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# Are We Puppets on a String? The Contextual Meaning of Unconscious Expressive Cues

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*In three studies, the authors show that unconscious expressive cues can lead to opposite evaluations, depending on the context in which they occur. In Study 1, brow (vs. cheek) tension reduced preferences in an easy judgment context but increased preferences in a difficult context. In Study 2, head shaking (vs. nodding) either increased or decreased prosocial affect depending on the context in which the judged character was presented. In Study 3, a subliminal smile (vs. frown) led to higher self-ratings of performance when paired with one's own actions but to lower self-ratings of performance when paired with a competitor's actions. Together, these results suggest that the meaning of unconscious expressive cues is not fixed.*

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**Keywords:** *nonconscious processing; affect; evaluation; bodily expressions*

**T**he informational value of expressive cues has intrigued scholars throughout the history of psychology. James (1890) regarded the self-perception of one's own facial expression (e.g., one's own smile) as an important cue to one's subjective experience. Relatedly, Darwin (1872/1965) was concerned with the communication value of another organism's facial expression (e.g., someone else's smile) on behavior and emotional experience. Modern research demonstrates the effects of both types of cues on evaluative outcomes.

Research on self-produced facial actions demonstrates that such cues tend to elicit congruent affective responses. For example, imitating a smile leads to positive affect (Laird, 1974); furrowing the brow leads to feel-

ings of effort and difficulty (Stepper & Strack, 1993); and head nodding, in comparison to head shaking, elicits positive reactions to persuasion attempts (Wells & Petty, 1980). Similarly, research on affective priming (Murphy & Zajonc, 1993), facial mimicry (Dimberg, Thunberg, & Elmehed, 2000), and aversive learning (Öhman & Dimberg, 1978) demonstrates that external stimuli such as subliminal smiles versus frowns tend to elicit congruent affective responses. Such effects can occur unconsciously, either by unobtrusive manipulation in the case of self-produced expressions or by subliminal presentation in the case of external stimuli.

## THE MEANINGS OF EXPRESSIVE CUES

Whereas most research has focused on the relationship between the expressive stimulus and an evaluative outcome, the current studies explore the nature of the underlying process. Our main goal was to differentiate between processing stages that might be involved in translating perceptions into subjective reactions.

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Many existing models of information processing distinguish between at least two broad levels of meaning assignment (e.g., Teasdale, 1993). One level involves the perceptual identification and categorization of the stimulus object; for example, a piece of metal of a certain size with serrated edges will be classified as a knife. Another level involves determining the evaluative implications of the given object. A knife brandished by a stranger in a dark alley has very different implications than a knife placed beside one's dinner plate. Thus, the perception-related meaning of an object (e.g., as a knife) must be distinguished from the subjective meaning of the object. The present investigation in part seeks to dissociate these two types of meaning in understanding the impact of unconscious expressive cues on feelings.

One approach to unconscious expressive cues, which we refer to as the Default Implications Model, suggests that the link between perception and evaluative implications is fixed. According to this model, perceptual inputs are directly translated into corresponding evaluative implications (for a related view, see Dijksterhuis & Bargh, 2001). For example, a subliminal smile necessarily has positive evaluative implications. Whereas the influence of expressive cues on evaluative implications is fixed, the model accords some flexibility in potentially suppressing these implications (e.g., because one has a preexisting evaluation of the stimulus) (Priester, Cacioppo, & Petty, 1996). Within this model, assimilation effects are the norm, contrast effects are unlikely, and suppression is an effortful process. Of additional note, this model essentially equates the perceptual meaning of a stimulus (e.g., a smile) with its evaluative implications (e.g., good).

A different approach to the link between unconscious expressive cues and evaluative implications, which we refer to as the Contextual Implications Model, differentiates the perceptual meaning of a stimulus from its evaluative implications. Whereas a subliminal smile may be a positive cue in terms of its perceptual meaning, the evaluative implications of this perceptual cue can differ depending on context. For example, a subliminal smile paired with explicit erotic material might engender embarrassment, arguably a negative (rather than positive) subjective experience. Within this model, then, there is no direct translation from perceptual meaning to evaluative implications; instead, the translation is inferential, flexible, and contextual.

The model is somewhat consistent with recent models concerning the effects of mood states on evaluative judgment. Martin's (2000, 2001) Mood-as-Input model and Gendolla's (2000) Mood-Behavior model both argue that mood states carry no direct implications for behavior. Rather, their implications for behavior depend on one's current goals as well as other contextual features.

In one study, for example, Martin, Ward, Achee, and Wyer (1993) found that happy (vs. sad) mood states led to less task persistence in one condition but to more task persistence in another. Specifically, given that happiness can lead to decreased subjective task demand (see also Gendolla & Krusken, 2002), happy (vs. sad) participants worked less persistently on the task if they were told to master it. By contrast, given that happiness also can lead to a sense of enjoyment from current activities, happy (vs. sad) participants worked more persistently on the task if they were told to work on it as long as it seemed enjoyable.

Although consistent with the previous models in broad respects, the present work represents an important extension of such ideas. First, whereas the prior models are concerned with the effects of mood, typically on performance, the present work is concerned with the effects of expressive cues on evaluative judgments; that is, the manipulations as well as the dependent measures in the current work are different than in the articles discussed above. Second, the present work is particularly concerned with whether contextual factors moderate the effects of unconscious expressive cues. One could well imagine that although contextual variability characterizes the effects of mood, it does not characterize the effects of unconscious expressive cues, particularly given prior work and theorizing (e.g., Dijksterhuis & Bargh, 2001).

Specifically, although both the Default Implications Model and the Contextual Implications Model can predict flexible behavioral outcomes, the Default Implications Model assigns such flexibility exclusively to later stages in the process (specifically in the form of suppressing already activated tendencies). By contrast, the Contextual Implications Model builds flexibility into earlier stages in the process (for instance, in the form of determining the implicational meaning of perceptual cues). Because the meaning of an expressive cue is fixed according to the Default Implications Model, a given cue can either lead to assimilation or fail to influence behavior. On the other hand, the Contextual Implications Model assumes that the implications of an expressive cue are variable. Indeed, the same expressive cue can produce opposite evaluative implications given a well-designed contextual manipulation.

One reason that the Default Implications Model has been widely accepted is because few prior studies have sought to manipulate the context in a manner that could produce opposite outcomes (for an exception, see Stapel, Koomen, & Ruys, 2002). In fact, the typical study of expression/affect relations includes only one context, one in which the expression manipulation is likely to produce assimilation effects. For example, Strack, Martin, and Stepper (1988) manipulated facial expressions

in such a way that participants were smiling or frowning without knowing it. Smiling participants rated cartoons as more humorous than frowning participants. Such results are consistent with the Default Implications Model in the sense that the expressive cues produced assimilation effects on humor ratings. However, the results also are consistent with the Contextual Implications Model, which would generally assume that smiling would be interpreted as humor within a cartoon enjoyment context.

To compare the two models of expression/affect relations, one must manipulate contextual features in such a way that the same evaluative stimulus could produce discrepant subjective outcomes. This, therefore, is what we did in the following three studies.

#### OVERVIEW OF STUDIES

In the three studies reported here, we sought to examine whether we could flexibly determine the evaluative implications of an expressive cue. Specifically, we manipulated the contextual aspects of each study in such a way that the same expression might have opposite evaluative implications in two context-related conditions. Support for the Default Implications Model would consist of a main effect for expressive cue regardless of the contextual manipulation (e.g., a subliminal smile always producing more positive self-perceptions). This model also could account for cases in which expressions of existing tendencies are suppressed, leading to null effects. On the other hand, support for the Contextual Implications Model would consist of a Crossover Expressive Cue  $\times$  Context interaction involving the cue's evaluative implications (e.g., a subliminal smile sometimes leading to more positive self-perceptions and sometimes leading to more negative self-perceptions).

In none of the studies did we manipulate cognitive load, self-awareness, or any other variable that might be associated with the desire and/or capacity to suppress activated evaluative tendencies. Therefore, contrast effects cannot be interpreted as corrections and assimilation effects as defaults. Rather, both assimilation and contrast effects would emerge from the inherent flexibility of the stimulus-to-implication sequence.

We specifically sought to reverse several expression/affect relations that have been well established in previous research. To provide evidence for the generalizability of the findings, we focused on three distinct types of expressive cues. Studies 1 and 2 focused on the impact of self-produced expressive cues, whereas Study 3 focused on the impact of external expressive cues. In Study 1, we examined the effects of proprioceptive cues by manipulating corrugator activity, either in a context in which such activity might be interpreted as difficulty with an easy task versus a challenging

one. In Study 2, we manipulated head shaking (vs. nodding), either within a context in which such a movement might be interpreted as sympathy based on a person's terrible situation versus anger based on disapproval with the person. Finally, in Study 3, we presented subliminal smiling (vs. frowning) faces, either in a context in which such smiles might be interpreted as success of the self versus success of one's competitor. In all studies, we predicted that context would moderate the evaluative implications of a given facial expression or gesture, providing support for the Contextual Implications Model of expression/affect relations.

#### STUDY 1

People furrow their brows when they are experiencing difficulty with the task at hand or negative affect. Although task difficulty and negative affect can be dissociated (Smith, 1989), the two often go hand-in-hand. Furthermore, both task difficulty and negative affect tend to induce a kind of task-specific caution, which prevents confident endorsements (Schwarz & Clore, 1996). Brow tension, in other words, is often associated with uncertainty and indecision (Larsen, Kasimatis, & Frey, 1992; Stepper & Strack, 1993).

Studies on the effects of brow (vs. cheek) tension on judgment have typically used judgment contexts in which the decision should be relatively easy. In such contexts, brow tension indicates unexpected difficulty and therefore implies uncertainty or indecision. The processing difficulty, in these contexts, would be incongruous with an apparently easy task, reducing confidence in one's judgments. However, the Contextual Implications Model suggests that there might be other judgment contexts in which processing difficulty would be the hallmark of adequate deliberation, perhaps leading to more confident endorsements. More specifically, if the task itself appeared to be difficult, requiring considerable thought and deliberation, processing difficulty may be seen as normal or even desirable. In these more difficult decision contexts, brow tension might be interpreted as due deliberation, leading to more (rather than less) decisive judgments.

In Study 1, our goal was to examine the evaluative influence of brow (vs. cheek) tension under varying levels of task difficulty. We therefore manipulated these expressions in two evaluative contexts. In one context, participants faced a relatively easy task (choosing between two very distinct posters), whereas in another context participants faced a relatively difficult task (choosing between two very similar posters). In both contexts, we manipulated facial expressions while participants were asked to think of reasons for preferring one poster over the other.

When the goal is to choose between two options, a decisive evaluation is likely to lead to polarized preference judgments. A higher preference for one option versus the other indicates an ability to differentially judge their subjective value. On the other hand, if a person judged two options similarly, this indicates difficulty in identifying how the options differ from one another and thus choosing among them. Consequently, as a measure of decisive affective judgments, we compared a person's preference for one poster over another.

The Default Implications Model proposes that unconscious cues have invariant implications for judgment. Accordingly, brow (vs. cheek) tension should imply more (vs. less) difficulty with the task, leading to less polarized (i.e., more cautious) preferences in both easy and difficult judgment contexts. On the other hand, according to the Contextual Implications Model, brow (vs. cheek) tension would be associated with different evaluative outcomes depending on the subjective difficulty of the task. Because processing effort is desirable when a task seems relatively difficult, signs of effort would imply adequate problem solving and lead to decisive judgments. By contrast, no effort is expected in an easy task. In such an easy task, signs of effort would imply confusion and indecisiveness. Therefore, support for the Contextual Implications Model would take the form of an Expression  $\times$  Context interaction such that brow tension leads to more polarized judgments in the difficult decision context and less polarized judgments in the easy decision context.

#### *Method*

##### *PARTICIPANTS*

Participants were 72 undergraduate students at the University of Georgia who were given partial credit toward an introductory psychology class requirement.

##### *MATERIALS*

Three posters were chosen to be relatively desirable but different in their descriptive relatedness. Two of the posters depicted woodland scenes. These scenes were very similar to one another except that one centered around a small stream, whereas the other centered around a small waterfall. The third poster depicted a sailboat on the ocean at night.

To make sure participants found it more difficult to generate reasons for choosing between the similar as compared to the dissimilar posters, we ran a pilot study. Twelve participants were shown the two similar posters and asked to rate how difficult they thought it would be to generate six reasons for choosing one poster over the other. After making this judgment, they were shown the two dissimilar posters and asked to rate how difficult they thought it would be to generate six reasons for choosing

one of these posters over the other. Both ratings were made on a 7-point scale with endpoints labeled *almost none* to *a lot*. As expected, participants reported that it would be more difficult to generate six reasons for preferring one of the similar posters ( $M = 4.67$ ) than one of the dissimilar posters ( $M = 2.75$ ),  $t(11) = 3.73$ ,  $p < .003$ .

##### *PROCEDURE*

Participants were run one at a time. They were told that the experiment was concerned with the physiological reactions that occur as people make evaluations. Under this cover story, two electrodes were taped to the participants' faces. The electrodes were connected to a machine that presented an array of lights and switches but that in actuality measured nothing. In combination with the cover story, this machine allowed us to manipulate participants' facial expressions without the participants becoming suspicious.

For half of the participants, we affixed the two electrodes between their brows. For the remaining participants, we affixed one electrode on the right cheek and one on the left cheek. Facial expressions were then manipulated by having participants contract their brow or cheek muscles, respectively. More specifically, after explaining the ostensible purpose of the experiment, and after attaching the electrodes, the experimenter had participants contract the facial muscles directly beneath the electrodes (i.e., brow or cheeks). The experimenter told participants that these contractions, which they held for 1 min, would be used to obtain a baseline for some physiological measurements that would be taken later in the experiment. Other than contracting their brows or cheeks, participants did nothing during this initial period. To keep up the pretense that we were measuring physiological activity, however, the experimenter manipulated some dials and switches on the machine during this time.

At the conclusion of this supposed baseline period, participants were told that they could return their facial expressions back to normal. After relaxing their muscles, participants were shown the two similar or two dissimilar posters and asked to think about which they preferred. Next, participants were asked to contract the muscles that were directly below the electrodes again, this time while generating six reasons for their choice (i.e., preferred poster). The expressions were maintained until the participants finished listing their reasons for approximately 2 to 3 min. During that time, the experimenter sat across the desk from the participant to encourage compliance.

After listing their reasons, participants were told they could return their facial expressions to normal. They were then asked to indicate how much they liked each of the posters on a 29-point scale with endpoints labeled *not*

very and very. Following these preference ratings, participants rated their current mood state on a 29-point scale (1 = extremely negative, 29 = extremely positive). Finally, participants were probed for suspicion about the hypotheses and then debriefed.

Results

PRELIMINARY ANALYSES

We assumed that the facial contractions were manipulating experienced cognitive effort. They also may manipulate mood, however. Specifically, contraction of the brow muscles may induce negative feelings (Larsen et al., 1992), whereas contraction of the cheek muscles may induce positive feelings (Strack, Schwarz, & Gschneidinger, 1985). To see if our manipulations of effort induced different moods, we submitted participants' mood ratings to a 2 (brow vs. cheek) × 2 (similar posters vs. dissimilar posters) ANOVA. This analysis revealed no significant effects (all  $F_s < 1$ ). Thus, our manipulations of subjective retrieval effort did not induce differences in mood.

A second concern was experimental demand. Our results would be of little theoretical value if they reflected participants' guesses about the nature of the experiment. So, before the experiment was explained to participants, the experimenter asked each participant to make some guesses about the nature of our hypotheses. These initial guesses did not reveal any suspicions. The experimenter then explained that the machine to which the electrodes had been connected did not really measure physiological activity and that the experiment was not concerned with such measurement. With this additional information, participants were again encouraged to guess our hypothesis. Not one participant guessed that we were manipulating facial expressions and none offered an alternate hypothesis that was close to the actual hypothesis. Consequently, we are confident that our results cannot be attributed to demand characteristics.

THE EFFECT OF PERCEIVED EFFORT

To compute differences in preferences for one poster over the other, we subtracted participants' liking for their nonpreferred poster from their liking for their preferred poster. We then conducted a 2 (facial activity: brow vs. cheek) × 2 (context: similar vs. dissimilar posters) ANOVA on these difference scores. Supporting the prediction of the Contextual Implications Model, the analysis yielded only one significant effect, an interaction between Facial Activity and Context,  $F(1, 76) = 5.33$ ,  $p < .05$ . As shown in Figure 1, brow (vs. cheek) tension reduced difference in preferences in the easy context condition but led to polarized preferences in the difficult context condition.

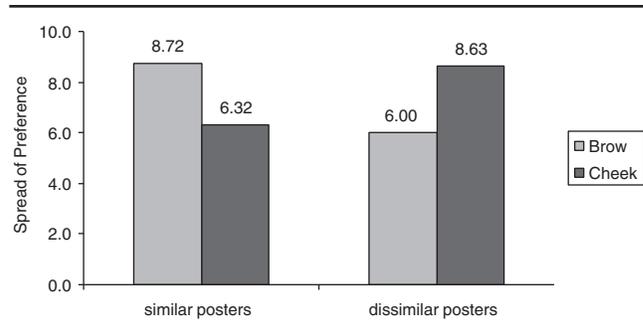


Figure 1 Effects of brow versus cheek tension on spread of preference for similar versus dissimilar posters, Study 1.

Discussion

Self-produced facial actions did not have invariant effects but rather interacted with context in predicting preference for one poster over another. The effect of brow (vs. cheek) tension, although unconscious, apparently engendered a different implication (i.e., decisiveness or indecisiveness) in the two context conditions. As noted by Barsalou, Niedenthal, Barbye, and Ruppert (in press), bodily cues can affect evaluations either indirectly or directly. Indirect effects occur when the bodily cues influence mood, which in turn influence the judgments at hand. Direct effects are unmediated by mood. Although our measure of mood may not have been extremely reliable, the lack of any hint of any effects on mood suggests that the current findings may have been direct rather than indirect. In either case, however, the contextual nature of the critical interaction remains unaltered.

To examine whether the contextual meaning of brow (vs. cheek) tension can be generalized to other self-produced expressive cues, in Study 2, we examined the contextual effects of head nodding (vs. shaking). In addition, a possible limitation of Study 1 was that the outcome of decisive (vs. indecisive) judgments was measured somewhat indirectly, specifically on the basis of a difference score. In the remaining studies, we chose to measure the predicted evaluative outcomes somewhat more directly.

STUDY 2

Head movements, similar to facial expressions, have been proposed to have invariant evaluative implications (Darwin, 1872/1965). For example, authors have found that head nodding produces positive feelings toward an object, whereas head shaking produces negative feelings (Forster & Strack, 1996; Tom, Petterson, Lau, & Burton, 1991; Wells & Petty, 1980). The behavioral outcome of such proprioceptive cues may be flexible (e.g., Forster & Strack, 1998). However, current research does not allow us to determine whether this flexibility is due to inhibi-

tion of a fixed implication or to different subjective implications derived from contextual cues.

Study 2 was designed to test these possibilities by examining the effect of self-produced motor actions in two different contexts. Specifically, we sought to show that head shaking (vs. head nodding) could have different implications depending on the apparent target of the actions. To test this prediction, participants were asked to move their heads up and down (nod) or back and forth (shake) while watching two film clips. In one, the protagonist denies responsibility for a past transgression. We expected head shaking in this context to be interpreted as disagreement and disapproval of the protagonist (i.e., shaking = bad person). In a second film, the protagonist discusses the misery of her situation. We expected head shaking in this context to be interpreted as distaste for the harsh situational influences, thereby promoting an empathetic response to the protagonist (i.e., shaking = bad situation). Such a Movement  $\times$  Context interaction would again suggest that unconscious expressive cues can have flexible evaluative implications.

#### Method

##### PARTICIPANTS

Participants watched two video clips. Both clips contained emotionally ambiguous real-life stories taken from national TV news magazine shows. Each clip lasted 1 to 2 min and was chosen because, normatively, it induces both feelings of anger and feelings of empathy toward the protagonist.

##### MATERIALS

The first clip depicted Julie, a young heroin addict. During the clip, she explains how terrible her addiction is, how compelling the drug is, and how poorly her life is going. We hypothesized that head shaking in this context would lead to sympathy for Julie, as if shaking participants were saying to themselves, "Oh, what a terrible situation!" The second clip depicted Terry, a schizophrenic ex-con. As a teenager under the spell of psychotic delusions, he tormented and killed one of his neighbors (a young girl). Thirty years later, he is released from prison and is seeking to live a normal life. He states that he is psychologically healthy now and deserves to live free from the scrutiny of concerned neighbors. We hypothesized that head shaking in this context would lead to anger for Terry, as if shaking participants were saying to themselves, "Oh, what a terrible person."

To validate our intuitions concerning the two film characters, we ran a pilot study. After viewing each of the two video clips, participants ( $N = 20$ ) indicated their agreement with three "bad person" items (e.g., "Terry/Julie is a bad person") as well as three "bad situation" items (e.g., "Terry's/Julie's situation is bad"). Ratings

were made on a 5-point scale with endpoints labeled *highly disagree* and *highly agree*. The order in which the clips were presented was counterbalanced. To examine differences in ratings concerning the two types of items, the ratings were analyzed with target (Julie vs. Terry) and judgment (bad person vs. bad situation) as within-subject variables and order of clip presentation as a between-subject variable. As expected, the only significant effect was a Target  $\times$  Judgment interaction, such that participants rated Terry as a worse person than Julie ( $M_s = 3.04$  and  $2.78$ , respectively) and Julie's situation as worse than Terry's ( $M_s = 3.3$  and  $3.15$ , respectively),  $F(1, 18) = 8.87$ ,  $p < .01$ . The ratings, in sum, confirm our intuition that the Julie clip highlights her bad situation (more than her bad characteristics), whereas the Terry clip highlights his bad characteristics (more than his bad situation).

##### DEPENDENT MEASURES

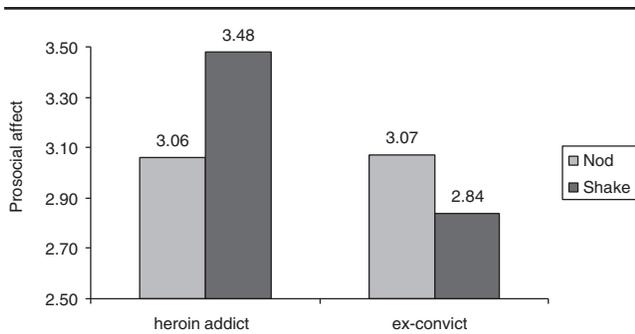
*Emotions.* To assess prosocial feelings we asked participants to rate the following items on a 5-point scale (1 = *I felt none of this feeling*, 5 = *I felt this feeling very strongly*): sympathy, caring, understanding, pity, compassion, empathy, irritation, annoyance, impatience, anger, disgust, contempt, and hostility. The last seven items were reverse-scored and all ratings were averaged so that a higher score implies more prosocial feelings (Cronbach's  $\alpha_s = .86$  for Julie and  $.85$  for Terry).

*Perception of responsibility.* In addition to assessing prosocial feelings, we also sought to determine if movement and context influenced appraisals of the protagonists' responsibility for his or her plight. Participants indicated their degree of endorsement with 17 relevant responsibility statements for each character (see below).

##### PROCEDURE

After arriving at the laboratory, participants were told that we were studying the effect of body movements on memory for social information. Instructions stated, "Some researchers have suggested that body movements can interfere with a person's ability to comprehend complex events. The present study seeks to understand whether these same dynamics extend to the comprehension of social material." After reading instructions, participants were asked to perform one of two movements. They were either asked to move their head "up and down" (i.e., head nodding) or "back and forth" (i.e., head shaking) at the rate of approximately one movement per second. After the experimenter had determined that the movement was being performed adequately, he or she started the videos.

Head movements were randomly assigned to clips such that participants performed one movement during one of the clips (i.e., either the clip about Julie or the clip



**Figure 2** Effects of head nodding versus shaking on emotional reactions to targets, Study 2.

about Terry) and the opposite movement during the other clip. To support the cover story, we administered a bogus memory test immediately following both videos. After watching the video clips, participants were given a questionnaire containing the dependent measures described above. Probe questions delivered after the study (following Bargh & Chartrand, 2000) revealed that participants had little or no awareness of the true purpose of the study.

### Results

#### EMOTION RATINGS

Prosocial affect was analyzed as a function of the target (Julie vs. Terry) and the movement performed during the video (nodding vs. shaking). The Target  $\times$  Movement interaction was significant,  $F(1, 34) = 5.26, p < .05$ . By contrast, the movement main effect was not significant,  $F(1, 34) < 1$ . Means, displayed in Figure 2, indicate that considering Julie only, head shaking (compared to head nodding) produced more prosocial feelings. By contrast, when considering Terry only, head shaking (compared to head nodding) produced less prosocial feelings. Thus, head shaking had opposite effects on the nature of feelings for Julie as opposed to Terry.

#### RESPONSIBILITY RATINGS

The 17 responsibility items were averaged across targets and then subjected to a factor analysis with **pc DEFINE** extraction and varimax rotation. The first two factors were clearly interpretable as personal (e.g., "Julie is the *only cause* of her continuing addiction") and situational causation (e.g., "Julie made a lot of *valid excuses* for her behavior"), respectively. A personal responsibility scale score was created by averaging over items pertaining to the two factors. Items indicating high perceptions of personal responsibility were positively keyed, whereas items indicating high perceptions of situational responsibility were negatively keyed.

As revealed above, head shaking led to more prosocial affect in response to Julie's plight but less prosocial affect

in response to Terry's plight. We assumed that such an interaction would be mirrored by one involving perceptions of personal responsibility. These differential effects were confirmed in a 2 (Julie vs. Terry)  $\times$  2 (nodding vs. shaking) ANOVA. As expected, participants judged Terry as more responsible for his actions when they were shaking ( $M = 3.27$ ) as opposed to nodding ( $M = 2.88$ ). By contrast, they judged Julie as more responsible for her actions when they were nodding ( $M = 3.50$ ) as opposed to shaking ( $M = 3.17$ ). The interaction was significant,  $F(1, 34) = 4.71, p < .05$ . These data parallel the feelings data in showing that shaking leads to more lenient judgments of Julie's behavior but less lenient judgments of Terry's behavior. The data presented here also provides direct evidence for the contextual nature of expressive effects on emotional appraisal.

### Discussion

Self-produced expressive cues did not have invariant effects but rather interacted with context in predicting the intensity of prosocial feelings. Of additional importance, judgments of personal responsibility mirrored this Movement  $\times$  Context interaction. In sum, the implicational meaning of head shaking (or nodding) reversed depending on the nature of the protagonist's film clip.

Studies 1 and 2 examined the contextual impact of self-produced expressions. To confirm the generality of our account of expression/affect relations, we turned to external expressive cues in Study 3.

### STUDY 3

In their influential study, Murphy and Zajonc (1993) showed that subliminal smiles (vs. frowns) could influence liking ratings for neutral Chinese ideographs, such that smiles led to more positive ideograph ratings than did frowns. The authors suggested that the influence of unconscious facial expressions is necessarily one that produces assimilation. In other words, an unconscious smile necessarily produces more positive judgments (or, perhaps, under certain conditions, has no effects). Such a statement is quite consistent with the Default Implications Model; however, it is inconsistent with the Contextual Implications Model. To test these two models against each other, we sought to vary the context such that a subliminal smile might, under certain conditions, have a negative rather than positive implication.

In this connection, it should be noted that Stapel et al. (2002) have recently shown that subliminal smiling or frowning faces can lead to either assimilation or contrast effects on subsequent judgments. Specifically, contrast or assimilation depended on the stimulus duration (brief vs. longer exposures), the nature of the subsequent judgment (categorization vs. evaluation), and

cue-target similarity. Study 3 was designed to show that opposite evaluative effects can result even when these factors (especially the first first) are held constant.

To show that the effects of subliminal smiles (vs. frowns) on evaluative judgments are context dependent rather than fixed, we primed people with these facial cues in two different contexts. Participants were led to believe that they were playing a competitive game in alternating turns. After taking a (self-related) turn, the participant sat passively to watch the turn of his or her competitor transpire on the computer screen. Subliminal smiles (or frowns) were presented either after trials of the participant or after trials of the competitor.

We expected that smiles (vs. frowns) following self-trials would imply personal success ("I'm doing well"), leading to higher ratings of self-performance. Such an effect is consistent with Murphy and Zajonc' (1993) findings. However, according to the Contextual Implications Model, even subliminal affective cues might, under certain circumstances, convey opposite evaluative implications. To assess this, we sometimes primed people with smiles during competitor (rather than self) trials. Under the latter conditions, we expected that smiles would imply that one's opponent is doing well and hence one is doing poorly (specifically because it is a zero-sum competitive game). Subliminal smiles paired with one's opponent were expected to lead to lower rather than higher ratings of self-performance. A crossover pattern would confirm our hypotheses.

### Method

#### PARTICIPANTS

Participants were 82 undergraduate students at the University of Illinois who participated in return for partial credit toward an introductory psychology course.

#### MATERIALS AND DESIGN

*Computer game.* The game was played on personal computers and consisted of a series of screens full of colored circles. The goal was to identify, as quickly and accurately as possible, whether each screen contained more red or blue circles. The game included two blocks, each with 16 self-trials and 16 competitor trials. Self- and competitor trials alternated. On each self-trial, the participant gained control of the screen, making a response to the particular configuration as quickly as possible. On each competitor trial, the participant watched the computer screen as a similarly configured pattern of circles appeared and disappeared from the screen, presumably because the competitor had made a response. In actuality, competitor trials were rigged. Each competitor trial was closely matched to the participant's speed on the preceding trial, producing a seemingly very competitive game. Participants were reminded before each trial

whether the upcoming trial belonged to them or to their opponents.

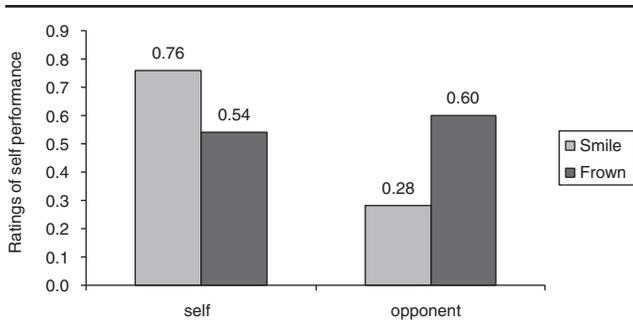
*Subliminal stimuli.* The subliminal stimulus was either a smiling or a frowning simple line drawing of a face presented using a backward-pattern-masking technique (Marcel, 1983). Facial cues were shown for 32 ms and immediately masked (for 64 ms) with a dotted black and white screen. The design of interest consisted of one between-subjects variable and one within-subject variable. On a between-subjects basis, participants were assigned to a condition in which only subliminal smiles were used or to a condition in which only subliminal frowns were used. On a within-subject basis, participants were given two blocks of trials, one in which the subliminal expression followed the trials of the self and one in which the subliminal expression followed the trials of the competitor. There was also one additional between-subjects factor representing an order variable. Some participants were randomly assigned to a condition in which the subliminal cue (either a smile or a frown) followed trials of the self in the first block and trials of the competitor in the second. By contrast, others were randomly assigned to a condition in which the subliminal cue followed trials of the competitor in the first block and trials of the self in the second. Preliminary analyses revealed that this order variable did not interact with the findings of interest,  $p > .2$ ; therefore, we collapsed across this variable in the analyses reported below.

#### DEPENDENT MEASURES

At the end of each block in the game, participants were asked two questions about their own performance ("How well do you think you did on the last set of trials?" and "How well do you think that you will do on the next set of trials?"). Participants also were asked two questions about the performance of their competitor ("How well do you think your opponent did in the last set of trials?" and "How well do you think that your opponent will do on the next set of trials?"). Responses to all questions were made on a 1- to 10-point Likert scale.

#### PROCEDURE

Participants entered the lab in pairs. After giving informed consent, they were told that the experiment involved a computer game in which they compete against each other. At this point, the participants were introduced to one another by name and encouraged to shake hands. Participants were then told, "You will play the game in turns, so one time it will be your turn, and then you will be able to see the performance of your competitor. The person who responds as quickly as possible with fewer mistakes will be the winner." At this point, participants were seated in front of a computer in private cubicles, from which they could not see their alleged



**Figure 3** Effects of subliminal smiles versus frowns on evaluations of performance when following self-trials compared to competitor trials, Study 3.

competitor. Participants were randomly assigned to conditions. Before starting the game, participants were warned that due to “technical limitations” they might see flashing dot patterns in-between screens. When the game was over, participants were probed for suspicion following the funnel interview procedure (Bargh & Chartrand, 2000). When probed, they also were asked to list any unusual or unexpected displays in the program so that they can presumably be eliminated in future sessions.

### Results

There was no indication of suspicion regarding the cover story or possible awareness of the subliminal smile or frown. Therefore, all participants were included in the analyses.

The ratings of present and future self-performance, which were correlated at  $r = .66$ ,  $p < .001$ , were averaged to give a summary score. Similarly, the ratings of present and future competitor-performance, which were correlated at  $r = .71$ ,  $p < .001$ , were averaged to give a summary score. Because the game was a competitive one with only one winner, doing well could involve good self-performance or poor competitor-performance. We created a final measure to reflect whether participants thought that they were doing better than their competitors or, alternatively, whether they were doing worse than their competitors. To compute this measure, we subtracted ratings of the competitor’s performance from ratings of self-performance.

We predicted that when self-trials were followed by a smile (or competitor trials were followed by a frown), relative self-performance would be rated higher. On the other hand, when competitor trials were followed by a smile (or self trials by a frown), we expected self-performance to be rated lower. These predictions were supported by a 2 (self vs. other)  $\times$  2 (smile vs. frown) repeated measures ANOVA, which yielded a significant two-way interaction,  $F(1, 80) = 3.90$ ,  $p < .05$ . No main effects were found. As shown in Figure 3, when subliminal smiles followed self-trials, self-performance was rated

higher. By contrast, when subliminal smiles followed competitor trials, self-performance was rated lower.

### Discussion

Study 3 conceptually replicates Studies 1 and 2, this time using subliminal external stimuli rather than proprioceptive cues. Subliminal smiles did not have invariant meanings but rather interacted with context in determining subjective performance ratings. A smile produced higher ratings of self-performance when it was paired with trials of the self, as predicted by the Default Implications Model. However, a smile produced lower ratings of self-performance when it was paired with the trials of the competitor. The latter effect, because it indicates that even a smile can have negative implications for the self, is consistent with the Contextual Implications (but not the Default Implications) Model. In this respect, the findings agree with Barsalou et al.’s (in press) contention that the inferences gleaned from an expressive cue will depend on the goals at hand. Specifically, one would be far more likely to interpret a smile as a sign of personal success when actually engaging in goal-relevant behavior (self- trials) as opposed to passively observing someone else’s behavior (other trials).

### GENERAL DISCUSSION

#### *Summary of Findings*

Most studies examining the influence of unconscious expressive cues have found congruence effects on behavior and judgments (e.g., Murphy & Zajonc, 1993; Stepper & Strack, 1993; Wells & Petty, 1980). Such prior results, along with relevant speculations from James (1890) and Darwin (1872/1965), have led most investigators to believe in some version of the Default Implications Model. However, it is noteworthy that studies examining the influence of unconscious expressive cues typically do so within a context that is likely to produce congruence effects (e.g., smiling in a humor context). The Contextual Implications Model can predict such congruence effects but also allows for incongruence effects in some contexts (e.g., smiling leading to embarrassment rather than happiness). We sought to evaluate the two models by systematically manipulating context in such a way that crossover interactions could be obtained (or not).

The findings, because they involve crossover interactions, support the predictions of the Contextual Implications Model. In this respect, we were able to show that the same expressive cue could lead to quite divergent evaluative outcomes. Specifically, Study 1 showed that brow (vs. cheek) tension reduced preferences (for one poster over another) when it occurred within an easy

decision context; by contrast, brow tension increased preferences when it occurred within a difficult decision context. Study 2 showed that head shaking (vs. nodding) either increased or decreased prosocial affect, depending on whether the character was denying responsibility for past actions or describing a miserable situation. Finally, Study 3 showed that subliminal smiles (vs. frowns) had positive implications for the self when paired with self-trials but negative implications for the self when paired with opponent trials. In total, the three studies demonstrate the contextual nature of expression/affect relations.

#### *Theoretical Implications*

Because our participants were truly unaware of manipulated expressive cues, and because we did not manipulate processing resources or motivation to inhibit activated meaning, our findings suggest that there is inherent flexibility in the representation of expressive cues. Implicational meaning, according to the present studies, is not a given. Rather, context seems to determine the subjective meaning of an expressive cue, even when such cues are unconsciously perceived. Our findings are consistent with other evidence for the context sensitivity of (nonevaluative) unconscious processes (Kihlstrom, 1999; Marcel, 1983; Merikle, Smilek, & Eastwood, 2001; Oswald & Gadenne, 2000; Reber, 1993; Velmans, 1991). For example, even “inevitable” stimulus-response conflicts such as the Stroop effect can be eliminated by contextual manipulations (Besner, 2001; Logan, Zbrodoff, & Williamson, 1984).

Our findings are also consistent with some of the recent conclusions regarding the sophistication of evaluative inference. For example, a facial expression is seen differently depending on the viewer’s interpretive frame (Fernandez-Dols & Carroll, 1997; Niedenthal, Halberstadt, Margolin, & Innes-Ker, 2000). Relatedly, Wittenbrink, Judd, and Park (1997) reported that implicit prejudice, once thought to be universal and invariant, is in fact highly sensitive to the judgment context (see also Brauer, Wasel, & Niedenthal, 2000; Dasgupta & Greenwald, 2001; Moskowitz, Salomon, & Taylor, 2000). In addition, Uleman, Newman, and Moskowitz (1996) recently suggested that although trait inferences can occur spontaneously, they are nevertheless somewhat flexible in nature.

Finally, the current research is consistent with recent findings concerning the contextual implications of affective cues. First, Martin’s (2000, 2001) Mood-as-Input model points to the contextual implications of affect, within this model in the context of mood states and behavior. Similarly, Gendolla and his colleagues (Abele & Gendolla, 1999; Gendolla, 2000; Gendolla & Krusken, 2002) demonstrate that the effects of mood are

dependent on the given context such that the same mood state can have different implications depending on the expected hedonic consequences (Gendolla & Krusken, 2002) or prime-target similarity (Abele & Gendolla, 1999). Prime-target similarity also has been shown by Stapel to moderate the effects of subliminal expressive cues (Stapel et al., 2002).

#### *Processing the Meaning of Unconscious Expressive Cues*

In differentiating the Default Implications Model from the Contextual Implications Model, we suggested an important distinction between perceptual aspects of meaning, which may sometimes be relatively invariant, and implicational aspects of meaning, which are presumably more variable (Lazarus, 1991). For example, a smile can be perceived as friendly or patronizing, depending on assumptions about the person’s motivations and other contextual variables. Such divergent reactions to a smile typically occur with the constraint that smiles are, perceptually, positive in meaning.

The idea that certain perceptual cues could have a fixed meaning, whereas implicational meaning is more variable, is consistent with recent research on category learning. Although objects have some fixed perceptual and conceptual features, they can nevertheless be classified differently depending on situational demands and other contingencies (Schyns, Goldstone, & Thilbaut, 1998; Spalding & Ross, 2000). For example, Kaschak and Glenberg (2000) found that participants had little trouble understanding a sentence such as “he magazined the fly,” despite the fact that a magazine is a noun and not a verb. According to this approach (Glenberg, 2001), objects have affordances that become salient within the particular context at hand. A magazine is a magazine but it also can be a fly swatter under certain circumstances. Similarly, a smile might always be perceived as a smile but it can carry negative implications under certain circumstances.

The distinction between perceptual and implicational aspects of meaning resonates with Stapel et al.’s (2002) distinction between diffuse and distinct affect. Consistent with our framework, these authors demonstrate that the global affective meaning (i.e., good vs. bad) of unconscious expressive cues is processed initially, followed by a more distinct processing of nonaffective characteristics. In a similar vein, we propose that even the processing of expressive cues that are diffuse by nature (such as the ones used in the present studies) can involve two distinct stages, one concerning the diffuse affective tone of the stimulus and the other concerning the implications of the stimulus given the local context (see also Barsalou, 2002; Barsalou et al., in press).

An alternative possibility is that our contextual manipulations influenced earlier, perceptual stages of meaning assignment. An interesting demonstration of such top-down influences on perception was provided by Jonides and Gleitman (1972) in an early study on categorical influences on perception. If participants were asked to look for the letter "O" in a visual display, there was more interference from distracting letters than distracting numbers. By contrast, if participants were asked to look for the digit "0" in a visual display, there was more interference from distracting numbers than distracting letters. In other words, the same "O" was perceived as a different object depending on whether participants thought they were searching for a letter or a number.

Similarly, it could be that participants in our study perceived the same expressive cues differently depending on the context. For example, a smile paired with one's own actions could be seen as a warm, radiant type of smile. On the other hand, a smile paired with one's opponent actions could be seen as a cold, sneering type of smile (Rothbart & Birrell, 1977). We cannot rule out such contextual influences on early aspects of perception. However, our interpretation of the results favors invariant perceptions but variant interpretations. Specifically, it is difficult to see how a frown could be perceived as a smile and *visa versa*. Even a sneer is still a type of smile rather than a type of frown. Nevertheless, future research is necessary to confirm this account.

#### *Strengths and Limitations*

The present studies have several strengths. First, they offer a clear way to examine the contextual implications of expressive cues. Second, they target previously established relations: brow vs. cheek tension and task performance, head shaking vs. nodding and accepting vs. critical reactions, and subliminal smiles vs. frowns and positive evaluations. Third, the relations examined included both internal and external cues (a distinction recently emphasized by Neumann & Strack, 2000). Finally, and most important, our studies show that the implication of each expressive cue was determined by contextual information, so much so that its influence on evaluative judgment reversed depending on contextual manipulations. A model of fixed implications cannot explain such contextual effects, even if it allows for suppression. It simply strains credibility to assume that inhibition or correction was involved in the present context effects.

The present studies, however, have several noteworthy limitations. First, because our main goal was to show contextual flexibility in expression/affect relations, our studies do not provide a thorough examination of the nature of each relation. In this respect, the rationale for

the predicted contextual interpretations was primarily intuitive. However, although the explanations we offer for the contextual effects might not be immune to alternative interpretations, the existence of such effects nevertheless remains indisputable.

In addition, as is customary in many studies of motor and expressive cues, the present studies compared the effect of two seemingly opposite expressive cues. As predicted, our findings indicate that such cues can have divergent evaluative implications. However, because no neutral control group was included in our studies, one cannot be sure whether the obtained effects are due to one or both expressive cues. Future research focusing on the effects of specific cues would be necessary to determine the specific (or both) expressive cue that may be involved in our interactions.

#### *Conclusions*

Previous research on unconscious affect implicitly suggests the metaphor of a hapless affective puppet moved involuntarily in a particular direction by the movements of unconscious hands. Considering the invisible nature of such operations, it is important to ask, as Loftus and Klinger (1992) did, whether the unconscious is smart or dumb. Although the present studies focus only on the effect of unconscious expressive cues on evaluations, they nevertheless join a growing body of research pointing to the inferential, context-dependent nature of unconscious processes. Fortunately, our affect puppeteer might be smarter than it looks.

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