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The Intensity of Facial Expression Is Determined by Underlying Affective State and Social Situation

Ursula Hess
University of Quebec at Montreal

Rainer Banse
Humbold University

Arvid Kappas
Université Laval

The present study concerned the influence of the presence of others on facial expressions of emotion. The proposition that facial expressive displays are better predicted by the social context than by emotional state (A. J. Fridlund, 1991) was tested in an experiment varying both the sociality of the context and the intensity of the emotion elicitor as well as the relationship between expressor and audience. The results indicate that the intensity of expressive displays cannot be satisfactorily predicted by either of these factors alone but is influenced by a complex interplay of all 3 factors.

Recently, the notion that facial emotional displays may be better viewed as communications of intent, mediated by the presence of others and independent of a concurrent emotional state, has attracted attention (Chovil, 1991; Fridlund, 1991; Fridlund, Kenworthy, & Jaffey, 1992). This argument is based on a behavioral ecology view asserting that—because emotional facial expressions obviously serve a communicative function and can be shown to be modified by the presence of others (audience effect)—the alternative explanation of emotional facial expressions as readout or symptoms of an underlying affective state becomes futile.

According to Fridlund et al. (1992), the audience effect presents important empirical support to this notion because it demonstrates the sociality of emotion displays. In a series of studies Fridlund and his colleagues (Fridlund, 1991; Fridlund et al., 1992) showed that positive and negative emotional facial displays were augmented in the presence of a real or imagined audience. Fridlund concluded from this data that the intensity of emotional facial expressions is better predicted by social context than by emotional state. In this article, we advance the argument that this conclusion is flawed on two accounts—first, with regard to the underlying rationale and second with regard to some specifics of the design chosen.

Concerning this latter issue, the aforementioned studies varied only the sociality of the situation and not the intensity of the affective state of the expressor.[1] Although Fridlund et al. (1992) provided a correlational analysis showing a low within-subject correlation between the intensity of the feeling state as measured by self-report and the intensity of the facial expression, this evidence is inconclusive for two reasons. First, the original emotion elicitation procedure was selected to produce emotional states of maximally similar intensity in all participants. The success of this approach is shown by the fact that a matching procedure aimed at equalizing emotional intensity over sociality conditions, performed for some of the analyses, resulted in the elimination of only a small percentage of the data. This implies restricted variance regarding the intensity of the self-reported feeling state, resulting in a necessarily low correlation between this variable and any other variable. Furthermore, and perhaps more importantly, this measure is flawed on a conceptual basis. Fridlund et al. (1992) purported to correlate an output—the emotional facial expression—with its hypothesized input, the internal feeling state of the participant. However, the measure for this input is another output—self-reported emotion. More specifically, while the behavioral ecology view stresses the communicative function of facial expressions, no doubt can be expressed that verbal report has such a function. Consequently, verbal report should be liable to the same influencing factors as is facial expression when taken in the same (social) situation. From the behavioral ecology point of view self-reported emotions and facial expressions represent thus the same underlying variable: beliefs about certain social situations. Therefore, both approaches in question would predict high correlations between these two variables.[2]

Ursula Hess, Department of Psychology, University of Quebec at Montreal, Montreal, Quebec, Canada; Rainer Banse, Department of Psychology, Humbold University, Berlin, Germany; Arvid Kappas, École de Psychologie, Université Laval, Ste-Foy, Quebec, Canada.

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Correspondence concerning this article should be addressed to Ursula Hess, Department of Psychology, University of Quebec at Montreal, CP 8888, succ. A, Montreal, Quebec, Canada H3C 3P8. Electronic mail may be sent via the Internet to Hess.Ursula@UQAM.ca

[1] Following Fridlund (1991) "sociality" in this context is defined as the degree to which the situation supposes the presence of others (ranging from the participant being alone to the participant performing a task in the explicit presence of another person). As we discuss later, this definition may be too simple because it disregards the nature of the relationship between the participant and the "audience."

[2] As mentioned above, the low correlation between self-report and facial expression measure by EMG found by Fridlund (1991) is most likely attributable to the restriction of variance inherent in the design of his study.

With regard to the basic rationale of the study, one should note that social influences on expressive behavior do not constitute contradictory evidence for the notion that emotional facial expressions are symptoms of an underlying affective state. In fact, most views of emotional communication would lead to the conclusion that social and emotional communications coexist in emotional displays (e.g., Fridlund, Ekman, & Oster, 1987). The behavioral ecology view of emotional facial expressions asserts that they should be viewed as communicative signals only (Chovil, 1991). However, it has long been recognized that verbal and nonverbal communications are inherently polyvalent. This notion has already been expressed, for example, in the model of communication presented by Bühler (1934, see Figure 1).

This model distinguishes three aspects of a message: the symbolic, the symptomatic, and the appeal function. The first refers to the sign content of the message and conveys information directed at the interaction partner and corresponds to the sociality factor stressed by the behavioral ecology view. The second, the symptomatic function, corresponds to a readout of the individual's internal state. The third function regards the possible actions of the interaction partner. For example, the sign content of the phrase "it is hot in here" refers to the temperature of the room (hot). Its symptom content reflects the fact that the speaker feels hot, whereas the appeal function may be to persuade an interaction partner to open a window.

In the framework of this and similar models, sociality and emotionality of facial expressive displays easily coexist. Furthermore, one should note that all three aspects of communication are not necessarily equally represented in any given message. Clearly, some emotional expressions, such as posed smiles (e.g., greeting smiles), may indeed serve only the signal and appeal function and are inherently social. However, emotional facial expressions congruent with a concurrent emotional state may be influenced by the sociality of the situation without losing their value as readouts of the concurrent emotional state in question.

Fridlund (1991) labels this approach the 'romanticist' two-factor view of facial expression, which places in opposition instrumental or social expressions on one side and spontaneous expressions on the other. However, as Buck, Loslow, Murphy, and Costanzo (1992) pointed out, the position attacked by Fridlund (1991) represents a simplistic view of the differences between felt and posed expressions that only partially reflects the current discussion in the field. Many proponents of the view that emotional expressions are valid readouts of an underlying affective state recognize that spontaneous and voluntary expressions are extremes on a continuum that both allows and demands emotional as well as social causal influences on expressive behavior (e.g., Buck, 1991, Buck et al., 1992; Cacioppo, Bush, & Tassinary, 1992; Hess, Kappas, McHugo, Kleck, & Lanzetta, 1989; Hess & Kleck, 1990).

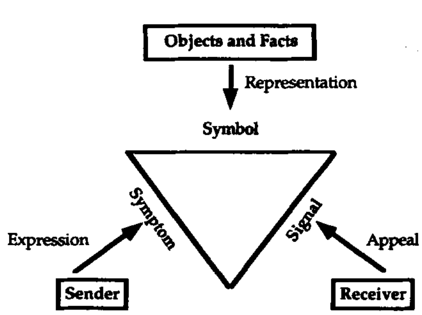

Figure 1. Bühler's Organon Model.

It is important to note that a body of clinical and anatomical data exists showing that the distinction between voluntary and spontaneous emotional facial expression is useful because facial expressions that are concurrent to a congruent emotional state seem to be enervated by different neural pathways than facial expressions that are voluntarily produced (see Rinn, 1984, 1991). The behavioral ecology view expressed by Fridlund (1991), which links facial expressions to beliefs about social situations, does not account for these findings.

The preceding argument only strives to provide a framework for the nonexclusivity of social and emotional causes for emotional displays (for a different argument regarding this issue see Buck, 1991). It does not provide evidence that emotional facial displays actually serve a symptomatic function. As Fridlund (1991) pointed out, the presence of facial emotional displays in a situation devoid of an audience cannot provide this evidence because one can never exclude the possibility of an imagined audience; as his ingenious experiment showed, audience effects can be demonstrated in situations where the audience is only implied.

As mentioned above, Fridlund (1991) and Fridlund et al. (1992) varied only the sociality of the situation, not the intensity of the concurrent affect. However, changes in facial expression in situations of equal sociality, as a function of differences in the intensity of the concurrent affect, would point to a readout function of the facial display. Therefore, the present study was conducted to test the hypothesis that the intensity of the concurrent emotional state influences the intensity of the accompanying emotion display.[3]

Although it may be argued that such changes are also consistent with the notion that more intense concurrent affect will be signaled in a purely communicative function by more intense facial expressions, this argument would render the discussion circular. Furthermore, an additional intermediate process for the monitoring and regulation of facial displays as a function of expressive state would have to be postulated. If predictions regarding the relationship between the intensity of the concurrent affect and the intensity of the accompanying facial expressions made by the behavioral ecology view of emotion displays and those made by an emotional facial expression as a readout of affective state view are identical in all cases, a distinction between the two becomes meaningless. Additional predictions regarding the influence of an audience on the displays do not make the behavioral ecology view more fruitful with regard to the relationship between concurrent affect and facial displays because these predictions regard a different issue—which is fur-

[3] Facial expression in this experiment was measured using mean EMG. As Fridlund (1991) noted, differences in mean EMG can be due to either a moderate increase in expression during the whole of the sampling period or to a large increase at one or more points during the sampling period. In our opinion, both changes in expressivity can be considered as changes in intensity of the facial expression shown, even though their appearance is different.

thermore largely undisputed by the more traditional view of facial displays as readout of affective state.

Furthermore, an indirect argument can be advanced for the view that the audience effects observed by Fridlund (1991) and Fridlund et al. (1992) are not unambiguous evidence for a strictly sociality-based view of emotional expressions. Proponents of the behavioral ecology view assert that the sociality of emotional facial expressions can be demonstrated by the fact that certain emotional facial expressions (such as smiling and laughing in the presence of an amusing stimulus) are facilitated by the presence of an audience (Chovil, 1991; Fridlund, 1991; Fridlund et al., 1992). The definition of sociality in this context implies that the facial expressions serve to communicate or signal the emotional valence of the situation. In order for the signal to be understood, the audience must be able to categorize the expression. In other words, the expressor strives to facilitate the communication of an emotional state or an attitude. A number of different processes for the recognition of emotions have been proposed. Pattern matching (see Ellis & Young, 1989; Oster, Daily, & Goldenthal, 1989) requires the observer to search for cues regarding the specific emotional information displayed, while role-taking requires that the observer relates information regarding the situational context to own experiences to deduce the emotional state of the expressor (e.g., Strayer, 1993; Wagner, Lewis, & Ramsey, in press). Friends and family generally have more pertinent knowledge about the expressor and the situation than do strangers and are therefore more likely to use a role-taking approach as a means of emotion recognition (which represents also the most successful strategy, see Wiggers, 1984). Strangers, however, need to rely on pattern matching or on other means, which are dependent on the clearness and nonambiguity of the emotion display. Consequently, the ecological view would need to assume that facial emotional displays which are meant to signal an emotional state are facilitated more by the presence of strangers than by the presence of friends, as strangers need more and redundant cues to attribute a certain emotional label to an expression; similarly, people attempt to pronounce words more clearly in the presence of people who are unfamiliar with their language or dialect.[4] However, this is not the case. In a recent review, Wagner and Smith (1991) showed that emotional facial displays are facilitated by the presence of friends and inhibited by the presence of strangers. This finding throws some doubt on the assertion that the audience effect provides conclusive evidence regarding the uniquely social function of facial emotional displays unless it is postulated that it is useful to conceal an internal affective state in the presence of strangers in all the situations sampled. This is certainly a possibility but does not seem to be consistent with the behavioral ecology view. Specifically, with regard to the situation chosen by Fridlund (1991) to demonstrate the audience effect—reaction to an amusing stimulus—it seems likely that one would want to share the humor appreciation (see e.g., Chapman, 1976).

The present study was conducted to replicate Fridlund's (1991) study while including the two crucial additional factors mentioned above: relationship (friends or strangers) between expressor and audience (real or implied) and intensity of the concurrent emotional state (moderate or high). According to the arguments outlined above, all three factors influence emotional expressivity. We predict that emotional facial expressions are facilitated in the presence of friends and inhibited in the presence of strangers. Furthermore, more intense feeling states will be accompanied by more intense facial expressions.[5] In addition, we predicted that the sociality of the situation will facilitate the expression of emotions at least for friends. No predictions can be made regarding audience effects in the presence of strangers because inhibition of facial expressivity may obscure such effects.

Facial expressivity was measured using facial electromyography (EMG) at three sites. Because humorous stimuli were used, we chose zygomaticus major to assess smiling and laughter, orbicularis oculi, which has been interpreted as an indicator of "genuine enjoyment" (Duchenne, 1990/1862; Ekman & O'Sullivan, 1991), and corrugator supercilii to assess the presence of frowns for the exclusion of mixed-affect expressions.

Method

Procedure

Forty-six pairs of women participated.[6] Participants were invited to the laboratory with the instruction to either bring a friend or come alone. The experimental procedure followed largely the one described in Fridlund (1991); however, participants saw three films, two that differed in the strength of the emotion they elicit and one filler item. A pretest showed that the films elicited significantly different levels of happiness or amusement in participants who saw them alone. The films showed a comedy routine with slapstick humor and a series of televised home videos also containing slapstick humor scenes. The sequence of films was counterbalanced over participants. The film used as a filler item elicited intermediate levels of amusement in participants who saw it alone in a pretest and was included to avoid drawing the participants' attention to the difference in "funniness" between the two target films. Data collected while the participants watched the filler item were not analyzed. Participants either (a) saw the two stimulus films and the filler item together in the same room (explicit coviewing), or (b) saw the

[4] Obviously not all emotional states are meant to be signaled. However, the emotion eliciting material chosen by Fridlund (1991)—namely funny films—belong to a class of stimuli for which the signaling of affect has been shown to be of importance. Specifically, laughter when watching a humorous sequence has been shown to signal that one has understood the joke and to help establish a common base in small group interactions (see Chapman, 1976).

[5] We predict that intensity of emotional facial expressions is linked to the intensity of the underlying affective state. One should note, however, that several emotion theories (Izard; 1971, Scherer, 1986) view facial expressions as part of the emotion process itself. However, there is no contradiction, as these theories would agree that facial expressions are linked to affective states and can be seen as symptoms of a concurrent emotional state.

[6] Immediately before the experiment participants performed a collaborative task together in the same room. Their task was to collaborate on the writing of a short text which was then presented in front of a camera. Most participants completed this task in about 30 min. One could argue that the fact that participants interacted for about 30 min before engaging in the experimental task, poses a problem for the experimental manipulation since it allows the "strangers" to come to know each other. However, a 30-min interaction cannot provide the same information that friends who frequently have known each other for years have about each other. Furthermore, one would anticipate that previous interaction can only reduce the effect of being strangers, as participants get to know each other. Thus, we are potentially weakening the effect of our manipulation against our own hypothesis by making friends and strangers less different from each other.

films in separate rooms (implicit coviewing), or (c) one participant saw the films while the other participant filled out an unrelated questionnaire in another room (implicit irrelevant task). In Conditions B and C both participants were told what the other would be doing. Special care was taken to make salient to the participants that the other participant would see the same film at the same time, or would fill out a questionnaire for an unrelated study. For Condition A participants were seated side by side at a slight angle approximately 3 m from the video screen. Participants were told that they would have to watch a series of films and that their task would be to perform a series of ratings after each film. For Condition B we added the information that they would watch the same films but in different rooms. For Condition C participants were told that only one of them could watch the films and that we would like the other person to complete a questionnaire in the meantime. For Condition B and C the other participant was conducted to another room where he or she performed the task as described.

Dependent Variables

Facial EMG. Facial activity was assessed with three pairs (bipolar placement) of Med. Associates Inc. Ag/AgCl miniature surface electrodes at the sites of zygomaticus major, orbicularis oculi, and corrugator supercilii. Electrode placements were according to Fridlund and Cacioppo (1986). All pairs were referenced to a forehead electrode placed near the midline. Med. Associates electrode electrolyte (TD41) was used as the conducting medium and the skin was cleansed with PDI disposable electrode prep pads (70% alcohol and pumice). The electrodes were stored in a carbon rod storage container (Tassinary, Geen, Cacioppo, & Edelberg, 1990). A Contact Precision Instruments (CPI) system was used to amplify the raw EMG signals; a notch filter was used to reduce 50 Hz electric noise.[7] The EMG was then passed through CPI integrators with a time constant of 200 ms. The smoothed EMG signal was sampled at 10 Hz and stored.

Skin conductance level. Skin conductance level (SCL) was measured using Med. Associates miniature electrodes placed on the second segment of the first and third fingers of the left hand (bipolar placement). A saline/Unibase preparation was used as the conducting medium (Lykken & Venables, 1971). A CPI SCL Coupler with automatic backoff was used. The signal was sampled with 10 Hz and stored to disk.

Self report. Fridlund (1991) used the Differential Emotion Scale (DES) (Izard, 1972) to assess self-reported emotional state. Therefore, following the presentation of each film, participants were asked to fill out the French version of the DES (Philipott, 1993).

Artifact Control and Data Reduction

The video records for all participants were inspected for movements that would disrupt the psychophysiological measures (e.g., scratching, yawning, poking at the electrodes, posture shifts, and talking). Onset and offset of artifacts was scored using a computer assisted system for behavior assessment (CODER2; Kappas, 1992) and the corresponding periods were set missing and were excluded from further analyses. Two different approaches were chosen to assess "genuine enjoyment" and to exclude mixed-affect episodes. Using an automated system for the detection of the onset and offset of expressive behavior (Banse, Hess, & Kappas; 1992) mean log scores for zygomaticus major and orbicularis oculi activity were computed for only those periods during which corrugator supercilii reactions were absent. To assess genuine enjoyment, mean log scores for zygomaticus major and orbicularis oculi activity were calculated for periods during which both muscles showed simultaneous reactions (Duchenne, 1990/1862; Ekman & O'Sullivan, 1991; using the same onset criteria as for the corrugator activity in the first method).[8]

Results

Self-Report

The participants' ratings on the scale "amusé, joyeux, gai" of the French version of the DES served as a manipulation check. A 2 (film) × 3 (sociality) × 2 (friends/strangers) mixed design analysis of variance (ANOVA) was conducted. For the between-subjects factors sociality and friends/strangers no main effects or interactions were found. As expected, a significant main effect for film emerged $F(1, 40) = 21.95, p < .001$ with the very amusing film eliciting more happiness/amusement than the moderately amusing film ($m = 3.37$, $SD = 1.29$ and $m = 2.04$, $SD = 1.67$ respectively).

Muscle Activity

A 2 (film) × 3 (sociality) × 2 (friends/strangers) mixed design ANOVA was computed for corrugator activity, corrected zygomaticus major and orbicularis oculi activity, and 'Duchenne patterns, respectively. Figures 2–5 show the means and standard errors.

Sociality of the situation. Regarding the sociality of the situation a main effect emerged as a trend for $OC_{\text{Duchenne pattern}}$ $F(2, 34) = 3.07, p = .059$. For $OC_{\text{corrected for cor activity}}$ this effect was not significant, but the same data pattern was found. Specifically, consistent with Fridlund's (1991) findings, participants who believed that another person was performing the same task at the same time (implicit coviewing condition) showed more orbicularis oculi activity than participants who believed that the other person was performing an irrelevant task. Participants who watched the film together with another person showed the most orbicularis oculi activity. However, when the data was analyzed separately for friends and strangers the effect emerged only for friends $F(2, 18) = 2.85, p = .084$ as a trend. This latter finding is consistent with Wagner and Smith's (1991) hypothesis. Multivariate contrasts revealed for both orbicularis oculi measures significant or marginally significant differences between the implicit irrelevant task condition and the explicit coviewing condition. Furthermore, the combined implicit and explicit coviewing conditions were significantly or marginally significantly different from the implicit irrelevant task condition for both measures. No significant contrasts emerged for the zygomaticus measures for friends.

For strangers the pattern was different. No main effect for sociality was found for any of the measures. Yet, for the two zygomaticus measures, a priori planned comparisons contrasting explicit coviewing with the implicit irrelevant task condition, revealed a trend in the predicted direction for the more amusing film (i.e., more facial activity in the explicit coviewing condition; for $ZYG_{\text{Duchenne pattern}}$ $m = 1.57$, $SD = .23$ and $m = 1.81$, $SD = .34$ respectively; for $ZYG_{\text{corrected for cor activity}}$ $m = 1.51$, $SD = .22$ and $m = 1.73$, $SD = .32$ respectively).

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[7] Corresponding to European AC frequency.

[8] For this a data driven threshold was computed adapting a procedure developed by W. Hess (1973) for the detection of pauses in speech. This procedure is particularly useful to distinguish events from noise. Based on these threshold levels mean EMG was computed for above threshold zygomaticus major and orbicularis oculi values complying with the additional criteria mentioned above.

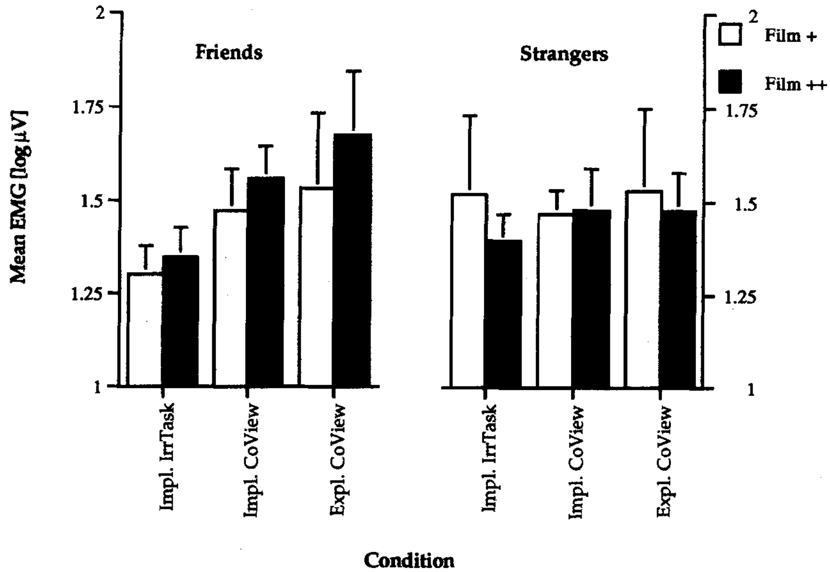

Figure 2. Mean electromyography (EMG) for orbicularis occuli (no corrugator activity) as a function of sociality and intensity of emotion eliciting stimulus.

Intensity of the emotion eliciting stimulus. Regarding the effect of the intensity of the emotion eliciting stimulus, main effects for film emerged for both zygomaticus measures. However, these main effects were modified by significant Friend × Film interactions. Friend × Film interactions emerged for all measures ($ZYG_{\text{corrected for cor activity}}$: $F(1, 34) = 5.13$, $p < .05$; $OC_{\text{corrected for cor activity}}$: $F(1, 35) = 3.71$, $p = .062$; $ZYG_{\text{Duchenne pattern}}$ $F(1, 34) = 4.44$, $p < .05$; $OC_{\text{Duchenne pattern}}$: $F(1, 34) = 7.31$, $p < .05$).

When the data was analyzed for friends and strangers separately, differences in facial activity due to the intensity of the stimulus emerged for friends only. Specifically, for friends a main effect for film was found for all muscle sites, $ZYG_{\text{corrected for cor activity}}$: $F(1, 18) = 9.61$, $p < .01$; $OC_{\text{corrected for cor activity}}$, $F(1, 19) = 16.48$, $p < .001$; $ZYG_{\text{Duchenne pattern}}$ $F(1, 18) = 9.23$, $p < .01$; $OC_{\text{Duchenne pattern}}$: $F(1, 19) = 35.88$, $p < .001$. No main effects of friendship were found and no further interactions.

Relative contributions of the intensity of the emotion eliciting stimulus and the sociality of the situation. To assess the relative contributions of the effect of the stimulus intensity and the sociality of the situation on facial activity eta squared was calculated separately for friends and strangers (see Table 1). Over-

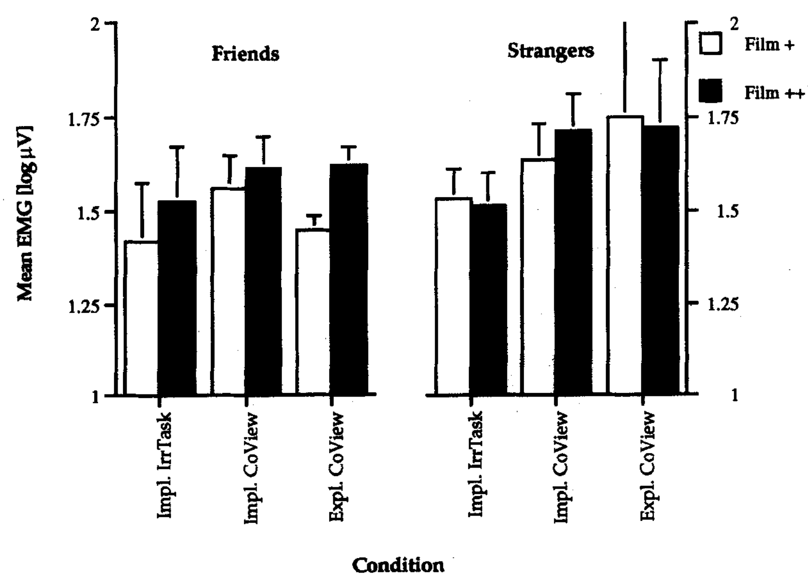

Figure 3. Mean electromyography (EMG) for zygomaticus major (no corrugator activity) as a function of sociality and intensity of emotion eliciting stimulus.

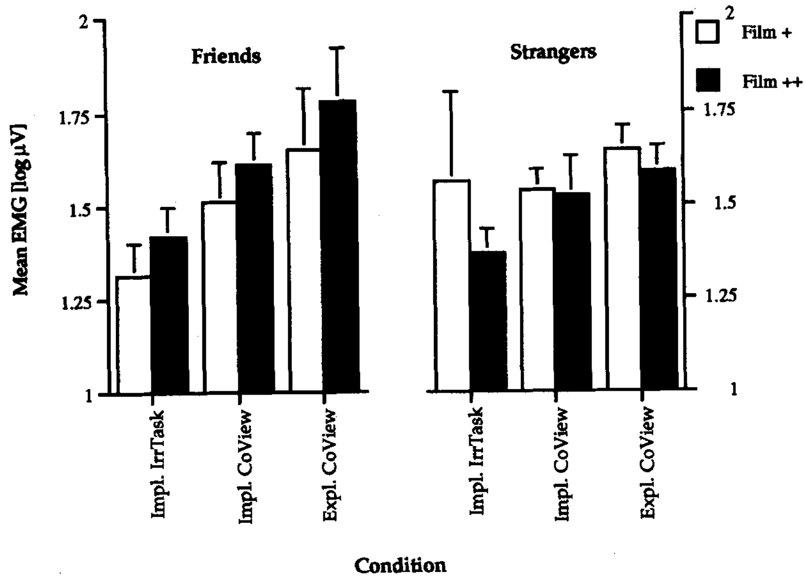

Figure 4. Mean electromyography (EMG) for orbicularis occuli (for simultaneous oculi and zygomaticus activity) as a function of sociality and intensity of emotion eliciting stimulus.

all the intensity of the stimulus explains more variance than the sociality of the situation for friends. For strangers, however, neither of the two factors explains a satisfactory portion of the variance. Regarding the two muscle sites, we found that, for friends, the intensity of the emotion eliciting stimulus explains more variance than the sociality of the situation for the orbicularis oculi measures while for the zygomaticus measures only the intensity of the emotion eliciting stimulus explains a satisfactory amount of variance. Regarding strangers, this pattern is reversed. However, one should note that for strangers very little variance is explained overall by the independent variables.

SCL. No significant main effects or interactions emerged for SCL.

Discussion

Regarding the effect of sociality, our data do not support Fridlund's (1991) notion that social context predicts the intensity of smiling better than does emotion, but rather, that the underlying emotion as well as the social situation determines the intensity of smiling in the case of the explicit or implicit presence of friends. In addition, our data show that the type of relationship

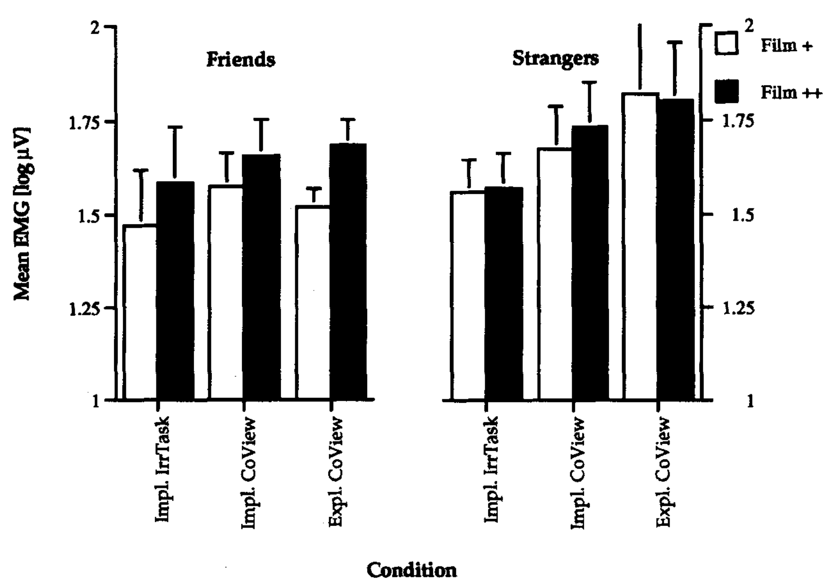

Figure 5. Mean electromyography (EMG) for zygomaticus Major (for simultaneous oculi and zygomaticus activity) as a function of sociality and intensity of emotion eliciting stimulus.

Table 1
Eta (Squared) by Effect and Dependent Measure for Friends and Strangers

Muscle site	Film	Sociality	Sociality × Film
Friends			
Orbicularis oculi (corrected for corrugator activity)	.464	.154	.136
Orbicularis oculi (Duchenne pattern)	.666	.241	.024
Zygomaticus major (corrected for corrugator activity)	.348	.042	.093
Zygomaticus major (Duchenne pattern)	.339	.027	.037
Strangers			
Orbicularis oculi (corrected for corrugator activity)	.031	.006	.034
Orbicularis oculi (Duchenne pattern)	.079	.069	.064
Zygomaticus major (corrected for corrugator activity)	.010	.103	.188
Zygomaticus major (Duchenne pattern)	.025	.129	.077

between expressor and audience needs to be considered. Specifically, for the presence of strangers, no effect of either the funniness of the film or the sociality of the situation was found, but rather a medium level of expressiveness regardless of the experimental condition. These results are in accordance with Wagner and Smith's (1991) hypothesis regarding the differential effects of the sociality of the situation on expressiveness for friends and strangers.[9] Inspection of the baseline SCL before the collaborative task preceding the experiment shows that friends had higher baseline levels than strangers. Although this difference is smaller by the time of the first experimental task it is reasonable to assume that this finding reflects the fact that the experimental situation was different for friends than for strangers in a number of ways.[10] However, further studies are indicated to investigate the mechanisms involved in producing different subjective experiences for strangers and friends in such a setting.

The present findings support the notion that facial displays should be considered as messages—with a signal as well as a symptom value. The relationship between expressor and audience can then be conceptualized as one of the marginal conditions influencing the relative balance between these components. In this framework, the notion of a general sociality effect should be replaced by a more detailed theory regarding social influences on expressive displays.

Moreover, the question of how social influences affect expressive displays has not been sufficiently considered. Fridlund (1991) demonstrated that sociality influences the intensity of facial displays. However, intensity is not necessarily the only difference between more and less social displays. Displays shown in the presence of an emotional stimulus when the expressor is alone are the least "social" expressions and those shown solely for the benefit of an audience in the absence of an emotion elicit the most social expressions—two types of expressions frequently referred to as spontaneous and voluntary, respectively. This distinction should not be viewed as referring to two mutually exclusive extremes; rather, as we have noted elsewhere (Hess, Kappas, McHugo, Kleck, & Lanzetta, 1989; Hess & Kleck, 1990), the voluntary and spontaneous expressions should be viewed on a continuum. However, anatomical as well as clinical evidence indicates that these expressions are enervated via different neurological pathways (e.g., Rinn, 1991). Furthermore, there is evidence that spontaneous and voluntary expressions tend to differ regarding their dynamics and their constituting elements as well as their intensity (Ekman, Friesen, O'Sullivan, 1988; Hess & Kleck, 1990; Hess et al., 1989). Duchenne already (1990/1862) has pointed to the importance of the presence of orbicularis oculi activity as an indicator of "felt" smiles. This notion has been supported empirically (e.g., Ekman, Davidson, & Friesen, 1990). It is interesting to note that for strangers in the present study, the pattern of results for zygomaticus major (which is relatively easy to control, see Rinn, 1991)—although reaching only marginal significance—corresponds to a sociality effect, whereas for orbicularis oculi (a muscle more difficult to control) no such pattern was found. In view of these reflections, assessing the intensity of facial displays as a means of assessing sociality may not be the most adequate procedure. Such an analysis might be profitably complemented by use of detailed topographical analyses (Cacioppo, Marshall-Goodell, & Dorfman, 1983; Hess et al., 1989). In this context it is interesting to note that little is known concerning the perceptual integration of smiles or other facial expressions over time. However, recent evidence from Kahneman, Frederickson, Schreiber, and Redelmeier (1993) concerning hedonic self-judgments suggests that such judgments are better explained by taking into account the peak value and the value at the end of an episode than by parameters that take duration into account.

Recent studies regarding the neuropsychological basis of human emotions support the notion that the processing of emotional information and the elicitation of emotional behavior may occur simultaneously at different levels (cf., Gainotti, Caltagirone, & Zoccolotti, 1993). Based on models such as the one proposed by Leventhal (e.g., Leventhal, 1984; Leventhal & Scherer, 1987) or by Buck (1984), emotions may be conceptualized as multicomponent hierarchical processing systems. Leventhal (1984) proposed three levels of processing. The sensory motor system represents a basic set of neuromotor programs that correspond to basic emotions and their associated expressive components. The schematic and the conceptual systems on the other hand represent memory systems that abstract and store memories of the prior conditions evoking the emotions together with the memory of the emotion itself. On the schematic level, the prior conditions that evoke the neuromotor response are associated with the resulting expressive behavior, autonomic response, and the concomitant subjective feeling state whereas the conceptual level represents an abstract, preposi-

[9] Note, however, that Wagner & Smith (1991) were concerned only with the general differences in expressiveness between friends and strangers and did not address the impact of implicit audiences.

[10] For the baseline period preceding the collaborative task a marginally significant main effect for friend emerged with $F(2, 35) = 2.66, p = .084$. For the baseline period preceding the viewing of the first film no significant or marginally significant main effects or interactions emerged.

tional, self-reflected memory structure. It is this latter system that may be used for the voluntary performance of emotional expressive acts. One can conceive of these three levels of processing as working simultaneously in response to emotion eliciting stimuli.

Recent evidence regarding the cortical and subcortical routes involved in assigning emotional value to external stimuli support the notion that human emotions are indeed hierarchically organized with subcortical structures generating specific sets of expressive, behavioral, and autonomic emotional reactions to appropriate stimuli (e.g., LeDoux, 1989). These neuromotor programs are integrated together with the cognitive components of cortical processing (see Gainotti et al., 1993) into a system responsive to the exigencies of social situations. It is plausible to assume that social and cultural influences on affective displays operate at both the schematic and the conceptual level. On the schematic level overlearned responses and modulation rules are represented. These responses do not require conscious intervention or awareness to be activated. Thus, at this level, social influences could be viewed as spontaneous. On the conceptual level, on the other hand, social and cultural norms and values are consciously evaluated (e.g., Scherer, 1986; Weiner, 1986) and expressive displays may be modified based on these evaluations. Consequently, the attempt to define expressive behavior either as solely a function of affective state reflected in subjective feeling state or solely as a function of the sociality of the situation appears overly simplistic and outdated.

In our view, cultural and social variables interact with innate systems. In this sense, the impact of social situations on emotions and their displays is not different from the impact of a noxious smell or a painful stimulus. Although people may be more flexible in their reactions to social stimuli, this does not imply that these reactions are necessarily more conscious or that they replace other emotional systems that fulfill an important function in facilitating people's interaction with their environment. Current notions of the influence of sociality seem to have essentially expanded the concept of social facilitation to implicit sociality, while denying the multifaceted nature of social interactions. The basic rationale of our study was an attempt to do justice to the complexity of social interactions, and although our approach is still reductionistic with regard to the variables chosen, we hope that it will inspire further studies that seek to include more or different aspects of the social–emotional processes. On the basis of these considerations, the distinction between social and emotional influences on expressive displays that is at the basis of Fridlund's (1991) approach seems to be an example of those artificial dichotomies in psychology, such as the mind–body distinction, that hinder more than help scientific progress.

In summary, we do not think it useful to argue about the *absolute* impact of the three factors investigated (sociality of the situation, relationship between expressor and audience, and the intensity of the stimulus), but we find it important to demonstrate that both the underlying affective state and the relationship between the expressor and the "other" as well as the sociality of the situation are determinants of expression intensity. Clearly, the intensity of a smile is not exclusively determined by either the affective state or the social context, but by the complex interplay of many factors. Fridlund (1992) criticized the so-called "romanticist notion of a two-factor theory of emotion," by which he refers to an interaction of an underlying emotional state with voluntary control imposed by the social situation. His one-factor theory, however, cannot account for the data pattern found in this study, as it is unclear how the influence of stimulus intensity on expressivity can be accounted for in such a framework.

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