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Sociality Effects on the Production of Laughter.

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ABSTRACT. Certain facial displays (typically the human smile) have been found to vary with a situation's sociality. Because the facial display that accompanies laughter is under less voluntary control, it is a stronger test of sociality effects. Participants (N = 162) were videotaped watching a humorous videoclip in 1 of 3 conditions: alone, in a same-sex dyad with a stranger, or in a same-sex dyad with a friend. The frequency and time spent laughing were significantly greater in one or both dyadic conditions than in the alone condition, although no differences existed for self-reported evaluations of the videoclip's funniness or amusement felt. When the self-report measures were controlled for, the dyads of strangers (compared with the alone condition) were associated with the frequency of laughter. Although the results provide further support for sociality effects, the situational demands faced by participants may be a better predictor of facial displays than level of sociality.

Key words: facial displays, laughter, sociality

LAUGHTER'S UBIQUITOUS OCCURRENCE during interaction makes it an important topic of social psychological study. Researchers studying the psychology of laughter typically have been concerned with the relation of laughter to a sense of humor (for exceptions, see Fry & Savin, 1988; Hayworth, 1928; Provine & Yong, 1991). Indeed, humor and laughter have been used interchangeably (e.g., Yovetich, Dale, & Hudak, 1990), but a strong relation between the two has not been demonstrated empirically (McGhee, 1977; Provine, 1997). When laughter has been examined, it has been used as a means to reveal psychological properties or simply as a byproduct of more interesting cognitive processes. Researchers, therefore, have tried to discover personality traits associated with laughing (Hehl & Ruch, 1990) or attitudes revealed in laughter (Grammer, 1990), and to examine the effects of laugh tracks (Olson, 1992) or other stimuli, such as alcohol, on laughter production (Weaver, Masland, Kharazmi, & Zillmann, 1985). Laughter, howeve r, occurs overwhelmingly during social interaction (Provine & Fischer, 1989) and, in treating laughter as an epiphenomenon of cognitive events, researchers have learned comparatively little about the behavior of laughter. Provine arid Yong argued that although researchers have explored laughter as it relates to psychological properties, less is known about the structure of laughter than about bird songs.

In evolutionary terms, human laughter is viewed as a homologue of the primate relaxed open-mouth display, known less formally as the play face (Darwin, 1872; Redican, 1982; van Hooff, 1972). Homologies are behaviors present in more than one species because of the existence of a common ancestor (Fridlund, 1994). The play face is characterized by a rather widely opened mouth, with lips that remain covering all or the greater part of the teeth (van Hooff). The play face derives its name from the context of occurrence in which this display occurs, rough-and-tumble-play episodes observed in all of the higher primates, including human children (Loizos, 1967). The play-face term does not necessarily imply the accompanying presence of positive

emotion (e.g., happiness). The play face and the vocalization heard with it, laughter (Preuschoft, 1992), are usually associated with positive emotion; however, both laughter and the play face can occur with negative, even derisive emotions, such as those related to jeering (Ei blEibesfeldt, 1989). In humans, the play face and laughter have been emancipated from rough-and-tumble-play contexts and occur in both adults and children. Although laughter is primarily an auditory signal, in the present study we examined one variety of laughter that occurs with the play-face display.

The Behavioral-Ecology View of Facial Displays

There is a growing body of empirical work concerning the communicative aspect of facial displays (Andrew, 1972; Chovil, 1991; Fridlund, 1994; Kraut & Johnston, 1979) and of emotions (Ginsburg, 1997; Harrd & Gillett, 1994; Sarbin, 1995). In what he termed the behavioral-ecology view of facial displays, Fridlund (1994, 1997) used evolutionary and ethological perspectives to argue that facial displays are communicative acts (signals) that are primarily social, occurring within particular contexts. According to Fridlund, facial displays communicate the intent or future behavior of an actor and have evolved because they facilitate interaction; therefore, they need not represent an internal, emotional state of the actor.

In support of the behavioral-ecology argument, researchers have demonstrated that facial displays vary with the sociality of the situation (Fernandez-Dols & Ruiz-Belda, 1995; Fridlund, 1991). Sociality usually is defined as the extent to which a situation allows individuals to fully interact with one another (Chovil, 1991). Chovil, for example, demonstrated that the actual presence or the visual availability of storytellers relating close calls potentiated facial displays by listeners. The listeners in the nonvisual conditions (over a telephone or separated by a partition) did not exhibit as many displays as did listeners in the visual (i.e., more social) conditions. This sociality effect on facial movements and emotion supports the behavioral-ecology view's emphasis on communication and underscores the use of the term facial display rather than facial expression.

Although researchers have found evidence to support a behavioral-ecology view of facial displays using the human smile (Fernandez-Dols & Ruiz-Belda, 1995; Kraut & Johnston, 1979), less attention has been given to the facial display accompanying laughter. Whether the behavioral-ecology view applies to all facial displays is an untested empirical question. Indeed, perhaps laughing does not fit into a behavioral-ecology conceptualization as easily as smiling does if, as has been previously suggested, this behavior is under automatic activation (Averill, 1969; Porteous, 1988; Provine, 1992). The purpose of this study is to examine whether the behavioral-ecology view of facial displays is supported when the facial display examined is the play face, the display that accompanies laughter (Preuschoft, 1992).

The Study of Laughter

Rather than explicitly questioning the link between facial displays and internal feeling states, researchers who have examined laughter apart from humor or other psychological properties have noted its social aspect (Chapman, 1976). Foot and Chapman (1976) observed that laughter "is also used for maintaining the flow of interaction in our daily encounters: filling in pauses in our conversations and maintaining the interest and attention of our conversational partner. It is in fact highly probable that we use laughter for these social purposes, much more frequently than we use it in response to actual humor stimuli" (p. 188).

In an examination of laughter in therapy groups, Nicholas (1990) reported that the presence of laughter functioned like a group norm that was established early and remained stable over time. People laugh more when others are present than when alone (see Chapman, 1983, for a review), or when they hear others laughing (Cupchik & Leventhal, 1974). Brown, Wheeler, and Cash (1980) demonstrated that children laughed to a stimulus tape after they had seen other children laughing but not after they had observed other children who were not laughing. Laughter during conversation is not primarily a response to a joke. In an observational study of naturally occurring laughter, the frequency of jokes as occasions for laughter was low-only 10% to 20% of the laugh episodes were estimated by the observers to be a response to something humorous (Provine, 1993). Provine reported that laughing was more than 30 times as likely to be performed by research participants in social than in solitary settings (Provine & Fischer, 1989) . In Provine's studies, participants were more likely to speak to themselves when alone than they were to laugh. These studies, both in naturally occurring contexts and in laboratory settings, support the claims of the behavioral-ecology view: Facial displays, including laughter, serve social motives. These studies were not conclusive, however, because they did not include the necessary controls for respondent emotion used in testing the behavioral-ecology view. In the present study, we have included a measure of emotion, so that we could tease apart emotional influences on laughter.

Although certain facial displays, such as the smile, have been examined with the behavioral-ecology view, laughter has not been so studied. Because smiling is strongly linked to interaction as an appeasement gesture (LaFrance & Hecht, 1995) and is so economically produced (the movement of one bilateral muscle, zygomatic major), a display like laughter, which is under less voluntary control, would be a more stringent test of the sociality hypothesis. Evidence does support an ecological view for facial responses to odor and taste that are also under less voluntary control (Steiner, 1977; Tassinary, 1985). We tested the applicability of the behavioral-ecology view of facial displays to laughter by examining the occurrence of laughter in three increasingly social conditions (alone, in a dyad of unacquainted individuals, and in a dyad of friends). In this investigation, we included the nature of the relationship as a component of sociality and defined sociality as "a function of both the physical presence versus a bsence of others and the identity of the other person present in the situation" (Jakobs, Manstead, & Fischer, 1996, p. 127).

We predicted in Hypothesis 1 that laughter would increase as the sociality of the condition increased. In particular, we expected that laughing would be greatest in the presence of a preexisting relationship, a friendship, which is greater in sociality than a dyad of strangers (Jakobs et al., 1996). (The effect of a preexisting relationship should extend to other relationship types--for example, subordinate--superior relationships--but this study was restricted to the examination of one, thai of friendship.) In addition, we predicted in Hypothesis 2 that the relation between laughter and sociality exists independently of the participants' reported emotional responses to and evaluations of the material used to provoke laughter. The predictions follow directly from theoretical statements about facial displays derived from a behavioral-ecology view wherein laughter should occur as a function of the sociality of the context and not of the reported emotional reactivity of the participants. Because evaluations of f unniness have been demonstrated to be different from reports of feelings in reaction to a videoclip (Cupchik & Leventhal, 1974), both measures were used in the present investigation. In addition, the impact of gender on laughter was explored; however, no specific research questions were developed because of the absence of theoretical arguments for gender differences in the behavioral-ecology view and the lack of gender differences observed in previous sociality studies (Fridlund, 1991).

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Method

Participants

Participants were recruited from introductory psychology and sociology participant pools and received course credit for their participation. Students selected appointment times, which had been randomly assigned to a sociality condition. Participants first signed up for a time slot, then read instructions that asked the participant to either bring a friend or come alone. Use of this procedure helped to reduce the possibility of selection bias, because participants were unaware of their assigned sociality condition until after a time slot was selected.

There were 162 participants (52 in the alone condition, 50 in the stranger condition, and 60 in the friend condition). Of the 162 participants, 93 were women (57%) and 69 were men (43%). They ranged in age from 18 to 52 years (M = 19.81, SD = 4.69). Using a between-subjects approximation, with 50 participants per group (150 total participants), we found that the power to detect a medium effect size was .84 (Cohen, 1988).

Instruments and Materials

The emotion rating form used in the investigation was a modification of Izard's Differential Emotions Scale (DES; 1977), which has been demonstrated to be a reliable and valid instrument (Izard, 1977, 1991). Participants rate 10 emotion terms (guilty, afraid, surprised, shy, happy, attentive, scornful, sad, angry, and disgusted) on a scale ranging from absent (1) to strong (5). Two additional adjectives used with the modified version, anxious and amused, were also rated (Fridlund, 1991; Harrington, 1996).

To ensure a context that would allow for laughter, we followed previous researchers (Chapman, 1983) and used a humorous videoclip to produce a playful context. The 3-mm 45-s videoclip consisted of three humorous epochs: (a) from Ghostbusters; (b) a baby plays in a bathtub while her mother laughs; (c) from The Pink Panther Strikes Again.

Procedure

Upon arrival at the laboratory, the participants were informed that they would be videotaped and were provided the opportunity to decline to participate. No participants chose to decline. Participants in the dyadic conditions were instructed to complete the DES and rate the intensity with which they were currently feeling each of the emotion terms. All participants were then led into the video room, where they watched the videoclip alone, with a friend, or with a stranger, depending on their assigned condition. All participants heard the following instructions on the audio portion of the tape: "Please try not to talk during this part of the experiment. We are interested in your reactions to these videotapes. Try to act and feel as if you were really there while the event occurred. In other words, allow yourself to become involved in the situation as fully as possible."

After viewing the videoclip, participants completed the DES and were asked to rate "the way you felt while you were watching the videotape." All participants evaluated the videoclip's funniness on a scale ranging from not funny at all (1) to very funny (5). Participants in the dyadic

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conditions also rated the relationship with their partner on a scale from do not know the person (1) to closest friend (5). The relationship ratings served as a manipulation check for the dyadic conditions and as a check for possible influence of relationship level on the presence of laughter. Participants were debriefed and thanked for their assistance.

Results

Manipulation Checks

As a manipulation check on sociality, judges (psychology graduate students not involved in the project) were asked to evaluate the sociality of the three conditions. Following the procedure of Fridlund, Kenworthy, and Jaffey (1992), 12 judges evaluated each condition on a 100-mm numbered rating scale ranging from complete lack of social involvement (0) to the most social a situation could possibly be (100). The presentation of the conditions was counterbalanced to avoid order effects. The reliability of the judges' ratings was .98, and the intraclass correlation coefficient was .79.

The three conditions were then checked for sociality differences using a one-way analysis of variance (ANOVA) with judges' sociality ratings as the dependent variable. The conditions were significantly different from each other, $F(2, 33) = 20.74$, p [less than] .001. Planned contrasts revealed that the alone condition was significantly different from the dyads and that the dyads were significantly different from one another. The means were in the predicted direction: alone, $M = 9.17$, $SD = 12.40$; stranger, $M = 35.00$, $SD = 20.67$; and friend, $M= 61.67$, $SD = 24.80$.

As a further check on the sociality manipulation of the conditions, the dyads in the friend condition reported significantly more familiarity with each other, $M = 4.18$., $SD = .62$, than the dyads in the stranger condition did, $M = 1.10$, $SD = .29$; $t(43) = 24.18$, p [less than] .001.

Coder Reliability

Three coders recorded the occurrence of each participant's laughter. The videotapes were dubbed onto tape with a visible time code with resolution to the frame (1/30 s). Laughter was defined for the coders as the presence of inarticulate vocal sounds such as a reiterated ha-ha, he-he (Chapman & Wright, 1976). Because the facial display component of laughter was the focus of this investigation, coders were instructed to record a laughter episode if the play face was present and was accompanied by expulsions of air or torso movement without sound. Coders indicated the minute and second when a laughter episode began and again when the episode ended.

Intercoder agreement was established within a 2 s window (Nwokah, Hsu, Dobrowolska, & Fogel, 1994). Kappa values were all in the acceptable level, ranging from .78 to .79 for both onsets and offsets. One author then coded a random sample of 20% of each coder's episodes to assess coder drift. Kappas between the author and coders 1 and 2 were .92 and .81, respectively, for both onset and offset of laughter. Kappa for the author and coder 3 was .89 for laughter onset and .90 for offset.

Gender Differences

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No gender differences were found for the number of laugh episodes, t(105) = -1.29, p = .20, or laughter duration, t(99) = -.37, p = .71 (the difference in degrees of freedom is caused by the elimination of participants who did not laugh at least once in the analyses). The mean number of laugh episodes was 5.77 (SD - 4.63) for women and 6.98 (SD = 5.06) for men. In addition, no gender differences existed on the rating of the videoclip's funniness, t(105) = -1.03, p = .31, or post-videoclip happiness, t(105) = -.57, p = .57. Men reported more amusement, M = 3.93, SD = .73, than women did, M = 3.52, SD = .87; t(105) = 2.58, p = .011. Because gender was significant for this self-report measure only, it has not been included in the major analyses.

Frequency of Laughter

Nearly every participant laughed: In the alone condition, 4 participants never laughed and in the friend and stranger conditions, only 2 and 3 participants, respectively, did not laugh once. The greatest number of laughs for one respondent was 30, and overall, the mean number of laughs per respondent was 6.30 (SD = 4.84).

In subsequent analyses, one mean was calculated for each dyad using the scores of the two dyad members. This was done to preserve the statistical independence within the three groups. In addition, this procedure effectively halves the error variance while maintaining power levels (McClelland, 1997).

A one-way ANOVA was conducted to test the relation between laughter and sociality. The ANOVA was significant, F(2, 104) = 5.14, p = .007. Dunnett's C post hoc comparisons revealed that the friend condition, M = 7.28, SD = 4.36, was significantly different from the alone condition, M = 4.85, SD = 3.94.

Although the largest mean number of laugh episodes occurred in the stranger condition, M = 8.14, SD = 6.17, this difference was not significant due to the large variability within the dyad.

The total time spent laughing also was significantly different for the three sociality conditions, F(2, 98) = 5.60, p = .005. Participants who did not laugh are not included in this analysis. The respondents in the stranger condition laughed longest, followed by respondents in the friend and alone conditions, respectively. Table 1 presents the means and standard deviations for the time spent laughing in each of the three conditions, indicating that, on average, participants in the dyadic conditions spent twice as much time laughing as alone participants did. Dunnett's C post hoc comparisons revealed that the friend and stranger conditions were significantly different from the alone condition but not from each other.

The number of laugh episodes was correlated moderately with the evaluation of the videoclip's funniness, r = .38, p [less than].001, and with the post-videoclip ratings of amusement, r = .42, p [less than] .001, and happiness, r = .23, p = .016. Correlations between the duration of laughter and the funniness evaluations were r = -.10, p = .33; post-videoclip amusement, r = -.04, p = .67; and post-videoclip happiness, r = -. 18, p = .07. Friendship level was not dependably correlated with number of laughs, r = -.06, p = .64, or with mean duration of laughs, r = .03, p = .81.

Post- Videoclip Measures

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A hierarchical multiple regression was conducted to determine whether the sociality conditions had a significant influence on the presence of laughter, when the reported emotional responses and evaluations of the videoclip's funniness were partialed Out of the equation. First, interaction terms between condition and (a) reported emotion and (b) evaluation were entered to test for any differences among the sociality conditions and responses to the videoclip. These interaction terms were not significant and therefore were not included in the analysis. As Table 2 shows, we entered the emotional responses and evaluations of the videoclip as the first step in the hierarchical regression. The emotion variable used in the regression was the sum of the amusement and happiness ratings ([alpha] = .66). In the second step, we entered the dummy codings of the sociality conditions. The hierarchical regression revealed that the dyad of strangers, compared with the alone condition, was a significant predictor of frequency of laughter when the reactions to the videoclip were partialed out of the equation.

A one-way ANOVA was then conducted on the target emotion terms (amusement and happiness) with treatment condition as the between-subjects variable. Because nervousness or anxiousness also has been associated with laughter (e.g., Freud, 1960), the self-reports of anxiousness were examined. There were no significant differences among conditions on post-videoclip self-reports of amusement, $F(2, 104) = .77$, $p = .47$, happiness, $F(2, 104) = 1.99$, $p = .14$, or anxiousness, $F(2, 104) = .36$, $p = .70$. In addition, there were no significant differences among the three conditions on the evaluation of the videoclip's funniness, $F(2, 104) = 1.14$, $p = .33$. Differences in anxiousness between the individuals in the dyadic conditions measured before the videoclip began (but after they learned they would be watching a videoclip in a room with a stranger) were examined to assess any influences of pre-videoclip anxiousness on laughter. There were no significant differences between participants in the stranger and friend condition on the measure of anxiety taken before the videoclip viewing, $t(108) = -1.82$, $p = .072$.

Finally, Pearson product-moment correlations between the two members of the dyad were conducted to determine whether the number of laugh episodes or the durations of laughter between the respondents were related. Low correlations would indicate that the laughter of one dyad member was not associated with the

Laughter of the second member. Strong correlations between respondents would indicate that the laughter observed might be more of a social signal than an individual emotional response to the videoclip. The stranger dyads had higher correlations for both frequency, r= .73,p[less than]0l, and duration, r= .65,p [less than].01, of laughter than the friend dyads did, r = .66, p [less than].01, and r = .42, p [less than] .05, respectively.

Discussion

We derived a sociality hypothesis from a behavioral-ecology approach to facial displays and tested it using human laughter. Although sociality effects have been demonstrated with other facial displays (Kraut & Johnston, 1979), the sociality approach has not been applied to laughter. The results demonstrated that the sociality of a situation potentiates respondent laughter. Respondents who watched the amusing videoclip alone laughed significantly less than did respondents who watched the videoclip with another person present (either a friend or a stranger). This contextual effect took place even though no group differences were found for respondents' evaluations of the videoclip's funniness or for the amount of reported happiness or amusement

felt while watching the videoclip. Respondents who laughed more did not report being happier or more amused and they did not find the videoclip funnier than respondents who laughed less. As in previous research (McGhee, 1977), only moderate correlations were found between laughter and self-report measures of perceived funniness, happiness, amusement, and anxiousness. These results can be argued to support a behavioral-ecology approach to facial displays, wherein facial displays are argued to be primarily communicative signals, rather than the result of internal emotional processe:; that erupt on the face (Fridlund, 1994).

It was expected that the more social condition of friends would contain more laughter than the stranger condition would, but this was not supported. This sociality effect was expected for laughter especially, given the argument that laughter is indicative of interpersonal bonds. However, the regression results showed that the amount of laughter observed was primarily a function of the stranger-alone contrast when emotional responses to the videoclip were partialed out of the equation. This result was in the direction opposite from the work of researchers who found that experiments with strangers inhibit displays (Foot, Chapman, & Smith, 1977; Wagner & Smith, 1991), although of these studies, only Foot et al. examined laughter, and the respondents in that study were children.

It may be that the contextual demands of the situation are more important for affecting behavior than the degree of sociality is. In this sense, although the stranger situation might not be as social as interacting with a friend, the demands of the situation might require more social responsivity and allow for less lability in response, as the strong correlations between strangers' laughter indicated. Stranger dyads probably require more attention to normative requirements, including communicative norms and conversational rules. Unlike unacquainted individuals, friends do not need to establish to each other that they have a sense of humor. Kendon (1982) has written "when a situation is young, or when people are less acquainted, external devices such as set routines and explicit rules will be relied upon to sustain procedures in a situation. I also suspect that spatial-orientation and postural discipline will be much more closely observed. With the development of familiarity with the procedures of a situation or of familiarity with people, the information that participants need from one another does not have to be as complete. In fact, a commonality of view, a jointness of perspective can, in such circumstances, be taken for granted and it does not have to be expressed in observable behavioral relations" (p. 357).

Therefore, the situational demands of watching an amusing videoclip with a stranger may be more compatible with the display of laughter than the more social, less evaluative friend condition. This explanation is consistent with sociality interpretations of facial displays in general and can incorporate the disparate findings on audience effects with strangers.

The laughter observed in the stranger condition may highlight laughter's role in creating bonds. Laughter has been described as a social coupling process (Provine, 1997), as a means of increasing in-group solidarity (Martineau, 1972), and in the communication literature, as a coordinating device in which persons can proffer or display affiliation with one another (Schenkein, 1972). In addition, the role of laughter in strengthening interpersonal bonds between mother and infant has been well demonstrated (see Nwokah et al., 1994).

Facial displays are not invariably linked to reported emotional states (see Russell & Fernandez-Dols, 1997) and can readily be construed as situated intents to act (Frijda & Tcherkassof, 1997).

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Although judges interpreting facial displays are as likely to use emotion terms as behavior terminology (e.g., intent to act in the situation; see Yik & Russell, 1999), Frijda and Tcherkassof argued that the labeling of an act as an act of emotion depends importantly on the situational context. Both the context and the line of action on which the person has embarked--or is preparing to embark--are recognized as essential to our understanding of emotion and its relation to facial displays. A "situated line of action" approach has been proposed for the understanding of emotion (Ginsburg & Harrington, 1996) and for the study of facial displays in particular (Ginsburg, 1997). By calling attention Co situational demands and opportunities for action, the situated-action approach can be used to explain the prevalence of laugh ter in the stranger dyads in the present study. When participants in the stranger dyads arrived at the laboratory, they were unacquainted individuals, but the experiment required them to sit together to watch a humorous videoclip. In such circumstances, norms of reciprocity would be strong, and the likelihood of normative behavior would be high. Since the participants knew the study pertained to humor, laughter would be consistent with the demand characteristics of the situation, and laughter by one stranger likely would be reciprocated. Norm salience in the friend condition is likely to have been less strong, given the existing relationship of the participants.

This situated-action construal also raises a question about the operationalization of sociality. From a behavior-ecology perspective, sociality is specified by the communicative demands and affordances of the situation; the closeness of personal relationships need not be linearly related to the sociality of a particular situation. Thus, the lines of action likely to be demanded or afforded by a research situation should be taken into account in the study of emotion generally and of a behavior-ecology approach to it specifically.

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TABLE 1
Time Spent Laughing (in Seconds), by Condition

Condition	M	SD	n
1. Alone	11.27 a	8.77	48 respondents
2. Stranger	20.75 b	16.72	24 dyads
3. Friend	18.21 b	13.52	29 dyads

Note. Only participants who laughed at least once are included in the analysis. Means within a column that do not share subscripts are significantly different from each other at p [less than].05.

TABLE 2
Hierarchical Regression Analysis for Variables Predicting Amount of Laughter

Variable	B	SE B	[beta]
Step 1			
Reported emotion	.94	.38	.26 *
Evaluation	.61	.27	.24 *
Step 2			
Reported emotion	.87	.37	.24 *
Evaluation	.68	.27	.26 *
Friend contrast	.65	.63	.11
Stranger contrast	1.34	.65	.23 *

Note. [R.sup.2] = .19 for step 1; [R.sup.2] = .29 for step 2. [delta][R.sup.2] (change in [R.sup.2] by adding the step) = .10 (p [less than].01). The dummy coding of the conditions in this analysis was treated alone as the control (minimal sociality) condition, and each of the other two conditions was compared against it.

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(*.)p [less than] .05.

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