

Subliminal Motivation: A Story Revisited

JOEL COOPER¹ AND GRANT COOPER

Princeton University

Can people have their motivational states affected subliminally? Two experiments are presented that address this controversial question. In the first, participants watched an episode of *The Simpsons* television program. Embedded in the program were verbal and pictorial stimuli related to thirst that were presented below conscious awareness. The results show that, compared to their pre-exposure ratings and compared to a control group, participants became thirstier following exposure. A second experiment replicated this finding and showed that the effect was not a result of straightforward linguistic priming. The implications of the results for subliminal advertising and for theoretical issues of preconscious processing are discussed.

Can people experience motivational states by information that is presented subliminally? This has been an enduring and controversial issue in psychology since advertising executive James Vicary reported that placing the subliminal messages "Eat popcorn" and "Drink Coke" in a motion picture increased popcorn sales by 58% and Coke sales by 18% (Pratkanis, 1992). There have been no reliable reports of subliminal stimuli affecting people's thirst, hunger, or purchasing behavior since Vicary's announcement. According to Pratkanis (1992), Vicary recanted his report in a 1962 interview with *Advertising Age* magazine. Nonetheless, the notion that people can be influenced to believe, feel, and behave in various ways as a function of messages that are beyond awareness continues to persevere.

An industry of major proportions has grown to sell a variety of self-help audio-tapes with claims that they can raise self-esteem or even teach the content of academic lectures . . . all done without the awareness of the listener. In scientific testing of such tapes in the areas of self-esteem (Greenwald, Spangenberg, Pratkanis, & Eskenazi, 1991), memory improvement (Audey, Mellett, & Williams, 1991), anxiety reduction (Audey et al., 1991), and weight loss (Merikle & Skanes, 1992), no evidence exists for the effectiveness of the subliminal tapes. Nonetheless, the industry persists.

Greenwald (1992) offered an impressive summary of research in unconscious cognition. He found little evidence for people's ability to process complex

¹Correspondence concerning this article should be addressed to Joel Cooper, Department of Psychology, Princeton University, Princeton, NJ 08544.

messages outside of awareness. However, he concluded that the research on subliminal activation and unattended stimuli provides reliable evidence for low-level, attentionless unconscious cognition. In a prototypical example of a subliminal activation experiment, Cheesman and Merikle (1984) presented subjects with a very brief exposure to a color name in a tachistoscope prior to viewing colored rectangles. The subliminal primes, presented at 4 ms, were successful at improving subjects' recognition of the colored rectangles.

Several studies have looked at whether the subliminal presentation of words can activate memory processes that affect the perception of objects or other people (Bargh & Pietromonaco, 1982; Chen & Bargh, 1997; Erdley & D'Agostino, 1988). In the study by Erdley and D'Agostino, for example, the investigators examined whether subliminal messages could change the perception of an ambiguous description of a person. Subjects were given the subliminal messages during a supposedly unrelated vigilance task. They later stated that they were unaware of ever having noticed any flashes or other messages pertaining to the second task in the vigilance sequence. However, subjects had indeed been presented with flashes in the vigilance task that displayed a positive trait (honest), a negative trait (mean), or neither trait (control). After subsequently reading an ambiguous description of a female target person, subjects were asked to rate the target on several trait dimensions. Relative to the control group, subjects subliminally exposed to the honest-related words rated the target as more honest, while those presented with the negative words judged her as more mean.

Neuberg (1988) extended the use of subliminal trait descriptions to behavioral acts. He found that people who were primed subliminally with words that represented the trait of competitiveness behaved more competitively in a prisoner's dilemma game than did participants who had been primed with neutral words. Although this effect occurred only for participants who were dispositionally high in competitiveness, the study nonetheless showed a link between subliminal exposure and behavior. Bargh, Chen, and Burrows (1996) showed that subliminal exposure to a stereotype caused people to behave in line with the representation of that stereotype. In one of Bargh et al.'s (1996) experiments, for example, participants who were subliminally primed with words that are generally included in people's stereotypical representation of an elderly person walked more slowly following the exposure than did people who were primed with neutral words.

Subliminal presentation of stimuli has also been shown to influence the *mere-exposure effect* (Zajonc, 1968, 1980); that is, the finding that people are more attracted to stimuli simply as a result of repeated exposure to those stimuli. Kunst-Wilson and Zajonc (1980) showed that subliminal activation could cause subjects to show mere-exposure effects even when exposure to the stimulus was presented below awareness. They had subjects view 10 irregular polygons at very brief, unmasked exposures of 1 ms. They then paired each polygon that had been shown subliminally with a polygon that had not been shown. This pairing was

shown supraliminally for 1 s. Subjects were asked two important questions. The first was to indicate which polygon they had seen previously. The respondents were not better than chance at picking the polygon that had been shown subliminally. The second question was which of the two polygons they preferred. On this question, subjects picked the polygon that had been presented subliminally 60% of the time. The effect of exposure on preference was replicated even though subjects were not able to identify the shape to which they had been exposed.

Consistent with the subliminal mere-exposure effect, but in a socially richer environment, Bornstein, Leone, and Galley (1987) asked subjects to discuss a poem with two "other subjects." Actually, the other subjects were confederates of the experimenter. In the first part of the experiment, subjects were exposed to a 4 ms exposure of one of the confederates in a tachistoscope. After the poetry discussion, the subjects filled out a rating scale. The results showed that subjects rated the confederate who was depicted in the subliminal photograph as a better contributor to the discussion, more likable, and more correct in what he said than the confederate not depicted subliminally. In a meta-analysis of work in subliminal mere-exposure effect, Bornstein (1989, 1992) concluded that mere exposure is a more powerful phenomenon when people are exposed subliminally rather than supraliminally.

Thresholds of Subliminality

Despite the voluminous body of literature that supports some role for nonconscious activation (e.g., Bornstein & Pittman, 1992), the effect continues to arouse controversy (Ainsworth, 1989; Pratkanis, 1992; Theus, 1994). A major issue is obtaining clarity on what defines the perception of a message or stimulus as subliminal. Cheesman and Merikle (1984) suggested that there are two possible interpretations of subliminal perception. One is based on a stimulus remaining below what they call a *subjective threshold*. This is the level of discriminative responding at which observers claim not to be able to detect or recognize perceptual information at a better than chance level of performance. An alternative, and much more rigorous, criterion is the *objective threshold*. This threshold is the level of discriminative responding corresponding to chance level performance.

The distinction between the objective threshold and the subjective threshold can be seen in the following example. Suppose a research participant is shown a letter on a tachistoscope that is presented very quickly, at low illumination, or possibly masked by another easily perceived stimulus. The participant can be asked if he or she noticed the stimulus. If the stimulus was not noticed, then it falls below the participant's subjective threshold. Note that an experimenter still needs to be concerned with the honesty of such responses (cf. Bernstein, Bisonnette, Vyas, & Barclay, 1989). Participants can be offered inducements to report accurately the stimuli they have seen in order to overcome their reluctance to admit

seeing the quickly presented, masked stimulus. Alternatively, the experimenter can use a forced-choice procedure to see if the stimulus was perceived. The participants can be shown the tachistoscopically presented letter along with several other letters and asked to indicate which one they had seen. If the participants do not perform better than chance in picking the correct letter, then that stimulus is said to fall below a participant's objective threshold.

Cheesman and Merikle (1986) proposed that the subjective threshold better captures the phenomenological distinction between conscious and unconscious perceptual experiences than does the objective threshold. In their view, subliminal stimulus or message would simply be one that subjects report they did not see.

Greenwald's (1992) review of the literature on unconscious cognition also concludes that the subjective threshold be considered the demarcation line between conscious and unconscious cognition. Unquestionably, stimuli below the objective threshold would be considered subliminal, but Greenwald and others (e.g., Lewicki, Hill, & Czymowska, 1992) do not believe that stimuli at that level of subliminality have ever produced reliable effects on cognition. Thus, we will consider a stimulus to be subliminal to the extent that it meets the criterion of being below an individual's subjective threshold of awareness.

Subliminal Perception and Motivation: A Return to the Beginning

The present study returns to the question of motivation. Can stimuli that are presented beyond awareness affect people's reported motivational states? If a stimulus can be presented to a person at least below their subjective threshold, can it affect people's feeling of a motivational state (e.g., thirst)? Rather than use tachistoscopic or computer presentations of stimuli, we sought a situation more congruent with the admittedly apocryphal situation originally brought to our attention by Vicary. In the current study, we showed participants a videotaped television program that contained subliminal stimuli relevant to the concept of thirst. Would participants report having a greater amount of this motivational state than participants who were not exposed?

Experiment 1

Method

Participants. The first experiment consisted of two replications that used precisely the same procedure. Participants in the first instantiation were 40 high school students (20 male, 20 female). Mean age was 15 years, 5 months. The students were paid \$3 each for their participation. The replication of the experiment was conducted with 20 male and 20 female volunteers from Princeton

University. Their mean age was 20 years, 2 months. They were paid \$5 each for their participation. Participants in both studies volunteered for an experiment in memory for visual stimuli.

Procedure. When participants arrived for the experimental session, they were told that they were going to watch an episode of the popular television series, *The Simpsons*. They were told that our interest was in the way motivational states affect people's memory. Thus, we were going to ask them a series of simple questions about how they were feeling and would then have them view *The Simpsons*. We indicated that, following the episode, we would ask them a series of questions about what they could recall.

The motivational states questionnaire was administered prior to the episode in order to give us the opportunity to obtain change scores for the participants. The questionnaire consisted of five 31-point scales asking participants to rate how tired they feel "right now," with identical questions asking how happy, comfortable, thirsty, and hungry they feel. Scale endpoints were labeled *extremely* and *not at all*. An open-ended question asked participants to indicate how many hours of sleep they had had the previous night and, finally, to describe their day thus far on a 6-point scale ranging from 1 (*excellent*) to 6 (*very poor*). Questions were always asked in the same order.

Participants watched a full episode of *The Simpsons* (running time 18 min). In the subliminal condition, 24 single frames were interspersed into the program. Of these frames, 12 were pictures of Coca Cola® cans, and 12 were pictures of the word "thirsty." Each frame was displayed for 33 ms. The cola can and the word "thirsty" were alternated, beginning with the word "thirsty," which occurred 59 s into the episode. From there, the words were relatively evenly spaced with the constraint that the stimuli appear at scene changes. Exploratory work showed us that the changing of scenes within the episode made the stimuli less likely to be noticed.

The control condition watched the same episode with single frames of 33 ms duration occurring at precisely the same points as in the subliminal condition. In the control condition, the frames were blank (i.e., merely white space).

At the conclusion of the study, participants were given a second motivational state questionnaire that asked them the five questions about their fatigue, happiness, comfort, thirst, and hunger. Each time, they were asked to record their state "right now" on 31-point scales. In keeping with the cover story, they were then given a memory questionnaire that asked them to recall various occurrences in the program. For example, "What was Marge [a *Simpsons* character] cooking in the first scene of the show?" Participants responded to eight recall questions.

In order to assess the lack of awareness of the subliminal stimuli, a series of assessments was used. Immediately following the memory questionnaire, each participant was asked to identify any unusual stimuli or pictures they might have noticed in the movie. Then, in order to reduce any reluctance for the

participants to mention seeing a stimulus that they might have thought they were not supposed to see, we told the participants that, in truth, there had been stimuli placed subliminally into the television show. Following this suggestion, we asked them to tell us what stimuli they might have noticed. No participant in either condition reported seeing anything out of the ordinary in the Simpsons episode.

Because of the debate surrounding participants' willingness to report seeing stimuli that they might have perceived only partially, a separate group of 10 participants drawn from the same population was tested. They watched the subliminal version of the videotape and were told that there would be numerous frames of Coca Cola® cans, the word "thirsty," and some blank flashes of light interspersed in the episode (the latter was false, but provided participants an opportunity to say they saw something, even if they could not identify the can or the word). As they watched the film, each participant was asked to press a button to indicate when they saw a stimulus.

A second group of 20 participants watched a shortened version of the episode (the first 9 min, containing 12 interspersed frames). Half of this group saw the subliminal version; the other half saw the control version. Prior to watching, each participant was given a series of seven index cards. They were told that the video would be stopped nine times and that, during each segment, a frame had been cut into the film that they may or may not recognize. They were told that the frame was identical to one of the pictures on their cards. The cards contained a picture of the cola can, the word "thirsty," a picture of a sandwich, the word "hungry," a picture of a person sleeping, and the word "tired." Consistent with Hardaway's (1990) recommendations, these participants were told that they would be paid one additional dollar for each correct identification. Participants in the main study and each of the stimulus assessment studies were fully debriefed and paid, and all of their questions were answered.

Results

Stimulus recognition. As indicated previously, no participant in either the high school study or the university replication was able to recall having seen a stimulus embedded in the television program, even when given the suggestion that such stimuli had been used. It was not possible to ask these participants to indicate, on line, whether they were observing subliminal stimuli because such questions would have been reactive on the dependent measure.

The first external assessment group had been asked to indicate the precise moment that they saw a stimulus in the videotape, including any flashes of light. The mean number of button presses for this group was 6.3. (There were 24 subliminal frames.) Of the total of 63 button presses, only 2 were within 5 s of an actual subliminal frame.

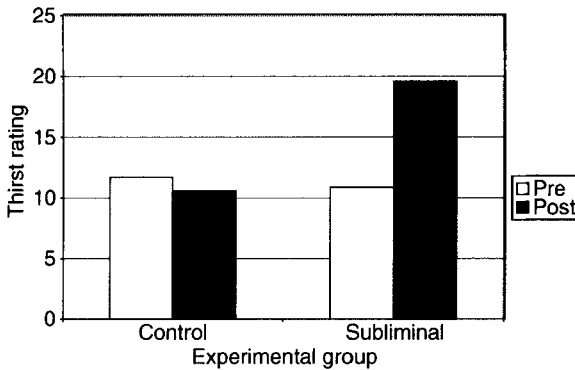


Figure 1. Ratings of thirst before and after watching subliminal messages: Experiment 1.

The second external assessment group had been presented the forced-choice task. Six segments were shown in which a picture of a cola can was presented subliminally, and six segments were shown in which the word "thirsty" was presented. Overall, the participants chose the cola can 16.2% of the time, the word "thirsty" 16.8%, the sandwich 17.5%, the word "hungry" 15.6%, the sleeping person 16.4%, and the word "tired" 17.5%. These percentages are not significantly different by chi-square test. In addition, participants were not more likely to choose the word "cola" when the can, rather than the word "thirsty," was present, nor were they more likely to respond with the thirsty card when the word rather than the picture of the can was present. Apparently, the stimuli were at a level beneath both the subjective threshold and the objective threshold.

Assessing thirst. The major dependent variable in the study was the change in participants' ratings of their thirst after watching the subliminal videotape compared to their thirst rating prior to exposure. An analysis of the data showed that the data were not different as a function of gender in each of the two replications. There were also no differences between the first instantiation, which was run with high school student volunteers, and the replication experiment, which was run with university students. Consequently, the data from all 80 participants are presented in Figure 1.

The results show that, on the 31-point scale, the group exposed to the subliminal stimuli rated themselves 8.6 points more thirsty than they had on the pre-test. Participants in the control condition rated themselves as trivially less thirsty (-1.1). The difference between the two groups was highly significant, $t(79) = 2.82, p < .005$. The change in the subliminal condition also differed significantly from zero, $t(39) = 2.44, p < .01$. We also examined the final thirst ratings, without taking pre-scores into account. The final thirst ratings for the subliminal group differed significantly from those of the control group, $t(79) = 2.21, p < .05$.

Participants' answers to the recall questions were uniformly good ($M = 84\%$ correct) and did not differ between conditions. There was no correlation between recall and any of the motivational states. The subliminal group and the control group did not differ on any of the other motivational ratings, nor were there significant changes for either group between the pre-test and post-test. Comparing changes from pre-test to post-test, the subliminal group became trivially less hungry (-1.0), while the control group became more hungry ($+2.0$), and the subliminal and the control group were each more tired ($M = 1.5$ vs. 2.0) and less happy ($M = -0.5$ vs. -1.0). The subliminal group did not change its comfort rating, while the control group became trivially less comfortable ($M = -0.3$). None of the differences approached statistical significance.

Discussion

The results of the first experiment demonstrate that participants significantly altered their ratings of their relevant motivational state after exposure to subliminal stimuli. The thirst-related cues using the word "thirsty" and a picture of a Coca Cola® can caused experimental participants to rate themselves as thirstier than they had prior to exposure. This was equally true of men and women and across two replications of the same procedure. Changes in ratings of participants' motivational state were selective. It did not occur across all of the ratings, but rather was specific to thirst. No changes occurred for other states, including the state of hunger.

It is interesting to note that the stimuli used in our film were not just subjectively subliminal, but also objectively subliminal (Cheesman & Merikle, 1984; Greenwald, 1992). Using the forced-choice procedure, participants drawn from the same population were not able to choose the stimuli at greater than chance levels.

One issue that our data cannot answer is whether participants became thirstier as a result of seeing thirst-related stimuli or whether the use of the word "thirsty" served as a semantic prime. It is possible that when participants were exposed to the subliminal word "thirsty," that word became more accessible as a descriptor than words like "hungry" or "tired" (e.g., Higgins, Rholes, & Jones, 1977). Such a result nonetheless would be interesting because it would still link a stimulus that was not perceived at the level of consciousness to a self-rating. However, it is perhaps a more robust finding if the same word that appeared subliminally was not also used in the dependent measure. For example, if the cola can had been used in the episode of *The Simpsons* without the word "thirsty," then we can make a stronger case that the subliminal stimuli affected participants' motivational state and not merely their readiness to use a word with which they had been primed. The second experiment uses a slightly altered procedure to avoid the use of verbal priming and to extend the findings of the first experiment.

Experiment 2

Method

Participants. Participants were 45 students (24 female, 21 male) at a private high school in central New Jersey. The students participated as volunteers and were not paid. As in Experiment 1, they were told that the study involved memory for visual stimuli.

Stimulus tapes. A different 18-min episode of *The Simpsons* was used in this experiment. In the subliminal thirst condition, a new frame was created to replace the word "thirsty." It was intended to show a person who was thirsty, rather than use the actual word. From the cover of *Sports Illustrated*, we used a photograph depicting a hot, perspiring Sugar Ray Leonard after his victorious boxing match with Roberto Duran. The stimulus tape, in this condition, showed Sugar Ray Leonard and the Coca Cola® can. The verbal prime "thirsty" was eliminated.

Procedure. Participants were randomly assigned to one of three film conditions. The procedure followed that of Experiment 1. Participants were told that they would be watching a television program and that we were interested in the way motivational states affect people's memory for events. We administered the motivational states questionnaire, this time on 9-point scales. As in Experiment 1, participants were asked to rate their thirst, hunger, tiredness, happiness, and comfort. In Experiment 2, the order of presentation of the different motivational states was randomized across participants.

Participants then watched the 18-min *The Simpsons* episode. Following the tape, they were given the second motivational state questionnaire. Finally, participants received a 15-item recall measure that assessed their memory for details of the episode.

As part of the debriefing, participants were asked to identify any unusual stimuli or pictures they might have noticed in the movie. No volunteer reported seeing anything out of the ordinary. As in Experiment 1, participants were then told that stimuli had been placed into the television show in a manner that was intentionally difficult for them to see. Armed with this knowledge, participants were again asked them to tell us if there were any stimuli they had noticed that were not part of *The Simpsons* program. No participant in any of the conditions reported seeing anything out of the ordinary in *The Simpsons* episode.

In order to assess the objective threshold of subliminality, a procedure similar to the forced-choice task of Experiment 1 was used. A different group of 20 participants viewed *The Simpsons* program. Half watched the control tape and half watched the experimental tape. They were presented with a series of seven cards containing the picture of Sugar Ray Leonard, a sandy desert, the word "thirsty," the word "hungry," the word "tired," the picture of the Coca Cola® can, and a picture of a sandwich. The videotape was stopped nine times, with each segmented

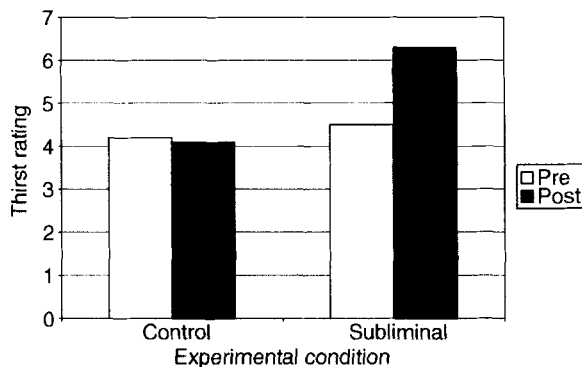


Figure 2. Ratings of thirst before and after watching subliminal messages: Experiment 2.

section containing either the Sugar Ray Leonard picture or a blank screen. Participants were told that, within each section, there had been a stimulus that corresponded to one of the seven cards. They were asked to indicate which picture had appeared in the particular section.

Results

Manipulation check. In response to the question asked of each participant in the main experiment, no one indicated that they had seen anything out of the ordinary. When told that, indeed, there had been stimuli placed in the film, still no one indicated any awareness of a picture that was not part of *The Simpsons* episode.

The forced-choice data for the extra group of participants was similar to the finding in Experiment 1. The data revealed no systematic differences in participants' use of the cards as a function of the stimulus presented. That is, participants chose Sugar Ray Leonard's picture 15.7% of the time, the desert picture 12.2%, the cola can 14.0%, the word "thirsty" 15.3%, the word "hunger" 13.0%, the word "tired" 13.3%, and the sandwich 16.5%.

Ratings of thirst. Participants' ratings of their thirst are depicted in Figure 2. The data parallel those obtained in the first experiment. There were no differences between participants who had been randomly assigned to the control and subliminal conditions prior to the watching the video. After the video, however, the subliminal group showed significantly higher thirst ratings, $M = 6.3$, than they had shown in the pre-ratings ($M = 4.5$), $t(45) = 2.51$, $p < .01$; and also reported higher thirst ratings than participants in the control condition ($M = 4.1$) who had watched the video. The latter difference was also significant, $t(45) = 2.59$, $p < .01$. The thirst ratings of the control group did not differ following the watching of the tape, $t < 1$.

As in Experiment 1, participants' recall of events in the program was good (86% correct answers) and did not differ between conditions. There was no correlation between any of the motivational states and participants' ability to recall the program. There were no gender differences on any of the measures.

Discussion

Taken together, these two experiments indicate that stimuli that appear below the level of awareness can affect people's motivational states. Specifically, after viewing words or scenes that imply thirst, volunteer participants attributed to themselves considerably more thirst than did control participants. This effect did not generalize to other states, but was specific to the state implicated by the stimuli.

The word studies provide a replication and extension of work reported by others. Using the Cheesman and Merikle (1984) procedure, we verified that our stimuli were at the objective threshold of subliminality. Previous work established the activation stimulus prior to exposure to the supraliminal stimuli. Typically, this has been done using a computer screen (Bargh & Pietromonaco, 1982) or tachistoscope (Bornstein et al., 1987). The current study used an online procedure with the subliminal stimulus woven into the viewed material.

The pictorial study extends what is known about the breadth of subliminal processing. Greenwald (1992) made the case that there is little evidence to support the notion that multiword strings can be processed subliminally. The current data do not challenge that conclusion. However, they do raise the question of what is meant by *complex* and *simple* within the context of subliminal processing. Watching a videotape in which a boxer is sweating profusely is a processing step removed from priming the word "thirst." The scene must be perceived unconsciously and then interpreted in order for it to activate the cognitive category, thirst. People seem to engage in this automatic processing even though they have no conscious awareness that they have ever been exposed to the stimulus material in the first place.

The success of the manipulation to create the perception of thirst motivation beyond awareness addresses some questions about the methodology of presenting subliminal stimuli. In the tradition of signal detection theory, it has been argued that each participant who takes part in a subliminal perception study should have his or her own d' statistic calculated individually (Lupker, 1986). The current study adopted Hardaway's (1990) argument that if it has an impact on subliminal persuasion, the fact of individual differences in d' should create greater variability in the impact of the stimuli on the dependent measure. Thus, if there are meaningful individual differences, studies using the current procedure should underestimate the strength of the effect.

The procedure for making the subliminal videotapes also raises the question of how, scientifically, a prescription can be written for creating stimuli that

cannot be seen. In much of the previous literature, 4 ms has been the operational procedure for subliminal tachistoscopic presentations of stimuli (Bornstein et al., 1987; Hardaway, 1990; Overbeeke, 1986). Kunst-Wilson and Zajonc (1980) reduced exposure time to 1 ms in order to create subliminality. Erdley and D'Agastino (1988) considered 125 ms subliminal. The current study used exposures of 33 ms but, unlike previous studies, it was placed within the context of an ongoing stimulus videotape.

In developing the tape, we tried a number of different exposure lengths. Not surprisingly, we found that exposure length and illumination both needed to be considered. In addition, the 33 ms stimulus was unrecognizable, provided it was spliced at the point that scenes changed. Placed in the middle of an ongoing scene, a faster or less well-illuminated stimulus would have been needed. The differences in how subliminal stimuli have been presented bears further attention. Although we can assess the thresholds of subliminality empirically, we have focused much less on the objective presentation of the stimuli. It is not certain that all subliminal presentations (e.g., 1 ms vs. 125 ms) create similar functional effects, even though each might be processed outside of consciousness.

Bargh (1997) recently reminded us that much important human social behavior is automatic. We are not aware of the impact of situational stimuli that influence our cognitions or affect our behavior. Attitudes, for example, can be automatically activated in response to environmental stimuli. They need be not consciously or deliberately considered, but serve to guide us through a potentially confusing social world (Fazio, Sonbonmatsu, Powell, & Kardes, 1986). Similarly, people's impressions of others might be activated automatically by a nonconscious exposure to a word or a face or other physical stimulus (Bargh et al., 1996), and their goals might be activated by situational variables of which they are thoroughly unaware (Bargh & Gollwitzer, 1994).

What is particularly interesting about the subliminal activation of a motivational state such as thirst is that it is completely at what Bargh (1997) has called the *preconscious level*. Alternatively, Fazio and Roskos-Ewoldsen (1994) argued that people might have an automatic reaction to attitude objects, such as a cockroach. They do not have to think it through, assess the social norms that govern the situation, or reflect on their past behavior. Nonetheless, this type of automaticity is not preconscious. People are aware that their aversive emotional reaction when turning on the light and seeing a scurrying, six-legged insect is a result of their strong negative attitudes toward cockroaches. In the current experiment, we presented people with stimuli that they had no knowledge of seeing. They had no knowledge of having reacted to the words or to the scene. They had no knowledge of interpreting the stimuli as being relevant to their own motivational state. But they engaged in all of these processes, presumably preconsciously. They perceived a word or a scene completely without awareness. Their perceptions, in turn, were processed and interpreted. The result of that interpretation caused

them to believe they were experiencing the sensation of thirst. Yet, we know that only moments before they were hardly thirsty at all. The complete lack of any conscious awareness of any link in the process makes the case of subliminal activation of motivational states a very interesting issue to consider.

So, was Vicary correct after all? Can we be prompted to think that we are thirsty not because of the time since our last drink, the state of our taste receptors, or the fluid needs of our tissues, but solely because of a word or scene that was processed nonconsciously? Although more research will be needed to assess the generalizability of the current data, our findings, along with the growing body of research in social cognition, suggest that there might be some truth to the suggestion that our motivational states are affected—and might even be caused—by pre-consciously perceived stimuli.

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