any ideograph. A 500 ms black screen separated trials. The order of trials was randomly determined for each participant.

### *Measures*

Participants completed a lexical decision task similar to that in the pilot to test for automatic connections between the Chinese ideographs and the attributes (black or white) that had been paired with them in the learning task. (The difference relative to the pilot was that there were four target words repeated three times, preceded by one of the three primes each time.) In effect, a prime and a target would be considered structurally connected in memory if the prime affects response to the target in a time that is too short (e.g., less than 250 ms) for controlled processing to have been responsible (Bargh & Chartrand, 2000). Specifically, if the "I" ideograph had been paired with black and the participant responded quickly to a word associated with black (e.g., soy sauce) or slowly to a word associated with white (e.g., rice) when preceded by the "I" ideograph prime, then "I" would be considered to be structurally associated with black in memory. Of importance, this task is presumably free from the contamination of social desirability biases that influence explicit measures (Fazio & Olson, 2003; Olson & Fazio, 2006).

After the lexical decision task, participants completed a funneled debriefing procedure (Adaval & Monroe, 2003; Bargh & Chartrand, 2000). We mentioned that the program used to record the data during the response accuracy and response time task had previously been used to present other types of stimuli (e.g., numbers, pictures) and that there had been some technical difficulties in trying to modify it to present Chinese words such that some of the previous stimuli might not have been fully erased. On this pretense, participants repeated the first 20 trials of the learning task and reported after each trial whether they saw anything *between* the time the "++++" went off the screen and the time the Chinese word appeared and, if so, what they saw.

We used this specific funneled debriefing technique to effectively push participants to watch for anything flashing on the screen between the "++++" going off and the Chinese word appearing. Participants who failed to detect the rapidly shown Chinese ideographs during the funneled debriefing task would be assumed to have learned the associations without deliberately processing the contingencies between the ideographs and the attributes they were paired with. Even if a few participants did detect an ideograph flashing during the funneled debriefing task, it would not necessarily mean that they detected it during exposure to the semantic conditioning procedure: in the funneled debriefing they were alerted to the fact that something might flash and were encouraged to watch for it. Furthermore, even if they did detect an ideograph flashing during exposure to the semantic conditioning procedure, the task was designed to not allow them the time to deliberately process the contingencies. Recall that at that point their focus was on paying attention to when the words "black" and "white" came on the screen in order to quickly press a corresponding key. As will be seen, we nevertheless take into consideration how awareness of the ideographs elicited in this funneled debriefing task affected the reaction time results.

## Results

Nine participants were excluded before any analyses: four committed a high number of errors (>20%) on either the semantic conditioning task (two participants) or the lexical decision task (two participants), and five had missing values on the dependent measure.

### *Manipulation checks*

We first analyzed responses to the funneled debriefing task. We were interested in whether a memory trace of I or G was present in participants' minds. If for a given participant the probability that a memory trace was present during the funneled debriefing task turned out to be extremely small, then that participant was likely unaware of the ideographs during the learning (i.e., semantic conditioning) phase. To estimate this probability, we used the measure below, which separates the effects of the actual memory for the items from the effects of "guessing" (Adaval & Wyer, 2004; Hilgard, 1951):

$$P(\mathrm{T}) = [P(\mathrm{hit}) - P(\mathrm{false\ alarm})] \,/\, [1 - P(\mathrm{false\ alarm})]$$

For each participant, we computed $P(\mathrm{T})$ separately for the two ideographs. We later correlated the average of these $P(\mathrm{T})$ values with a measure of semantic conditioning. A hit was defined as (correctly) reporting the ideograph that actually flashed on a given trial. The maximum number of hits for a given participant for a given ideograph was seven (i.e., the number of trials in which that ideograph actually flashed). A false alarm was defined as reporting that an ideograph flashed when in fact nothing flashed or reporting that the wrong ideograph flashed. Thus, the maximum number of false alarms for a given participant for a given ideograph was 13 (i.e., seven trials in which the other ideograph flashed and six trials in which nothing flashed).

Sixty-two of the ninety-one participants did not report seeing the ideographs I or G in any trial, and twenty-nine participants reported seeing I or G flashing in at least one trial. The mean $P(\mathrm{T})_{\mathrm{avg}}$ was .10, meaning that, on average, there was a .10

probability of a trace of an ideograph being present in memory during the funneled debriefing task.

*Brand–attribute associations*

We obtained six measures for each individual: (i) the mean reaction time to the black words when preceded by the prime I, (ii) the mean reaction time to the black words when preceded by the prime G, (iii) the mean reaction time to the black words when preceded by the neutral prime "XXX," (iv) the mean reaction time to the white words when preceded by the prime I, (v) the mean reaction time to the white words when preceded by the prime G, and (vi) the mean reaction time to the white words when preceded by the neutral prime "XXX." Because of skewing in the data, individual response times were log-transformed using natural logs (Bargh & Chartrand, 2000).

Response times were then analyzed as a function of color association condition (i.e., I paired with black and G with white, or I paired with white and G with black), target word type (i.e., black vs. white), and learning stage–test stage similarity (i.e., target word preceded by an ideograph that had previously been paired with the color that "matched" vs. "mismatched" that of the target word, or by a neutral prime). Participants responded generally more quickly to white target words ($M=512$) than to black ones ($M=542$) ($F(1, 178)=5.98$, $p=.02$). However, the effect of learning stage–test stage similarity was significant ($F(2, 178)=3.89$, $p=.02$) and did not depend on either the target word type ($F(2, 178)=.80$, $p=.45$) or color association condition ($F(2, 178)=1.51$, $p=.22$). That is, participants responded less quickly to target words when the ideograph that preceded them had been paired with the "mismatched" color during the learning phase ($M=542$) than when it had been paired with the "matched" color ($M=511$), and this difference did not depend on whether the target was black (550 vs. 534) or white (535 vs. 488) (see Fig. 1). Consistent with the results of the pilot, a comparison of these average reaction times with the mean reaction time to the target words when preceded by the neutral prime "XXX" ($M=495$) suggests that there was no "facilitation" effect of a conceptually related prime ($t(178)=.91$, $p=.36$) but, rather, a "hindrance" effect of a prime with the opposite meaning ($t(178)=2.86$, $p=.005$).

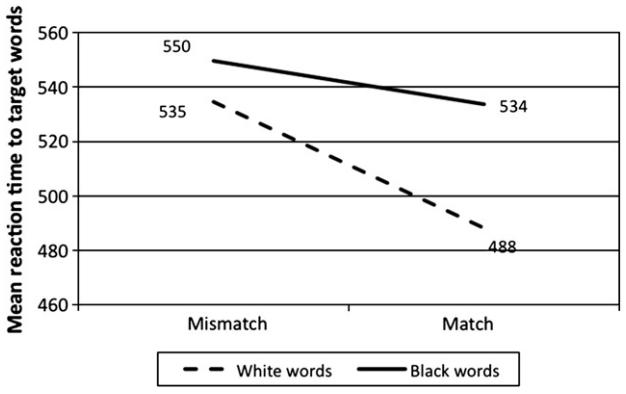


Fig. 1. Response times (in ms) to target words in lexical decision task under matched vs. mismatched conditions.

For the 29 participants with $P(T)_{avg}$ greater than zero, we also correlated $P(T)_{avg}$ with a measure of the semantic conditioning effect. We computed this measure by averaging the reaction time to target words after mismatched primes and subtracting it from the average reaction time to target words after matched primes. The correlation was statistically not different from zero ($r=.06$, $p=.75$).

## Discussion

In this experiment, we exposed participants to the ideographs too briefly to enable them to process their association with the paired attribute (black vs. white) in a deliberative fashion. We then tested whether the semantic meaning of the attribute had transferred using a lexical decision task. The results show that the reaction times to the black and white target words were longer when preceded by the ideograph that had been paired with the mismatched vs. matched color during the learning phase. Thus, through the use of a subliminal procedure, an indirect dependent measure, and a rigorous measure of awareness, we were able to provide what we regard as strong support for three assumptions. First, semantic conditioning can occur unconsciously when a stimulus (an ideograph in this experiment) is repeatedly paired with the same attribute. Second, activating the representation of a brand (ideograph) automatically activates the semantic meaning that has been associated with it. Third, and importantly, the automatically activated meaning has, in turn, an unintentional effect on subsequent responses (i.e., it slows down recognition of real words associated with the opposite meaning).

*Experiment 2*

In experiment 2, participants were asked to evaluate potential brand names for new products in the beverage category. The brand names were the Chinese ideographs I and G. The goal of the experiment was to examine whether the semantic meaning that has transferred to a brand unconsciously has downstream implications for the evaluation of that brand, and if so, if the downstream effects observed reflected a meaningful application of the learned semantic meaning.

*Pilot study*

We ran a pilot to obtain baseline evaluations of the two (ideograph) brand names. Thirty-two participants received one of two questionnaires that differed only in the product (cola drink or soymilk drink) for which they had to evaluate two brand names. It was explained in the first page of the questionnaire that companies go through various steps when choosing a brand name, brainstorming being typically the first. In the brainstorming phase, people try to be spontaneous and come up with as many new brand names as possible. They try to be as creative and unrestrained as they can in coming up with new brand names. They sit around a table and throw out names that come to their minds, no matter how crazy they may sound at first. Then, the various names go through screening and

research before one brand name is finally chosen. Participants were told that we were interested in their reactions to names that people suggested in the initial brainstorming phase. They would see two brand names that are Chinese letters. These brand names were two of many names that were suggested for a new cola (soymilk) drink that a large foreign company was planning to introduce in their country in six months. It was explained that the company's name could not be mentioned because of confidentiality issues. Finally, participants were told that, since the new cola (soymilk) drink would be especially targeted at students aged 18–25, the company was very interested in their opinions. Specifically, they wanted to know each person's personal opinions about the two potential brand names that the participants were being asked to evaluate.

On the next page of the questionnaire, participants indicated their reactions to the potential cola (soymilk) drink brand names I and G on three semantic differential items (−3 to +3), anchored by "I dislike I (G)/I like I (G)," "My reaction to I (G) is negative/My reaction to I (G) is positive," and "My reaction to I (G) is unfavorable/My reaction to I (G) is favorable." (The order of these measures of I vs. G was counterbalanced.) Responses to these items were highly correlated (Cronbach's alpha = .90) and were summed to provide a single index of the attitude toward each ideograph brand name.

Brand name evaluations were subjected to a mixed ANOVA with product (cola vs. soymilk) and brand name (I vs. G) as independent variables. There was a significant product effect ($F(1, 29) = 6.79$, $p = .01$), such that both I and G were liked better for a soymilk drink ($M = 1.24$) than for a cola drink ($M = -.77$). While G tended to be liked more than I for a brand name, the brand name effect was not significant (cola: $M_I = -2.06$, $M_G = .53$; soymilk: $M_I = .67$, $M_G = 1.8$; $F(1, 29) = .45$, $p = .51$). The interaction effect was also not significant ($F(1, 29) = 1.16$, $p = .29$).

## Method

### *Participants and design*

One hundred Chinese undergraduates were randomly assigned to conditions of a 2 (color association: I paired with black and G with white vs. I paired with white and G with black) × 2 (product: cola vs. soymilk drinks) × 2 (brand name: I vs. G) mixed factorial, with the brand name factor within subjects.

### *Materials and procedure*

Participants were told that they would participate in two separate studies. The first study, consisting of two parts, was "a computer study for a professor of psychology." The second study was "a short paper and pencil survey for the marketing department." Participants were told that, although the two studies were separate, they would complete the market survey in between the two computer tasks in order to give their eyes a rest.

The first part of the first (computer) study was in fact the identical semantic conditioning task used in experiment 1, with participants randomly assigned to either one of two color association conditions: I paired with black and G with white or I paired with white and G with black.

When participants finished the semantic conditioning task, they received a two-page questionnaire that was ostensibly the marketing department survey. This was in reality the main dependent measure, brand name evaluation. Participants then completed the second part of the "psychology study," in reality the same funneled debriefing procedure used in experiment 1. Finally, they completed a short "post-study" questionnaire aimed at assessing if any participant had become aware of the experimental hypothesis.

### *Measures*

Participants received the exact same questionnaire as in the pilot, with the cover story on the first page and the measures on the second page. As in the pilot, responses to the three brand evaluation items (dislike/like, negative/positive, unfavorable/favorable) were highly correlated (Cronbach's alpha = .95) and were summed to provide a single index of the attitude toward each name. Finally, participants completed the same funneled debriefing task as in experiment 1. The final questionnaire they completed, which assessed awareness of the experimental hypothesis, contained two questions: (1) "When you were answering the survey about the new cola (soymilk) drink brand names, did you think that it was related in any way to the computer task you had done before?" and (2) "If 'Yes,' in what way did you think they were related? Please explain."

## Results

Two participants were excluded before any analyses because they had a high number of errors (>20%) on the learning task.

### *Manipulation checks*

Responses to the "post-study questions" were analyzed first to identify any participants who might have been aware of the experimental hypothesis. Participants who were aware of the hypothesis *and* who could identify either I or G during the funneled debriefing task could have potentially responded to the brand name evaluation survey according to demand (see Allen & Janiszewski, 1989).

Two independent judges examined the responses and classified participants as either hypothesis-aware or -unaware. None of the participants specifically mentioned the fact that the association between the ideograph and the color during the first (semantic conditioning) task was expected to influence their evaluation of the brand names for the product. Nevertheless to be conservative, participants were classified as being hypothesis-aware if they met two criteria as follows: 1) if participants answered that the computer task influenced their responses to the survey about the (Chinese ideograph) brand names and 2) if, in explaining how, they said that they had seen at least one of the two Chinese ideographs during the semantic conditioning phase. Two participants were classified as hypothesis-aware and were dropped from the analyses.

We analyzed responses to the funneled debriefing task in the same way that we did in experiment 1, using the same formula to determine likelihood of awareness of the ideographs during the semantic conditioning stage. Sixty-three of the ninety-six participants did not report seeing I or G in any trial, and thirty-three participants reported seeing I or G flashing in at least one trial. The mean $P(T)_{avg}$ was .11, meaning that, on average, there was a .11 likelihood of a trace of the ideographs being present in their memory during the funneled debriefing task.

*Reactions to the brand names*

We expected the evaluation of the ideograph G as a brand name for cola to be more favorable than the evaluation of the ideograph I when G had been paired with black (I with white) than when G had been paired with white (I with black). Correspondingly, we expected that the evaluation of I as a brand name for a soymilk drink would be more favorable than the evaluation of G when I had been paired with white than when it had been paired with black.

Participants' reactions to the brand names were analyzed as a function of color association condition (i.e., I–black, G–white vs. I–white, G–black), product (cola drink or soymilk drink) and matching conditions (whether the ideograph had previously been paired with the color that matched or did not match the color of the product). As in the pilot, participants generally liked G more than I ($F(1, 92)=11.90$, $p=.001$) and liked both I and G more as brand names for soymilk drinks than for cola drinks ($F(1, 92)=4.77$, $p=.03$). However, the effect of matching conditions was also significant ($F(1, 92)=8.27$, $p=.005$) and was independent of both product ($F(1, 92)=.76$, $p=.39$) and color association conditions ($F(1, 92)=3.06$, $p=.08$). That is, participants had less favorable reactions ($M=-1.34$) when the color with which a particular (ideograph) brand name had been paired in the learning phase mismatched the color of the product than when it matched it ($M=.29$), and this difference did not significantly depend on whether the product was cola (−1.65 vs. −.51) or soymilk (−1.03 vs. 1.09) (see Fig. 2). Interestingly, the average evaluations of I and G in the matched condition for both soymilk and cola were similar to those obtained in the pilot. It was in the mismatched conditions where the evaluations deviated from (i.e., were lower than) those in the pilot.

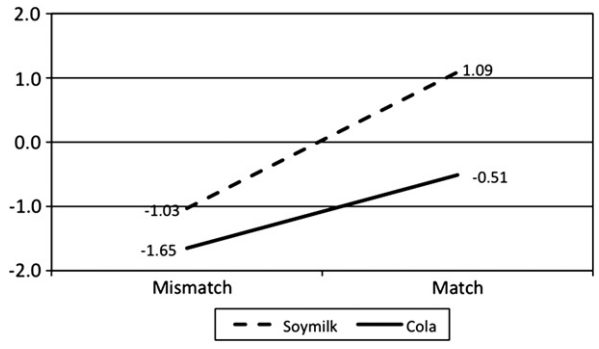


Fig. 2. Evaluation of brand names under matched vs. mismatched conditions.

As in experiment 1, for those participants with $P(T)_{avg}$ greater than zero we also correlated $P(T)_{avg}$ with a measure of the semantic conditioning effect. We computed this measure by subtracting participants' evaluation of the brand name that had been previously paired with the mismatched color from the evaluation of the brand name that had been previously paired with the matched color. The correlation was statistically not different from zero ($r=-.2$, $p=.28$).

## Discussion

The results showed that participants' evaluations of the brand names depended on both what attribute the brand had been paired with (i.e., black vs. white) and the product category in which the brand names were being assessed (i.e., cola vs. soymilk). These results provide convergent evidence that semantic conditioning can occur unconsciously. They also show that the semantic meaning that has transferred to the brand unconsciously can influence downstream overall (brand) attitudes. This new finding contributes to prior research by Kim et al. (1996) who had found that downstream attitudes were affected only if participants were aware of the pairing of the brand with the attribute, leading them to conclude that the mechanisms underlying semantic conditioning in their research were cognitive.

When completing the dependent measure in this experiment, participants were first told that they would be evaluating two brand names of cola (soymilk) drinks. This should have activated corresponding schemas. Activating a schema (e.g., the "cola" schema) sets off a top-down process whereby the schema is supposed to facilitate consistent object identification (e.g., a 'black' cola brand) and hinder inconsistent object identification (a 'white' cola brand). Thus, a conceptually fluent brand name should come to mind more easily than a conceptually disfluent brand name, and the former should therefore be evaluated more favorably than the latter, which was what we found.

In fact, the action seemed to be in the disfluent experimental condition. The associations led to less favorable attitudinal responses when they were incongruent with existing associations in memory (i.e., in the mismatched conditions), whereas the evaluations of brand names in the matched conditions—that is, the conditions where congruent associations were learned (i.e., I/G associated with white (black) for a soymilk (cola))—were similar to those obtained in the pilot test. These results can be seen as consistent with the literature on schemas, which suggests that "schema congruity" is what people naturally expect—it is the default. It is incongruity that triggers a reaction (Medin, Ross, & Markman, 2001).

Our finding of a main effect of product category on brand name evaluations, namely that the two Chinese names were close to the neutral point for soymilk but negative for cola, is also consistent with the above interpretation in the sense that activating the cola/soymilk schema probably also activated expectations that for cola the brand name would be "western," whereas for soymilk it could be either western or Chinese. Hence, seeing two Chinese names suggested for cola drinks clashed with expectations, leading to negative evaluations.

## General discussion

The results from both of our experiments provided insight regarding the psychological processes underlying the transfer of semantic meaning from an attribute to a (ideograph) brand that is paired with it. Together, they provided compelling evidence that elaboration is not necessary for semantic conditioning to occur. In our experiments, each of two Chinese ideographs was subliminally paired with an attribute carrying specific semantic meaning. In experiment 1, the ideographs subsequently served as primes during a lexical decision task. The results showed that they influenced the speed with which words semantically related to the previously associated attributes were recognized. In experiment 2, the ideographs subsequently served as brand names of two potential products from the beverage category. The results showed that attitudinal responses to those (ideograph) brand names varied with the appropriateness of their associated attribute for the specific beverage in question.

Our research thus provided evidence that a semantic association that was learned unconsciously can have significant and meaningful consequences for brand evaluation, even when it remains out of consciousness during brand evaluation. It is striking that the brain can make an unconscious yet meaningful application of an association that was unconsciously learned. One would think that at least some reasoning should be necessary when considering the evaluative implications of the meaning of the attribute that becomes associated with the brand. For instance, one would intuitively assume that, at the very least, consciousness of a learned association—for example, the association in this research between a particular Chinese ideograph and the color black—is required to determine that that ideograph would be an appropriate brand name for a cola drink but an inappropriate one for a soymilk drink. Our results suggest, however, that the brain does this automatically. Even though most of our participants were not even aware of the ideographs, they still *unconsciously* applied the meaning associated with each of them "correctly."

Recent research in the area of evaluative conditioning distinguished between two ways of obtaining attitude change via evaluative conditioning (Sweldens et al., 2010). One way involves repeatedly pairing a brand with the same affective stimulus. The other way involves pairing a brand simultaneously with different (i.e., not the same) affective stimuli of the same valence. In the former case, attitudes toward the brand change because a memory link is established between the brand and that particular affective stimulus. In the latter case, attitudes toward the brand change because the affect elicited by the various stimuli gets attached to the brand directly (i.e., no memory link is established between the brand and any particular affective stimulus). The two types were hence respectively termed "indirect evaluative conditioning" and "direct evaluative conditioning" (Sweldens et al., 2010).

The present research tested for the possibility of unconscious semantic conditioning by presenting one of the paired stimuli subliminally. We reasoned that, with subliminal stimuli, semantic conditioning would be most likely to emerge using an indirect rather than a direct procedure. Unless one could be certain that the different words or pictures used as stimuli in a direct conditioning procedure conveyed exactly the same meaning, it would be safer to repeatedly pair the brand with the same stimulus rather than with different ones as this would reduce the possibility for confusion. Our procedures turned out to be effective in establishing a memory link between the Chinese ideographs and the paired attributes. Our results thus add to the work by Sweldens et al. (2010) by demonstrating (unconscious) indirect conditioning in a different domain, namely the semantic rather than the affective domain. It remains for future research to investigate the extent to which semantic conditioning would occur unconsciously with direct conditioning procedures.

In evaluative conditioning, direct procedures have the advantage of producing more resilient attitudes. As Sweldens et al. (2010) show, brand attitudes created through direct procedures are, for example, less vulnerable to changes in the valence of the stimuli that were paired with the brand than brand attitudes created through indirect procedures. This is because with a direct procedure the affect gets attached to the brand directly, whereas with an indirect procedure, a memory link is created between the brand and the one stimulus (e.g., a celebrity endorser) paired with it—if the valence of the stimulus changes (e.g., the endorser falls from grace), the attitude toward the brand changes as well (see Sweldens et al., 2010 for a detailed discussion).

In semantic conditioning, one would not necessarily expect this advantage to hold because the result of both direct and indirect semantic conditioning procedures would likely be the same. Imagine one wanted to associate the meaning "fast" with "brand X." If one wanted to use a direct procedure, one would have to find several stimuli that convey that exact meaning and no other one. The result of pairing "brand X" with the various stimuli conveying "fast" would be a "brand X–fast" association. Using an indirect procedure (i.e., pairing the brand repeatedly with the same stimulus, e.g., the word "fast") would result in exactly the same outcome: a "brand X–fast" association. In the case of semantic conditioning, the difficulty with direct procedures would lie in finding the several stimuli that convey exactly the intended meaning and no other one in the first place. This may at least in part account for why Olson et al.'s (2009) direct semantic conditioning procedure only produced an effect when the dimension of the to-be-learned attributes (size, speed) was primed beforehand: several of the stimuli used likely elicited various meanings in addition to the intended one (e.g., a picture of a "hippo" may bring to mind "Africa" just as easily as it may bring to mind "large").

Our results also add to prior research investigating unconscious conceptual fluency effects of incidental ad exposure. Shapiro (1999) found that incidental exposure to contextual elements in an ad that were semantically related to the product advertised unconsciously facilitated the activation of the product concept in memory and led to an increased likelihood of inclusion of that product in a consideration set. These results demonstrated positive effects of conceptual fluency. When the contextual information was semantically unrelated, however, there were no effects and thus no evidence

of negative effects of conceptual disfluency. That said, Shapiro's (1999) studies were not really designed to test for the possibility of negative effects of conceptual disfluency; for instance, the dependent measure did not contain an option for the product to be 'excluded' from the consideration set. Had the dependent measure contained such an option, negative effects of conceptual disfluency might have arisen. Hence, we add to Shapiro's (1999) research by demonstrating negative effects of conceptual disfluency.

Our findings for the mismatched and matched conditions contribute to consumer research investigating the effects of schema congruence/incongruence on brand/product evaluations (e.g., Meyers-Levy, Louie, & Curren, 1994; Meyers-Levy & Tybout, 1989). In the incongruence experimental conditions in previous research, the incongruity between an attribute that a product possessed and a schema in memory for that product category was explicit, and participants had the opportunity to resolve it (e.g., Meyers-Levy & Tybout, 1989). In our research, the attributes (black/white) were paired with a brand that was displayed subliminally, and therefore, the participant was not aware of the congruity/incongruity between the attribute and the product category. Without awareness of incongruence (i.e., black for soymilk and white for cola) it would not be possible for the individual to attempt to resolve it.

While advertising regulations prohibit the use of subliminal advertising, there are so many commercials in today's world of advertising where images and words are very fleetingly presented, sometimes so fleetingly, that they are hardly, if at all, consciously noticed. It is to those types of marketing communications that our research might be considered most applicable in a managerial sense particularly since, as is well known, viewers invest few cognitive resources in processing most marketing communications. That said, the main purpose for our use of a subliminal paradigm was theory testing rather than practical application. It was the procedure that enabled us to document unconscious semantic conditioning effects in the purest manner we could conceive of.

Regarding protecting the consumer, it is possible that consumers would think twice and be less susceptible to influence if they were alerted to the facts that: 1) brands often flash together with specific attributes in commercials, usually more than once and 2) seeing such a commercial numerous times, which is typically what happens with advertising campaigns, amounts to heavy and repeated exposure to their pairing. Whether or not alerting consumers would enable resistance to influence, however, is an open question. Priming research suggests that awareness of a prime reduces its effects on judgments (Bargh & Chartrand, 2000). But this may not extend to the case of semantic conditioning where new associations have been formed. In addition, Wegner's (1994) ironic process theory suggests that efforts to resist may actually *increase* rather than decrease the effect. In the present research context, what would happen if participants were told, for example, that they acquired the I ideograph–black association because the I ideograph flashed before the word "black?" Would they then be able to prevent the association from influencing their judgments?

We would like to note one particular limitation of our research. We had a limited set of dependent measures in this research, given our focus on the examination of underlying processes. Brand name is amorphous and highly malleable and thus perhaps a more easily influenced dependent variable than less ambiguous, more specific variables. Future research might examine if our effects extend to product evaluations, intentions, and behavior, and if so, under what circumstances they would do so.

One final topic of theoretical interest would be to investigate if semantic conditioning is more superficial when acquired in an unconscious fashion. If people process an association in a conscious and deliberative fashion, the learning might be deeper — it might be the case that focusing attention on the association enables more connections in the memory network. For example, learning that a product is "white" in a deliberative fashion perhaps results in an enhanced likelihood of believing the product is pure and more environmentally friendly. Or perhaps it does not. It remains for future research to explore just how far the influence of unconscious semantic conditioning extends.

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