MIMICRY AND THE JUDGMENT OF EMOTIONAL FACIAL EXPRESSIONS

Sylvie Blairy, Pedro Herrera, and Ursula Hess

ABSTRACT: Lipps (1907) presented a model of empathy which had an important influence on later formulations. According to Lipps, individuals tend to mimic an interaction partner's behavior, and this nonverbal mimicry induces—via a feedback process—the corresponding affective state in the observer. The resulting shared affect is believed to foster the understanding of the observed person's self. The present study tested this model in the context of judgments of emotional facial expressions. The results confirm that individuals mimic emotional facial expressions, and that the decoding of facial expressions is accompanied by shared affect. However, no evidence that emotion recognition accuracy or shared affect are mediated by mimicry was found. Yet, voluntary mimicry was found to have some limited influence on observer' s assessment of the observed person's personality. The implications of these results with regard to Lipps' original hypothesis are discussed.

The communication of emotions and thoughts is an important aspect of everyday social interactions. Specifically, our ability to understand the emotional states as well as the interpersonal intent of our interaction partners influences the quality of our social interactions. The process underlying the understanding of another's emotional and cognitive point of view is called "empathy." In its original usage empathy referred to the tendency of observers to project themselves "into" another person in order to know the other person. This notion was first expressed by Lipps (1907) who believed that empathy is mediated by the imitation (mimicry) of other's behavior.

Sylvie Blairy, Department of Psychiatry, Erasme Hospital, Free University of Brussels; Pedro Herrera and Ursula Hess, Department of Psychology, University of Quebec at Montreal.

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Address correspondence to Sylvie Blairy, Department of Psychiatry, Erasme Hospital, route de Lennik, 808, Bruxelles, Belgium; E-mail: sblairy@ulb.ac.be.

Specifically, Lipps proposed a three-step model. First, witnessing the affective behavior (e.g., facial expressions, postures) of an interaction partner leads to imitation by the observer. Second, the observer's nonverbal mimicry induces—via a feedback process—the corresponding affective state in the observer. Third, the mimicking observers employ their internal states to understand the observed person's self. That is, the shared affect facilitates the understanding of the observed person's self.

Clinical scholars of various orientations have accorded the notions expressed by this model an important place in the psychotherapeutic process (see Hess, Philippot, & Blairy, in press). Specifically, Lipps' model was adopted by Freud (1921/1955) who considered mimicry a key process for empathy, that is, the understanding of the patient's emotional feeling states and perspectives. In fact, several therapeutic approaches such as dance therapy encourage mimicry of the client's behavior as means to enhance therapist's empathy (e.g., Ivey, Ivey, & Simek-Drowning, 1987; Siegel, 1995). However, so far, the effectiveness of this process has not been established (Bänninger-Huber & Steiner, 1992).

The present study investigated Lipps' model with a specific focus on mimicry of emotional facial expressions. One should note that Lipps' model is not restrained to the mimicry of emotional facial expression. In fact, the model is more general and encompasses different aspects of knowledge P) of the other's self that can be expressed through nonverbal communication channels and thus imitated. Facial expressions convey information regarding various characteristics of an individual such as gender, age, emotional state, attitude, personality traits (see Ekman, 1978). In the framework of present study, we decided to focus on facial expressive behavior and on two types of information commonly expressed through this channel, specifically, emotional state and personality. In the first part of the present paper, we tested Lipps' model for emotion recognition accuracy. That is, we argue that the improvement of knowledge regarding another's "self" should in this context lead to an increase in recognition accuracy. We therefore investigated the two causal links that articulate Lipp's model in this context, that is, the link between facial mimicry and emotion recognition accuracy on one hand, and the link between shared affect and emotion recognition accuracy on the other hand. Further, in the second part of the paper, we tested the notion that facial mimicry enhances empathy with regard to personality assessments in a first impression paradigm. Specifically, based on findings that empathy leads to more positive evaluations (e.g., Turner & Berkowitz, 1972; Batson, Duncan, Ackerman, Buckley, & Birch, 1981), we tested the notion that facial mimicry leads to more positive judgments of a target person's dominance and affiliation traits. These two traits were chosen because of their link to facial displays (e.g., Knutson, 1996; Hess, Blairy, & Kleck, in prep).

Mimicry and Emotion Recognition

As mentioned above, three different processes are implicated in the application of Lipps' model to emotion recognition. First, mimicry of emotional displays; second, emotional contagion, and finally, the facilitating effect of emotional contagion on interpersonal judgments. We will now turn to a brief review of the literature regarding these three processes in the context of emotional facial expressions.

Previous research suggests that individuals tend to mimic an interaction partner's facial displays (e.g., Bavelas, Black, Lemery, MacInnis, & Mullet, 1986; Dimberg, 1982, 1988; Englis, Vaughan, & Lanzetta, 1982; Hess, Philippot, & Blairy, 1998 ; McHugo, Lanzetta, Sullivan, Masters, & Englis, 1985; Lanzetta & Englis, 1989; Lundqvist, 1995; Vaughan & Lanzetta, 1980, 1981; Wallbott, 1991, for a review see Hatfield, Cacioppo, & Rapson, 1994; see also Hess, Philippot, & Blairy, in press). For example, Dimberg (1982) showed participants a series of emotional facial expressions of anger and happiness and measured muscular activity at the *Corrugator Supercilii* (brow) and *Zygomaticus Major* (cheek) sites. Dimberg found that participants showed more *Corrugator Supercilii* activity when they were exposed to angry expressions than when they were exposed to happy expressions as well as more *Zygomaticus Major* activity when they were exposed to happy expressions than when they were exposed to angry expressions. However, facial mimicry does not always occur. For example, Hess et al. (1998) specifically investigated observers' facial reactions to emotional facial expressions in a series of judgment tasks. The results revealed that, depending on the nature of the decoding task, facial reactions to facial expressions may be either affective or cognitive. Specifically, participants were found to mimic only when they were asked to make affective judgments regarding the emotional facial expressions whereas when observers had to decide whether an emotional facial expression was posed or spontaneous, no mimicry was found. In this latter case, *Corrugator Supercilii* activity was related to cognitive load. Further, Lanzetta and colleagues found evidence for counter-mimicry, that is, facial expressions contrary to those shown by the model (e.g., Englis et al., 1982; Lanzetta & Orr, 1986).

In sum, there is evidence that observers mimic facial displays. However, the findings on counter mimicry and those reported by Hess et al.

(1998) suggest that this process may be somewhat less automatic and reflex-like than suggested by Lipps.

The second step of Lipps' model asserts that facial mimicry affects the observer's emotional state. The notion that facial displays influence affective state has been extensively investigated in the context of the facial feedback hypothesis (for a review see Matsumoto, 1987; Manstead, 1988; McIntosh, 1996). Lipps' model is based on the sufficiency version of this hypothesis (Tourangeau & Ellsworth, 1979), according to which the production of an emotional facial expression is sufficient to induce an emotional state corresponding to the facial expression. For example, Duclos, Laird, Schneider, Sexter, Stern, and Van Lighten (1989) found that contracting the muscles involved in fear and sadness expressions induced the target emotion. However, in general, only limited support for the sufficiency hypothesis has been found (e.g., Matsumoto, 1987; Manstead, 1988; McIntosh, 1996). Yet, despite the fact that the specific feedback process described by Lipps is not well supported, there is clear evidence for emotional contagion effects, that is, individuals who are exposed to emotional facial expressions tend to report emotional states congruent with these displays (e.g., Bush, Barr, McHugo, & Lanzetta, 1989; Gump & Kulik, 1997; Hsee, Hatfield & Chemtob, 1992; Laird, Alibozak, Davainis, Deignan, Fontanella, Hong, Levy & Pacheco, 1994; Schneider, Gur, Gur, & Muenz, 1994; Strayer, 1993, see also Cappella, 1993).

The third step of Lipp's model implies that the mimicking observers employ their own affective state as a means to recognize the interaction partners' emotional state. Specifically, observers are claimed to associate the changes in their behavior and their internal state with the emotion that usually causes these changes in themselves. This association then facilitates emotion recognition. While research regarding the influences of a person's affective state on social judgments has recently received considerable interest (e.g., Bower, 1991; Fielder, 1991; Forgas, 1992, 1995; Forgas & Bower, 1987), the specific effect of affective states on the recognition of emotional facial expressions has received less interest. One exception is a study by Bouhuys, Bloem, and Groothuis (1995). They found that when feeling more depressed, participants perceived more rejection/sadness in faces displaying weak emotions and less invitation/happiness in faces displaying strong emotions. However, no evidence supports the notion that individuals attribute the specific emotion that they are feeling to the facial expression of their interaction partners. Further, based on the Affect Infusion Model (AIM) proposed by Forgas (see e.g., Forgas, 1995), which describes how an individual's affective state influences social judgment processes, this outcome seems unlikely. Rather, according to the AIM, happiness should entrain a simplified, heuristic judgment process and thus less decoding accuracy whereas sadness should entrain a systematic, substantive judgment process and thus more decoding accuracy.

In summary, there is evidence that individuals who are exposed to emotional facial expressions show both congruent facial expressions and congruent affects—two crucial elements of Lipps' model as it applies to emotion recognition. However, while these two processes are generally well established, the articulatory links between facial mimicry and decoding accuracy in one hand, and between shared affect and decoding accuracy in other hand, have not yet been assessed. Two experiments were conducted to investigate these two causal links. Specifically, the first experiment assessed whether individuals mimic the emotional facial expressions they are decoding and whether they report the corresponding emotional state. Further, we investigated whether emotion recognition accuracy is associated with either facial mimicry or shared affect or both. The second experiment assessed the causal relationship between emotion recognition accuracy on one hand, and facial mimicry as well as shared affect on the other hand. Specifically, individuals who were instructed to mimic the emotional facial expressions that they were decoding were expected to be better decoders, and to report more congruent affect than individuals who were not instructed to mimic the emotional facial expressions.

Experiment 1

Experiment 1 addressed the question of whether individuals who are decoding a series of happy, angry, sad, disgusted, and fearful emotional facial expressions spontaneously show congruent facial expressions, and report congruent affects. Further, correlations between facial mimicry, shared affect, and emotion recognition accuracy were assessed.

Facial mimicry often produces weak, that is, at the level of visibility or below, facial expressions and thus may not be reliably assessed using observational methods. To address this problem, facial activity was measured using EMG as it allows the detection of facial activity too weak to be visible to the naked eye (see Cacioppo, Petty, Losch, & Kim, 1986; Tassinary & Cacioppo, 1992).

Method

Participants

Thirty volunteers (15 women and 15 men) were recruited at the University of Quebec at Montreal.

Stimuli

To avoid ceiling effects in decoding accuracy and allow for variance in decoding accuracy due to the experimental manipulation, we constructed a series of difficult to decode emotional facial expressions. Specifically, the facial expressions of happiness, anger, sadness, disgust, and fear for two male and two female Caucasian actors were selected from a series of standardized emotional facial expressions (JACFEE, Matsumoto & Ekman, 1988). Based on the neutral face (0%) and the emotional facial expression (100%) of the same actor, a series of intermediate expressions differing in physical intensity by 20% steps was constructed using the computer program Morph 1.0.[1] The resulting set of 4 (intensity steps: 20%, 40%, 60%, 80%) x 5 (emotions: happiness, anger, sadness, disgust and fear) x 4 (actors) stimuli were presented in a judgment study paradigm in which the participants task was to evaluate the expressions using the same scales as those employed in the present context (for more details see Hess, Blairy, & Kleck, 1997). Twenty emotional facial expressions corresponding to each of the five emotions shown by 4 actors that were accurately recognized by approximately 50% of the judges in the judgment study were chosen as stimulus material. The 50% criterion was chosen to allow for sufficient variance in decoding accuracy to detect any faciliatative effect of facial mimicry. The stimuli were presented using an Apple Macintosh Centris 610.

Dependent Measures

Decoding accuracy. Participants rated each expression on seven continuous scales, labeled happiness, sadness, fear, anger, disgust, surprise, and contempt.[2] They also rated how difficult they perceived the task to be. The scales were anchored by "not at all" at one extremity and "strongly" at the other. Participants made their ratings by using a mouse to click on the scales. The mouse click position was recorded and yielded a score between 1 to 200. Decoding accuracy was defined as the observers' ability to correctly infer the posed emotion. An expression was considered as accurately identified when the emotion receiving the highest intensity rating on the emotion profile corresponded to the target emotion. An accurately identified expression received a score of 1 and a misidentified expression received a score of 0.

Self-reported emotional state. Following the decoding of one facial expression for each emotion, participants were asked to complete a French adaptation of a questionnaire developed by Philippot, Chapelle, and Blairy

(1994) describing sensations that may be experienced during the decoding task. This questionnaire contains 16 scales describing a variety of physical sensations (e.g., butterflies in the stomach, feeling cold) as well as 6 scales describing subjective feeling states labeled positive feeling/good mood; feeling of fear/anxiety/distress; feeling of sadness/depression; feeling of cheerfulness; feeling of irritation/aggressiveness; and feeling of repugnance. The scales were continuous and anchored by "not at all" at one extremity and "strongly" at the other. Presenting these scales together with the physical sensations allowed to reduce the possibility that participants became aware that we were interested in their own emotional states. This questionnaire was introduced as a well-being questionnaire.[3]

Facial EMG. Facial activity at the *Corrugator Supercilii, Orbicularis Oculi,* and the *Levator Labii Alesque Nasii* sites was measured on the left side of the face. Electrode placements were chosen according to Fridlund and Cacioppo (1986). Muscular activity was measured using bipolar placements of Med. Associates Inc. Ag/AgCl miniature surface electrodes with Med. Associates Inc. electrolyte gel (TD41). The skin was cleansed with PDI disposable electrode prep pads (70% alcohol and pumice). A Contact Precision Instruments system with 60 Hz notch filter was used to amplify the raw EMG signals, which were integrated with 200 ms time constant. The smoothed EMG signal was sampled at 10Hz and stored to disk.[4]

Procedure

The experimenter explained to the participants that their task was to decode the emotion(s) portrayed by a series of stimulus persons. To reduce the possibility that participants became aware that the EMG electrodes were intended to measure facial expressions, a cover story suggesting that the electrodes served to measure facial skin temperature was employed. To justify the presentation of the well-being questionnaire, the experimenter explained that previous research had shown that performing a decoding task may influence the participants' well-being. In order to control for this phenomenon, a questionnaire describing sensations that could be experienced during the judgment task would be presented from time to time. Further, participants were informed that they would be filmed during the experiment. The video camera was hidden to avoid that participants focus on the camera during the experiment. Participants then signed a consent form repeating this information, they were seated in a comfortable armchair, and the electrodes were attached. In order to familiarize the participants with the procedure, they were asked to complete two practice trials during which the experimenter answered questions regarding the procedure.

For each trial, participants first saw the neutral face of the stimulus person for 10 seconds during which physiological measures were recorded. These recordings served as baselines. This specific baseline period was chosen to avoid confounding reactions to the stimulus persons with reactions to emotional facial expressions (see Hess et al., 1998). Then the emotional facial expression of the stimulus person was presented for 10 seconds, followed by the rating scales for the decoding task. Also, after one of the four expressions for each emotion, participants were asked to fill out the well-being questionnaire (i.e., the questionnaire describing physical sensations and affective reactions). The specific expression preceding the questionnaire was counter-balanced across subjects. At the end of the experiment participants were debriefed. Specifically, they were asked to speculate about the use of the well-being questionnaire. None of the participants revealed to have harbored any suspicions regarding a link between the emotion terms in the questionnaire and the facial judgment task.

Artifact Control and Data Reduction

The video records for all participants were inspected for movements that could disrupt the physiological measures. Using a visual editing computer program (PHYSIO3; Banse, 1995), periods corresponding to such movements were set missing and were excluded from further analyses. The periods during which the neutral faces were presented served as baselines. Standardized differences scores were calculated for each trial. All analyses reported were based on these scores.

Results

Preliminary analyses revealed neither significant main effects nor interactions involving Sex of participant. Consequently, all subsequent analyses were collapsed across this factor.

Facial EMG

Analyses of variance using a multivariate approach with Muscle site (Corrugator Supercilii, Orbicularis Oculi, and Levator Labii Alesque Nasii) as within subjects factor were conducted for each type of target facial expression. The means for the three muscle sites are shown in Figure 1. This

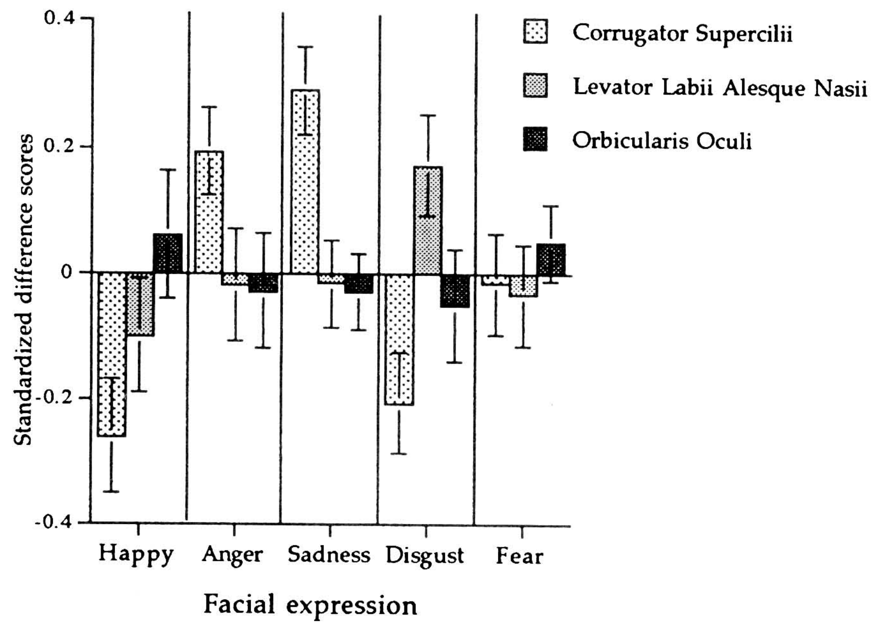

Figure 1. Mean standardized difference scores for observers' *Corrugator Supercilii, Orbicularis Oculi,* and *Levator Labii Alesque Nasii* activity as a function of the target person's emotional facial expression.

analysis across muscle sites is allowable as facial EMG data were previously transformed into z-scores and the data are thus on the same scale. To assess mimicry, expected patterns of muscle activity were specified as a function of each measured muscle's role in the production of facial expressions. Specifically, *Corrugator Supercilii* produces the drawing together of the eyebrows in a frown, which is found in expressions of anger but also in expressions of sadness and to some degree in disgust expressions. *Orbicularis Oculi* produces the wrinkles in the corners of the eyes when smiling (Ekman & O'Sullivan, 1991) and is thus found in happiness expressions but can also appear in disgust expressions as a function of the wrinkling of the nose and the eye region typical for that expression. Finally, *Levator Labii Alesque Nasii* is involved in the pulling up of the upper lip in expressions of disgust.

Consequently, mimicry of happiness expressions should be indicated by higher levels of *Orbicularis Oculi* activity than *Corrugator Supercilii* and *Levator Labii Alesque Nasii* activity. Mimicry of angry facial expressions as well as of sad facial expressions should be reflected by comparatively higher levels of *Corrugator Supercilii* activity. During the decoding of disgusted facial expressions, participants were expected to show more *Levator Labii Alesque Nasii* activity than *Corrugator Supercilii* activity the level of which should be higher than that for *Orbicularis Oculi* activity. Finally, because EMG activity recorded on the *Corrugator Supercilii* site may also result from *Frontalis* activity, we expected that during the decoding of fearful facial expressions, higher levels of *Corrugator Supercilii* activity may be observed.

Significant or marginally significant Muscle effects emerged for all types of target expressions, with the exception of fear expressions for which no significant effects emerged (happiness displays: $F(2,28) = 3.77$, $p=.035$; anger displays: $F(2,28) = 2.74$, $p=.082$; sadness displays: $F(2,28) = 5.70$, $p=.008$; disgust displays: $F(2,28) = 7.53$, $p=.002$). This suggests discernable patterns of facial activity during the decoding of expressions of happiness, anger, sadness, and disgust. Post-hoc analyses revealed these patterns to be congruent with the patterns expected for spontaneous mimicry.

Specifically, post-hoc analyses revealed that, as expected for mimicry, during the decoding of happy facial expressions, activity at the *Orbicularis Oculi* site was higher than both *Corrugator Supercilii* and *Levator Labii Alesque Nasii* activity, $t(29)= 2.58$, $p=.015$ and $t(29)= 2.08$, $p=.047$, respectively. Similarly, during the decoding of anger expressions a mimicry congruent pattern of facial activity was found as *Corrugator Supercilii* activity tended to be higher than both *Orbicularis Oculi* and *Levator Labii Alesque Nasii* activity, $t(29)= 1.82$, $p=.079$ and $t(29)= 2.37$, $p=.025$, respectively. As regards evidence for facial mimicry during the decoding of sadness expressions the post hoc analyses revealed higher *Corrugator Supercilii* activity than both *Orbicularis Oculi* and *Levator Labii Alesque Nasii* activity , $t(29)= 3.39$, $p=.002$ and $t(29)= 3.05$, $p=.005$, respectively, again a pattern consistent with the predicted mimicry pattern. For the decoding of disgust expressions, higher *Levator Labii Alesque Nasii* activity than both *Orbicularis Oculi* and *Corrugator Supercilii* activity , $t(29)= 2.66$, $p=.013$ and $t(29)= 3.60$, $p=.001$, respectively, was found which is in accordance with the expected pattern. However, the analyses did not revealed that *Orbicularis Oculi* activity was higher than *Corrugator Supercilii* activity. Nonetheless, as the predominance of *Levator Labii Alesque Nasii* activity is the more important of the two elements of the disgust pattern these findings can be interpreted as indicative of mimicry.

Self-Reported Emotional States

Repeated measures analyses of variance using a multivariate approach with Emotion (happy, anger, sadness, disgust, and fear) as within subjects factor were conducted on each dependent measure. The analyses revealed significant main effects of emotion for irritation/aggressiveness, $F(4,116) = 3.29$, $p = .014$, as well as for repugnance, $F(4,116) = 2.58$, $p = .041$. Specifically, participants reported feeling more irritation/aggressiveness following the decoding of angry, $t(29) = 2.37$, $p = .025$, and fearful $t(29) = 2.68$, $p = .012$, expressions than following the decoding of happy expressions. Further, participants reported feeling more repugnance following the decoding of disgust expressions than following the decoding of happy, $t(29) = 1.88$, $p = .070$, and fearful expressions and $t(29) = 2.02$, $p = .053$ (see Table 1).

In sum, congruent self-reported emotional states, indicative of emotional contagion, were found for the decoding of facial expressions of anger and disgust.

Correlations Between Decoding Accuracy and Self-Reported Emotional States

A significant negative correlation emerged between positive feeling and decoding accuracy for sad expressions $r(29) = -.48$, $p < .01$. No further significant correlations were found.

Correlations Between Decoding Accuracy and Facial Mimicry

No significant correlations were found.

Discussion

Findings from Experiment 1 generally support the notion that observers spontaneously mimic the emotional facial expressions they see, as well as the notion that they experience some emotional contagion. However, no link between decoding accuracy and facial mimicry or shared affect was found. Thus, the results from this experiment only partially support Lipps' model.

The present study used a correlational approach relating *spontaneous* mimicry to decoding accuracy. Yet, it is possible that the static and relatively weak emotional facial expressions employed as stimuli in the present

TABLE 1

Experiment 1: Mean Ratings and Standard Deviations for Observer's Self-Reported Emotional State as a Function of the Target Person's Emotional Facial Expression

	Positive feeling		Feeling of fear/ anxiety/distress		Feeling of irritation/ aggressiveness		Feeling of sadness/ depression		Feeling of cheerfulness		Feeling of repugnance	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Happiness	48.1	47.9	12.13	12.5	10.9	17.2	9.3	9.97	49.3	44.2	9.76	18.0
Anger	41.2	52.0	11.5	11.8	18.8	22.9	11.2	9.76	41.1	36.6	10.83	13.7
Sadness	52.6	45.0	15.33	21.5	15.7	21.6	12.1	13.9	44.6	40.5	12.6	18.1
Disgust	51.9	39.8	16.23	20.6	15.0	18.44	8.6	9.2	38.7	38.6	20.8	33.4
Fear	48.06	44.0	16.8	24.0	27.53	39.06	14.0	24.8	41.0	44.3	10.13	10.6

study, did not suffice to entrain the empathic process described by Lipps. Further, the clinical literature regarding the role of mimicry in the establishment of empathy advocates the use of voluntary mimicry to entrain the automatic process described by Lipps. Experiment 2 investigated therefore whether *voluntary* facial mimicry is accompanied by shared affect and facilitates emotion recognition.

Experiment 2

The goal of this study was to compare the decoding accuracy of individuals who were instructed to mimic emotional facial expressions to the decoding accuracy of individuals who were not so instructed. Further, we assessed whether individuals who were instructed to mimic emotional facial expressions felt the target emotion more intensively.

No significant main effect nor interactions involving Sex of participant emerged in Experiment 1. Further, the judgment study on the stimulus set of which the present stimuli are a subset did not reveal any sex of rater effects (see Hess et al, 1997). For practical reasons associated with the measurement of facial EMG using surface electrodes, in particular, the absence of facial hair, the decision was made to include only female participants.

Method

Participants

Forty female volunteers were recruited at the University of Quebec at Montreal. They were randomly assigned to either the mimicry group or the no-mimicry group.

Stimuli

The same stimuli as in Experiment 1 were employed.

Dependent Measures

Decoding accuracy. Following each trial, participants rated the expressions on the same seven scales as in Experiment 1. The accuracy scores were computed as in Experiment 1.

Self-reported emotional state. Following the decoding of one facial expression for each emotion, participants were asked to complete the same questionnaire describing subjective feeling states as in Experiment 1.

Facial EMG. Facial activity at the *Corrugator Supercilii, Orbicularis Oculi,* and *Levator Labii Alesque Nasii* sites was measured on the left side of the face using the same experimental material and method as in Experiment 1.[4]

Difficulty of the facial movement task. At the end of the experiment, participants were asked to rate the difficulty of the facial movement task on a seven point scale. This question served to assess whether the facial manipulations for the mimicry and the no-mimicry group were of comparable difficulty, as the difficulty of this secondary task may impact on decoding accuracy.

Procedure

The same general procedure as in Experiment 1 was employed with the difference that the participants were instructed to perform a facial motor task while judging the stimuli. The facial motor task for the participants in the mimicry group was to reproduce the expression portrayed by the stimulus person whereas the facial motor task for the participants in the no-mimicry group was to display a specific expression described before each trial. The expressions performed by the no-mimicry group were incompatible with the expressions portrayed by the stimulus person (see Appendix A). This was done to prevent participants from spontaneously mimicking the stimulus person's facial expression. The cover story was adapted to explain that the study concerned the impact of performing another activity during a judgment task and that previous research had shown that motor activity can influence emotion judgments.

Artifact Control and Data Reduction

The video records for all participants were inspected for movements that could disrupt the physiological measures as in Experiment 1. Since no neutral faces were presented for this study, the relaxation period served as baseline.[5] Standardized differences scores were calculated for each trial. All analyses reported were based on these scores.

Results and Discussion

Manipulation Check

Participants in the mimicry group were instructed to imitate the facial expression of the model whereas participants in the no-mimicry group were instructed to show incompatible facial expressions. A first manipulation check assessed whether participants in the two groups did indeed show different facial expressions. For this, a repeated measures analysis of variance using a multivariate approach with Muscle site (Corrugator Supercilii, Orbicularis Oculi, and Levator Labii Alesque Nasii) as within subjects factor and Group (mimicry vs. no-mimicry) as between subjects factor was conducted for each type of facial expressive stimulus. Differences in expressions for participants in the two groups should result in a significant Muscle site by Group interaction. Second, the facial expressive patterns described for Experiment 1 were used to assess whether the mimicry group and the no-mimicry followed the facial task instructions. That is, whether participants in the mimicry group did in fact mimic the expressions and whether participants in the no-mimicry group showed an incompatible expression. Figure 2 show the means for all conditions.

Did Participants in the Two Groups Show Different Facial Expressions During Decoding?

Significant Group x Muscle site interactions showing that the two groups displayed different facial expressions during decoding were found for the decoding of happy, $F(2,37) = 10.93$, $p<.001$, angry, $F(2,37) = 4.14$, $p= .024$, sad $F(2,37) = 12.67$, $p<.001$, disgust, $F(2,37) = 5.30$, $p=.009$, and fear $F(2,37) = 11.99$, $p<.001$, expressions. Further, significant main effects of Group and Muscle site were found for the decoding of happy expressions, $F(1,38)= 4.22$, $p=.047$ and $F(2,37)= 7.41$, $p= .002$, with participants in the mimicry group showing more *Levator Labii Alesque Nasii* activity than participants in the no-mimicry group $F(1,38)= 18.12$, $p<.001$. For anger expressions a significant main effect of Muscle site $F(2,37)= 6.78$, $p= .003$ emerged with participants in the mimicry group showing more *Corrugator Supercilii* activity as well as more *Levator Labii Alesque Nasii* activity than participants in the no-mimicry group, $F(1,38)= 4.74$, $p=0.36$ and $F(1,38)= 3.35$, $p=.075$. For the decoding of sad expressions significant main effects of Group and Muscle, $F(1,38)= 5.05$, $p=.030$ and $F(2,37)= 78.24$, $p<.001$ respectively, emerged. Partici-

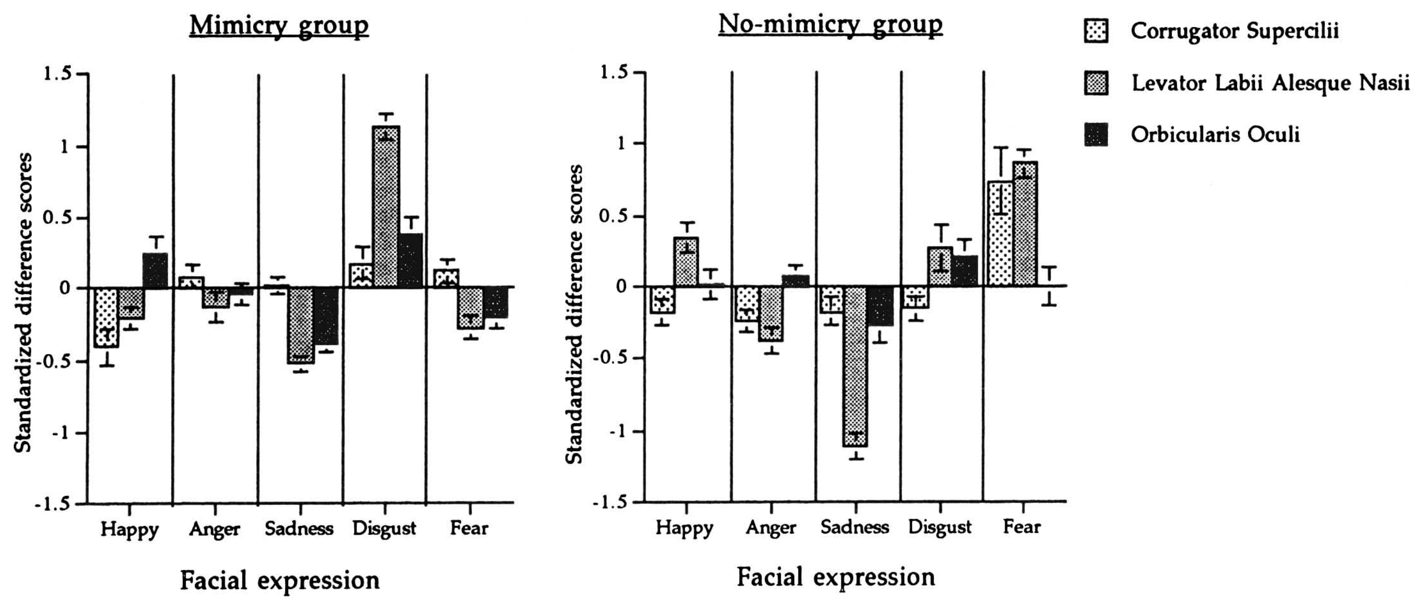

Figure 2. Mean standardized difference scores for observers' *Corrugator Supercilii, Orbicularis Oculi,* and *Levator Labii Alesque Nasii* activity as a function of the target person's emotional facial expression and facial task group.

pants in the mimicry group showed more *Levator Labii Alesque Nasii* activity than participants in the no-mimicry group $F(1,38) = 32.247$, $p<.001$.

For the decoding of disgust expressions significant main effects of Group and Muscle site, $F(1,38)= 16.86$, $p<.001$ and $F(2,37)= 18.67$, $p<.001$ respectively, were revealed with participants in the mimicry group showing more *Levator Labii Alesque Nasii* activity as well as more *Corrugator Supercilii* activity than participants in the no-mimicry group $F(1,38) = 21.86$, $p<.001$ and $F(1,38) = 4.84$, $p=.034$, respectively.

Finally for the decoding of fear expressions significant main effects of Group and Muscle site $F(1,38)= 25.65$, $p<.001$ and $F(2,37)= 11.89$, $p<.001$ respectively were found. Specifically, participants in the no-mimicry group showed more *Levator Labii Alesque Nasii* activity and more *Corrugator Supercilii* activity than participants in the mimicry group $F(1,38) = 77.26$, $p<.001$ and $F(1,38) = 5.336$, $p = .026$, respectively.

Thus, this manipulation check shows that participants in the two groups displayed different facial expressions for all decoded expressions. To assess whether these expressions were in fact the one's demanded by the facial task, and in particular, whether the facial expressions shown by the mimicry group can in fact be considered mimicry, post-hoc analyses were performed.

Did Participants Comply with the Specific Facial Task?

For happy expressions, for the mimicry group, as expected, higher *Orbicularis Oculi* than both *Levator Labii Alesque Nasii* and *Corrugator Supercilii* activity, $t(19) = 3.79$, $p<.001$ and $t(19) = 3.54$, $p = .002$, respectively was found. In contrast, participants in the no-mimicry group showed a different expression with more *Levator Labii Alesque Nasii* than both *Orbicularis Oculi* and *Corrugator Supercilii* activity, $t(19) = 2.85$, $p=.010$ and $t(19) = 3.59$, $p=. 002$, respectively. Thus, happy expressions were mimicked by the participants in the mimicry group but not by those in the no-mimicry group.

For anger expressions, although post hoc analyses did not reveal significant differences across the three muscles activity for the mimicry group, inspection of means confirmed the expected pattern. Further, participants in the no-mimicry group showed more *Orbicularis Oculi* activity than both *Corrugator Supercilii* and *Levator Labii Alesque Nasii* activity $t(19) = 2.73$, $p=.013$ and $t(19) = 5.19$, $p<.001$ respectively, a pattern inconsistent with mimicry of anger expressions.

For sad expressions, participants in the mimicry group showed, as expected, more *Corrugator Supercilii* activity than both *Orbicularis Oculi* and

Levator Labii Alesque Nasii activity, $t(19) = 6.03$, $p < .001$ and $t(19) = 6.87$, $p < .001$ respectively, whereas participants in the no-mimicry group showed more *Orbicularis Oculi* activity than *Levator Labii Alesque Nasii* activity $t(19) = 6.83$, $p < .001$, as well as more *Levator Labii Alesque Nasii* activity than *Corrugator Supercilii* activity, $t(19) = 10.79$, $p < .001$. Thus, the mimicry group showed evidence of facial mimicry whereas the no-mimicry group displayed an incompatible expression.

Participants in the mimicry group showed more *Corrugator Supercilii* activity than both *Levator Labii Alesque Nasii* and *Orbicularis Oculi* activity, $t(19) = 2.64$, $p = .016$, and $t(19) = 2.25$, $p = .036$, respectively, during the decoding of fear expressions. In contrast, participants in the no-mimicry group showed more *Levator Labii Alesque Nasii* activity as well as more *Corrugator Supercilii* activity than *Orbicularis Oculi* activity $t(19) = 5.96$, $p < .001$ and $t(19) = 3.02$, $p = .007$ respectively.

Finally, for disgust expressions, participants in the mimicry group showed the expected mimicry pattern with more *Levator Labii Alesque Nasii* activity than both *Corrugator Supercilii* and *Orbicularis Oculi* activity, $t(19) = 5.99$, $p < .001$ and $t(19) = 4.70$ $p < .001$, respectively, whereas participants in the no-mimicry group showed more *Levator Labii Alesque Nasii* activity as well as *Orbicularis Oculi* activity than *Corrugator Supercilii* activity, $t(19) = 2.66$ $p = .016$, and $t(19) = 2.18$ $p = .042$ respectively. Thus, the no-mimicry group showed a pattern that is compatible with mimicry of disgust—albeit at a much lower level than the mimicry group.

In sum, the post-hoc analyses confirm that both the mimicry and the no-mimicry manipulation can be considered successful as participants in the mimicry group showed the facial muscle pattern associated with mimicry for happy, sad, disgust, and fear expressions, and did not display incongruent facial expressions during the decoding of anger. Further, participants in the no-mimicry group generally displayed a different pattern of facial activity than participants in the mimicry group.

Difficulty of the facial task. No significant main effect of Group emerged $F(1,24) = .27$, ns. Thus, the difficulty of the two facial tasks can be considered comparable.

Decoding Accuracy

To assess whether voluntary facial mimicry facilitates decoding accuracy, profile analyses were employed. Profile analyses assess whether the assumption that the decoding accuracy profiles are parallel across the five emotions is tenable (that is, participants in the two groups show the same pattern of decoding accuracy across the five emotions) and whether the two decoding accuracy profiles are coincident (that is, whether the groups have similar levels of accuracy across emotions). The results show that the profiles were both parallel and coincident $F(4,35) = 1.37$, $p = .264$ and $F(1,38) = .00$, $p = .959$.

Thus, no differences in decoding accuracy as a function of facial mimicry emerged. However, it is possible that the concurrently performed facial movement task increased task difficulty to the point where any facilitative effect of facial mimicry on decoding accuracy might have been obscured by floor effects. A comparison of the level of decoding accuracy obtained in Experiment 1, where participants were not instructed to control their facial display, and the level of decoding accuracy obtained in the present experiment would be informative on this issue.[6] To compare accuracy scores, a repeated measures analysis of variance using a multivariate approach with Emotion (happy, anger, sadness, disgust, and fear) as within subjects factor and Group (mimicry, no-mimicry, and group from Experiment 1) as between subjects factor was conducted on each dependent measure. No significant main effect or interactions involving Group emerged. The failure to obtain a significant effect of facial mimicry on decoding accuracy does therefore not seem to be due to the performance of a second task during decoding. Thus, neither spontaneous nor voluntary facial mimicry increases emotion recognition accuracy.

Perceived Decoding Difficulty

The preceding analysis strongly contradicts Lipps' notion that facial mimicry facilitates recognition of another individual's emotional facial expressions. However, it is possible that mimicry facilitates emotion recognition by making the task seem easier without actually resulting in higher recognition accuracy. To assess this notion, a profile analysis on the self-reported task difficulty across the five emotions was conducted. The results showed that the profiles were parallel $F(4, 35) = .798$, $p = .535$ but not coincident $F(1,38) = 8.33$, $p = .006$ (see Figure 3). Specifically, post-hoc analyses showed that participants who voluntarily mimicked the facial expressions rated the decoding task as less difficult than participants who displayed an incompatible facial expressions for all expressions except happiness, $F(1,39) = 4.26$, $p = .046$; $F(1,39) = 5.11$, $p = .030$; $F(1,39) = 5.74$, $p = .022$, and $F(1,39) = 11.15$, $p = .002$ for angry, sad, disgusted, and fearful expressions respectively. Thus, voluntary mimicry decreased perceived decoding difficulty.

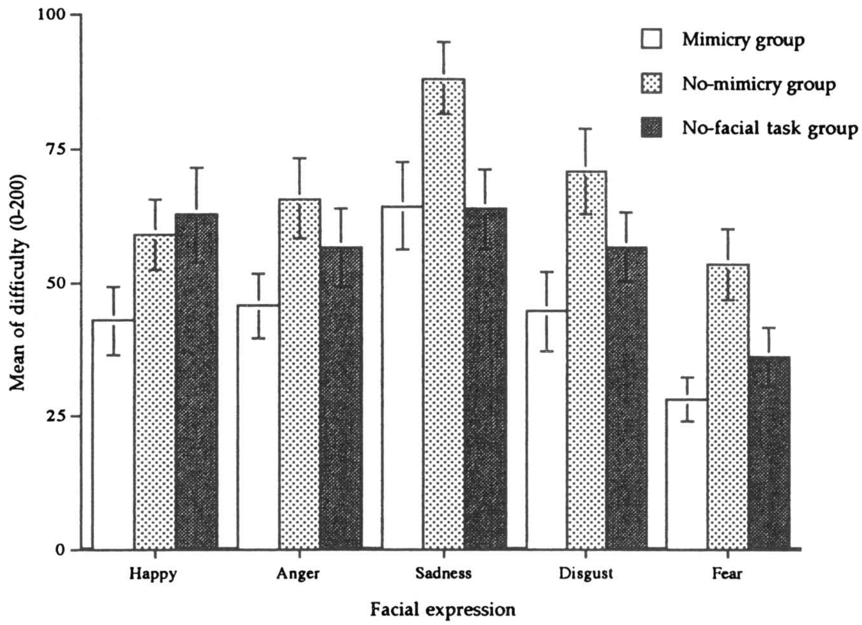

Figure 3. Mean ratings and standard errors for perceived decoding difficulty as a function of the target person's emotional facial expression and facial task group.

On the other hand, this finding may also be due to the fact that performing an incompatible facial movement task renders the task more difficult. To assess this alternative explanation, we compared self-reported task difficulty from experiment 1 with self-reported task difficulty from experiment 2, again using profile analyses. Figure 3 shows the means for this analysis.

The profiles for the no-mimicry group and the no-facial task group (Experiment 1) were not parallel $F(4,45) = 3.61$, $p = .012$. Specifically, the no-mimicry group rated the decoding task for sad and fearful expressions as significantly more difficult than the no-facial task group, $F(1,49) = 6.89$, $p = .012$, and $F(1,49) = 4.88$, $p = .032$, respectively. Profiles for the mimicry and no-facial task groups were parallel and coincident $F(4,45) = 1.17$, $p = .164$, and $F(1,45) = 2.08$, $p = .106$.

In sum, the voluntary adoption of an incompatible facial expression increases perceived task difficulty for some emotions. However, for expressions of anger and disgust, the differences between mimicry and no-mimicry group seem to be due to a facilitation effect induced by the mimicry task. This notion is further supported by an inspection of the means of the mimicry group and the no-facial task group. While no significant differences emerged, the means for the mimicry group are lower than the means of the no-facial task group for happy, angry, disgusted, and fearful expressions. Thus, while voluntary mimicry does not improve recognition accuracy it may decrease the perceived difficulty of the decoding task at least for the decoding of anger and disgust.

Self-Reported Emotional State

Emotional contagion is the second important element of Lipps model, which assumes this process to be mediated by mimicry. Emotional contagion should therefore be present in the mimicry group only. To assess this notion, a 2 (Group) x 5 (Emotion) analysis of variance was conducted on each of the 6 target scales from the well-being questionnaire. No significant main effects or interactions involving Group emerged. For positive feeling/good mood, feeling of irritation/aggressiveness, feeling of fear/anxiety/distress and feeling of repugnance, the results revealed significant main effects of Emotion $F(4,35) = 5.72$, $p = .001$; $F(4,152) = 2.83$, $p = .026$, $F(4,35) = 4.13$, $p = .008$, and $F(4,35) = 3.35$, $p = .020$, respectively. The means are shown Table 2. Post-hoc comparisons showed that participants reported more positive feeling after decoding happy expressions than after decoding any other emotional expression, $F(1,38) = 14.96$, $p < .001$, as well as more fear after decoding fearful expressions than after decoding any other emotional expression, $F(1,38) = 10.43$, $p = .003$, and finally more repugnance and more irritation after decoding disgusted expressions than after decoding any other emotional expression, $F(1,38) = 11.05$, $p = .002$, and $F(1,38) = 8.06$, $p = .007$, respectively. In summary, consistent evidence for emotional contagion was found for three of the five emotions. This effect did not differ as a function of mimicry. Thus, no evidence that emotional contagion is mediated by voluntary facial mimicry was found.[7]

Correlations Between Decoding Accuracy and Self-Reported Emotional States

Significant negative correlations emerged between decoding accuracy for sad expressions and positive feeling $r(40) = -.33$, $p = .037$ as well as between decoding accuracy for angry expressions and irritation/aggressiveness, fear/anxiety/distress, repugnance, and sadness/depression $r(40) = -.42$, $p = .007$; $r(40) = -.54$, $p < .001$; $r(40) = -.51$ $p = .001$ and $r(40) = -.50$, $p = .001$, respectively.

TABLE 2

Experiment 2: Mean Ratings and Standard Deviations for Observer's Self-Reported Emotional State as a Function of the Target Person's Emotional Facial Expression

	Positive feeling		Feeling of fear/ anxiety/distress		Feeling of irritation/ aggressiveness		Feeling of sadness/ depression		Feeling of cheerfulness		Feeling of repugnance	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Happiness	61.9	58.9	17.0	17.1	20.8	37.7	15.8	33.4	41.0	51.3	14.0	33.9
Anger	31.3	42.6	29.2	37.1	20.7	34.0	20.6	35.6	26.5	39.6	17.7	28.0
Sadness	29.9	38.0	18.3	17.1	18.6	32.4	24.3	42.1	26.5	35.8	13.4	22.3
Disgust	36.4	41.8	22.5	16.7	32.2	43.0	15.7	28.7	29.3	36.2	30.8	43.2
Fear	33.9	50.4	38.0	47.1	21.6	36.8	22.0	34.4	28.2	44.6	17.1	33.2

Does Spontaneous or Voluntary Mimicry Facilitate Recognition Accuracy?

In conclusion, Experiment 1 provides some support for the notion that individuals spontaneously mimic the emotional facial expressions they are exposed to. Both Experiment 1 and Experiment 2 provide evidence for emotional contagion effects in the present paradigm. However, neither spontaneous mimicry as assessed in Experiment 1 nor voluntary mimicry as assessed in Experiment 2 could be shown to increase decoding accuracy. Further, only for expressions of anger and disgust emerged a reduction of perceived task difficulty. While this latter finding is somewhat congruent with Lipps' model, it clearly can not be considered a support of the model in the light of the overwhelming negative results regarding decoding accuracy. Further, Lipps' model predicts positive correlations between shared affect and decoding accuracy, in the present study an effect in the opposite direction was observed. Specifically, self-reported negative affect was associated with lower decoding accuracy for angry expressions. Thus, the results do not support the Lipps' notion that facial mimicry induces congruent emotional states, which then facilitate emotion recognition.

Mimicry and Personality Judgments

The results from part 1 indicated no support for the notion that mimicry and contagion facilitate emotion recognition. However, Lipps' model applies not only to the decoding of emotional states, but also to judgments of the interaction partners personality. As mentioned above, facial expressions of emotion convey information not only about the expressor's affective state, but also about his or her interpersonal intentions and dispositions. For example, Knutson (1996) showed that facial expressions of emotion affect trait inferences of dispositions such as dominance and affiliation. Specifically, Knutson found that high dominance and high affiliation are inferred from happy expressions, high dominance and low affiliation from anger and disgust expressions, and finally, low dominance from fear and sadness expressions. These results were replicated and extended by Hess et al., (in prep).

To our knowledge, no set of emotional facial expressions from actors for whom the personality characteristics of the models are known exist at the present time. We therefore decided to investigate whether facial mimicry influences the interpersonal disposition ratings in general. Specifically, we investigated the notion that individuals who were instructed to mimic a target person's facial expression make personality attributions that are more indicative of empathy than individuals who were not so instructed. In this context, a number of studies has shown empathy effects on evaluative judgments regarding the disposition of others. In general, individuals who are urged to imaginatively place themselves in the situation of another person, and to experience the resulting affective reactions, tend to evaluate the target person more positively than individuals who did not receive these empathy fostering instructions (e.g., Brehm & Aderman, 1977; Brehm, Fletcher, & West, 1981, Experiment 1; Turner and Berkowitz, 1972).

This implies in the present context, that individuals who were instructed to mimic a target person's emotional facial expressions should judge this person as more affiliative and less dominant than individuals who were not instructed to mimic the target's emotional facial expressions.

Method

Participants

Fifty female volunteers were recruited at the University of Quebec at Montreal and at the College Bois de Boulognes at Montreal. They were randomly assigned to either the mimicry group or the no-mimicry group.

Stimuli

The four full-blown emotion displays of happiness, anger, disgust, and sadness, portrayed by two female and two male Caucasian actors were selected from a series of standardized emotional facial expressions (JACFEE, Matsumoto & Ekman, 1988). The expressions were digitized and translated from color to black and white. The expressions were presented using an Apple Macintosh Centris 610.

Dependent Measures

Dominance and affiliation judgments. Participants rated each emotional facial expressions using a French translation of thirty-two trait adjectives which sample the interpersonal dimensions of dominance and affiliation (see Knutson, 1996). Participants were instructed as follows "Based on your intuition, please rate how accurately each word describes the person." The scales were anchored by "extremely inaccurate" at one extremity and "extremely accurate" at the other. The questionnaire was presented using a Apple Macintosh Centris 610.

Facial EMG. Facial activity at the *Corrugator Supercilii, Orbicularis Oculi,* and *Levator Labii Alesque Nasii* sites was measured on the left side of the face using the same procedure as in Experiment 1.

Procedure

The same general procedure as in Experiment 2 was employed with the only difference that the stimuli were presented for 8 seconds. The experimenter explained to the participants that the study investigates impression formation, that is, the attribution of personality traits. The participants' task was to rate the individuals shown in the photographs using a series of thirty-two trait adjectives. To introduce the experimental manipulation, the experimenter explained that to well understand the personality of others it is necessary to pay attention to their behaviors. The mimicry group was told that one strategy to do this consists in reproducing the observed behavior whereas the no-mimicry group was told that the strategy consists in focusing on the others behavior while not moving. This latter instruction was intended to prevent participants in the no-mimicry group from spontaneously mimicking the target person's facial behavior.[8]

Artifact Control and Data Reduction

The same artifact control and data reduction as in Experiment 2 were employed.

Results and Discussion

Manipulation Check

The same muscle activation patterns described for Experiment 1 were assessed to verify whether participants in the mimicry group showed facial displays congruent with mimicry. For the no-mimicry group, t-tests comparing difference scores to zero were calculated to assess whether the notion that facial displays did not differ from baseline is tenable. The pattern of the results is shown in Figure 4.

Happy facial expressions. For the mimicry group, a significant main effect of Muscle emerged $F(2,20) = 12.17$, $p<.001$, congruent with the mimicry pattern, *Orbicularis Oculi* activity was higher than both *Corrugator Supercilii* and *Levator Labii Alesque Nasii* activity , $t(21) = 4.67$, $p<.001$ and $t(21) = 3.89$, $p<.001$ respectively. However, for the no-mim-

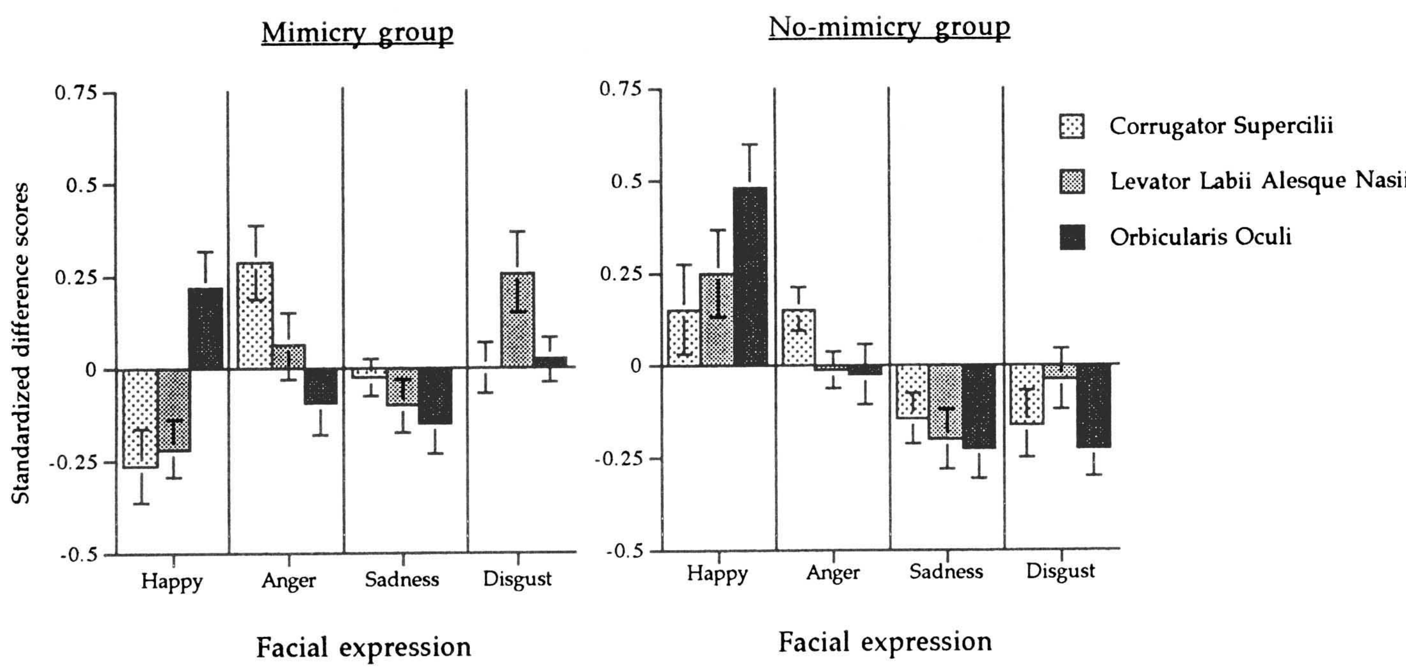

Figure 4. Mean standardized difference scores for observers' *Corrugator Supercilii, Orbicularis Oculi,* and *Levator Labii Alesque Nasii* activity as a function of the target person's emotional facial expression and facial task group.

icry group, the notion that *Orbicularis Oculi* activity did not differ from baseline was not tenable $t(20) = 4.02$, $p < .05$.

Angry facial expressions. For the mimicry group, a significant main effect of Muscle emerged $F(2,20) = 7.22$, $p = .004$, and *Corrugator Supercilii* activity was higher than both *Orbicularis Oculi* and *Levator Labii Alesque Nasii* activity, $t(21) = 3.9$, $p = .001$ and $t(21) = 2.31$, $p = .031$, respectively. Again, for the no-mimicry group, the notion that *Corrugator Supercilii* activity did not differ from baseline was not tenable $t(20) = 2.29$, $p < .05$.

Sad facial expressions. No significant main effect emerged. However, inspection of means indicated that *Corrugator Supercilii* activity tended to be higher than both *Orbicularis Oculi* and *Levator Labii Alesque Nasii* activity. For the no-mimicry group, the notions that *Orbicularis Oculi* and *Levator Labii Alesque Nasii* activity did not differ from baseline was not tenable $t(20) = 2.75$, $p < .05$ and $t(20) = 2.25$, $p < .05$ respectively.

Disgusted facial expressions. For the mimicry group a significant main effect of Muscle emerged $F(2,20) = 3.43$, $p = .052$ with the expected higher *Levator Labii Alesque Nasii* than both *Orbicularis Oculi* and *Corrugator Supercilii* activity , $t(21) = 2.58$, $p = .018$ and $t(21) = 2.19$, $p = .040$, respectively. Yet, *Corrugator Supercilii* activity was not higher than *Orbicularis Oculi* activity. For the no-mimicry group, the notion that *Orbicularis Oculi* activity did not differ from baseline is not tenable $t(20) = 3.07$, $p < .05$.

In summary, the results suggest that participants in the mimicry group successfully mimicked facial expressions. However, contrary to our instructions, participants in the no-mimicry group seemed to have spontaneously mimicked happy and angry facial expression as well. Further, they showed some facial activity for sad and disgust expressions. Thus, individuals were not able to completely suppress facial mimicry while judging some of the emotional facial expressions. This result is somewhat surprising, since the procedures and instructions essentially replicated those of Graziano, Smith, Tassinary, Pilkington, Sun, and Pilkington (1996) in four experiments. However, participants in this latter study were not required to perform a judgment task. It is possible that the judgment task was sufficiently distracting to participants that they could not suppress spontaneous mimicry.

Consequently, only comparisons of affiliation and dominance judgments of stimulus persons showing sad and disgusted expressions allow a comparison between judgments of individuals who voluntary mimic and those who do not mimic. Group comparisons for judgments of stimulus persons showing expressions of happiness and anger compare individuals who voluntary mimic with those who spontaneously mimic.

Dominance and Affiliation Judgments[9]

To assess whether the groups differed in their evaluations, a 2 (Emotion) x 2 (Sex of stimulus person) x 2 (Group) analyses of variance with Emotion and Sex of stimulus person as within subjects factors and Group as between subjects factor was conducted on each dimension. However, in the framework of the present paper only effects involving Group will be presented and discussed in detail.[10]

Voluntary mimicry versus spontaneous mimicry. A marginally significant Group x Sex of stimulus person x Emotion interaction emerged for the low-dominance/high-affiliation dimension $F(1,48) = 3.66$, $p = .062$. Post-hoc analyses revealed that for anger expressions participants who voluntarily mimicked emotional facial expressions rated the male stimulus persons as less low-dominant/high-affiliative than participants who spontaneously mimicked the expressions $F(1,48) = 5.05$, $p = .029$ ($M = 45.5$, $SD = 27.07$ and $M = 64.2$, $SD = 31.37$, respectively). No other significant main effects or interactions involving Group were found. Thus, compared to spontaneous mimicry, the voluntary mimicry of emotional facial expressions does not seem to entrain a more positive evaluation of the target persons.

Voluntary mimicry versus no-mimicry. The analysis revealed a significant Group x Sex of stimulus person interaction for the low-dominance/low-affiliation dimension $F(1,48) = 4.81$, $p = .033$. Inspection of means showed that participants who voluntarily mimicked the expressions rated the male stimulus persons as less low-dominant/low-affiliative than participants who did not mimic ($M = 85.12$, $SD = 30.72$ and $M = 96.67$, $SD = 31.84$, respectively). Further, the results showed a marginally significant Group x Emotion interaction for the high-dominance/high-affiliation dimension $F(1,48) = 3.27$, $p = .077$. Inspection of means showed that participants who voluntarily mimicked the emotional facial expressions rated the stimulus persons portraying disgust as less high-dominant/high-affiliative than participants who did not mimic ($M = 62.88$, $SD = 30.23$ and $M = 72.74$, $SD = 35.39$, respectively). No other significant main effects or interactions involving Group were found. Thus, contrary to our expectations, no evidence was found that participants in the voluntary mimicry group judge the target persons as more affiliative and less dominant.

However, the results suggest that voluntary mimicry leads to lower ratings on the personality scales than spontaneous mimicry and no-mimicry. The notion is suggested by an inspection of means for the eight dimensions (see Tables 3 and 4). Specifically, voluntary mimicry leads observers to judge the personality traits presented in the questionnaire as generally less accurate descriptions of the target persons than did spontaneous mimicry and no-mimicry. This may suggest that voluntarily mimicry lowers the tendency to make trait attributions regarding others' behaviors. This pattern of results is congruent with the finding that, regarding the causes of target behaviors, actors and observers produce different explanations. Specifically, actors tend to stress the importance of situations while observers tend to stress the importance of the actor's dispositions (Jones & Nisbett, 1971; Nisbett, Caputo, Legant, & Maracek, 1973). In fact, in the present experiment the voluntary mimicry lead observers to de-emphasize the actor's dispositions as causes of their behaviors. We can speculate that the instructions to mimic the emotional facial expressions lead the participants to process the information in a "actor-like" way, that is to take the affective role of the target person. Thus, the instructions to mimic the emotional facial expressions could have lead to an empathic process. Therefore, as mentioned by Lipps, mimicry might have a causal role in the empathic

TABLE 3

Means and Standard Deviations for Rated Dominance and Affiliation for Happy and Anger Expressions as a Function of Facial Mimicry

	Spontaneous mimicry		Voluntary mimicry	
Dimension	*M*	*SD*	*M*	*SD*
High dominance	72.21	26.50	63.98	25.38
Low dominance	92.56	21.52	81.35	26.75
High affiliation	82.35	24.04	79.37	28.42
Low affiliation	82.93	23.59	78.30	21.53
High dominance/high affiliation	71.63	27.61	65.43	30.60
Low dominance/low affiliation	94.57	29.03	87.42	26.94
High dominance/low affiliation	72.20	26.50	63.98	25.38
Low dominance/high affiliation	85.64	26.72	79.37	28.42

TABLE 4

Means and Standard Deviations for Rated Dominance and Affiliation for Disgusted and Sad Expressions as a Function of Facial Mimicry

	No-Mimicry		Voluntary mimicry	
Dimension	*M*	*SD*	*M*	*SD*
High dominance	117.12	21.18	114.68	25.71
Low dominance	75.27	18.84	66.87	22.00
High affiliation	86.63	22.87	80.05	20.16
Low affiliation	76.39	20.24	72.65	22.15
High dominance/high affiliation	107.51	18.84	100.61	16.84
Low dominance/low affiliation	66.42	18.10	65.41	21.72
High dominance/low affiliation	87.82	30.79	83.08	29.50
Low dominance/high affiliation	63.86	23.29	52.17	25.77

process. Further, the differences between spontaneous and voluntary mimicry groups suggest that to enhance empathy, facial mimicry may need a deliberate effort from the observer.

General Discussion

In 1907, Lipps proposed a model to explain how individuals understand another person's self. Recently, this model has received substantial interest in the domains of empathy and emotional contagion (e.g., Hatfield, Cacioppo & Rapson, 1992, 1994; Hess, et al., 1998, in press; Wallbott, 1991, 1995). Specifically, a causal link between facial mimicry and shared affect has been recruited to explain emotional contagion in human interaction (Cappella, 1993; Levenson, 1996; McIntosh, 1996).

Based on this general notion, therapist's mimicry of their client's nonverbal behavior has been suggested to enhance therapist's empathy (see Hess, et al., in press, for a review). However, so far no study has directly investigated whether mimicry induces the corresponding affective state, and whether this affective state facilitates the understanding of other's self. Thus, the aim of the present paper was to test the Lipps' model in the context of judgments of emotional facial expressions.

The other's self is a large concept. The first part of this paper focused on the affective state of the observed person. Specifically, two experiments investigated the link between facial mimicry and on one hand emotion recognition accuracy and shared affect on the other hand. The second part of this paper focused on the personality traits conveyed by the facial expressions. Specifically, we investigated whether facial mimicry influences personality trait inferences.

Part 1 found support for the notion that individuals mimic the emotional facial expressions they are exposed to, and that emotional contagion occurs in the present paradigm. Specifically, the first experiment showed that individuals spontaneously mimic facial expressions of anger, sadness, and disgust, and that the decoding of anger as well as of disgust expressions was accompanied by shared affect. The second experiment also found evidence for emotional contagion following the decoding of happy, disgust, and fear expressions. Further, the findings from the second experiment suggest that for some facial expressions voluntary mimicry decreases perceived task difficulty. However, for neither experiment positive correlations between facial mimicry and shared affect on one hand, and shared affect and accuracy for emotion recognition on the other hand, were found. Instead, negative correlations between recognition accuracy for sad expressions and positive feeling were found in both experiments. In addition, in the second experiment, negative correlations emerged between several negative affective states and recognition accuracy for anger expressions. This pattern of results strongly suggests that mimicry does not facilitate emotion recognition. On the contrary, for anger expressions shared affect was accompanied by a decrease in emotion recognition accuracy. The finding that positive feelings decrease recognition accuracy for sad expressions is in accordance with the Affect Infusion Model (Forgas, 1995) which predicts that happiness should entrain a simplified, heuristic judgment process and thus lower decoding accuracy. However, no corresponding increase in recognition accuracy for sad feeling states— due to the entrainment of a substantive judgment process—was found.

Further, some limited evidence suggests that facial mimicry may reduce perceived task difficulty. As mimicking of facial expressions in a decoding task provides additional motor information regarding the expressions to decode, it is possible that this additional information creates a certain facilitative effect.

In sum, no evidence that recognition accuracy for emotional facial expressions as well as contagion of emotions are mediated by mimicry was found. The disconfirming outcomes of the two studies can not be solely attributed to a lack of statistical power, because some statistically significant effects in the direction opposite to that predicted by the Lipps' model emerged. Interestingly, Gump and Kulik (1997) in a recent study also found no support for the mediation of contagion by mimicry.

The lack of an effect must always be interpreted cautiously, of course. One could argue that facial mimicry enhances emotion recognition in vivo interaction, but not when observing slides of emotional facial expressions. First, in vivo, the observer is involved in an interaction with the target person. According to Swann (1984), the differentiation between involved (active) and uninvolved (passive) perceivers is crucial. A number of specific differences have been found for judgments made by active versus passive observers. Specifically, an active perceiver focuses on the understanding of the target person. For example, active observers pursue a number of goals with the target person (e.g., Chen, Yates, & McGinnies, 1988; Kellermann, 1989; Stafford, Waldron & Infield, 1989), which should motivate the understanding of the observed person. In the present study, the observers were passive and their motivation to understand the observed person was low. Moreover, empathy as conceived by Lipps views the observer as a willful agent who deliberately makes an effort to step outside the self and into the experiences of others (Davis, 1994). It is possible that participants did not sufficiently make this effort, and thus the processes described by Lipps were not activated. Further, in vivo, the face is dynamic and shows a range of expressive movements which affords the possibility of numerous facial efference processes, and therefore provides more information to the observer. This advantage is lost in static faces. Thus, it may be necessary to study the influence of facial mimicry on recognition accuracy and emotional contagion in more a naturalistic setting to observe the effect proposed by Lipps.

However, despite these limitations, findings from the present study cast doubt on the generality of this process. Even if mimicry could enhance empathy in an active and motivated empathic observer (e.g., a therapist), it is doubtful that this process may be applied to more casual interactions.

According to Lipps, mimicry is also the central mechanism for those aspects of empathy which are related to the understanding of a person's personality. The results from part 2 suggest that individuals who voluntary mimic facial expressions tend to attribute the emotion displays of others less to personality than individuals who spontaneously mimic facial expressions or do not mimic the facial expressions. Thus, while voluntary facial mimicry does not seem to facilitate the decoding of emotions, some limited evidence suggests that it may influence perception of the others' personality. However, additional research is needed to investigate the influence of voluntary facial mimicry on the judgment of personality.

As mentioned in the general introduction, Lipps' model plays an important role for the formulation of procedures used in the psychotherapeutic process for some clinical scholars. Specifically, mimicry is considered a key process to ameliorate the understanding of the client's emotional feeling states and perspectives. The results of the present study do not confirm that either spontaneous or voluntary facial mimicry enhances the understanding of another person's emotional feeling states; however, the possibility can not be excluded that voluntary facial mimicry may help a therapist to better understand the patients' perspective regarding the causes of their behaviors. Nevertheless, the effectiveness of mimicry as technique to enhance therapist's empathy clearly rests yet to establish.

Notes

1. Morphing is the creation of a series of images "in between" a start image and an end image, depicting the transformation from one image to the other. This is a direct transformation of each pixel of the start image to the corresponding pixel of the end image. The procedure consisted of selecting the neutral face and the emotional face of the same actor, and then specifying Key Points and Key Lines in the two faces. Key Points are pairs of points (one member of a pair in each face) that link crucial features of the faces. Key Lines are reshapeable lines or curves that join Key Points, providing paths along which Morph will interpolate additional transformation-control points. This procedure could lead to ambiguous emotional facial expressions by including distorsions which could create expressions that are anatomically impossible. This possibility was addressed by Hess, Blairy, & Kleck (1997). In this study, participants were asked to judge of morphed emotional facial expressions of happiness, anger, disgust, and sadness, differing in physical intensity by 20% steps. Participants rated each expression on seven emotional scales. Analyses conducted on the rating scales showed that the level of rated intensity of the emotion as well as decoding accuracy varied as a function of physical intensity of the target expression. That is, the decrease on accuracy is due to the decrease on physical intensity of facial expressions and not to distorsions caused by the morphing procedure.
2. In order to reduce chance accuracy, decoders were provided with seven emotion scales even though only five emotional facial expressions are employed as stimuli.
3. This questionnaire has been extensively used in paradigms related to the one employed in the present study. In the past, participants have not reported suspicions regarding the link between the emotion terms in the scale and the judgment task during the debriefing sessions where they are explicitly encouraged to speculate about the "well-being" scale. Participants typically report that the scale serves to assess stress.
4. Due to a technical problem data from the *Zygomaticus Major* site had to be excluded from the analyses. One could argue that the absence of the *Zygomaticus Major* data presents a limitation for the study. However, previous research (e.g., Hess, Kappas, McHugo, Lanzetta, & Kleck, 1992) found that EMG activity recorded on the *Zygomaticus Major* site may result not only from *Zygomaticus Major* activity per se, but also from cross talk from *Masseter* activity (*Masseter* clenches the jaw in anger expressions). Thus, the *Zygomaticus Major* site could be activated during both happy and anger expressions. Further, it has been shown that crow's feet wrinkles around the eye reliably accompany genuine happiness (e.g., Duchenne, 1862/1990) and can thus been used as a marker for a happy expression. The greater discriminative power of *Orbicularis Oculi* has also been demonstrated by Cacioppo, Bush, & Tassinary (1992) who compared *Zygomaticus Major* and *Orbicularis Oculi* recordings in a highly comparable experimental condition.

5. To avoid confusing participants by presenting both a neutral and an emotional facial expression, while asking them to perform the facial task for the emotional expression only, the neutral expressions were not shown.
6. The procedures used in Experiments 1 and 2 was somewhat different. In Experiment 1, the facial expressions to be decoded were preceded by the presentation of a neutral expression, whereas participants in Experiment 2 saw only the emotional expression. This raises the question of whether the resulting accuracy scores can be compared. Regarding this issue, Kirouac and Doré (1982) have shown that the presentation of both a neutral and an emotional facial expressions during a decoding task does not increase decoding accuracy. The decoding accuracy data from both experiments may therefore be considered comparable.
7. One could argue that to display an incompatible facial expression induces emotional states which obscure the effect of facial mimicry. To investigate this alternative hypothesis, a comparison of the intensity of the emotional state reported in Experiment 1 where participants were not instructed to control their facial display and the intensity of the emotional state reported in Experiment 2 was performed. For this, a 3 (Group) x 5 (Emotion) analysis of variance was conducted on each of the 6 target scales from the well-being questionnaire. For feeling of irritation/aggressiveness, the results showed a significant Group by Emotion interaction $F(8,130) = 2.55$, $p = .013$. Post hoc analyses revealed that participants in the mimicry group reported feeling more irritation/aggressiveness than participants in the no-facial task group (Experiment 1) following the decoding of disgusted expressions $F(1,48) = 3.02$, $p = .088$ ($M = 30.45$, $SD = 43.26$ and $M = 15.00$, $SD = 35.52$, respectively). No further Group by Emotion interactions were found.
8. The facial movements that participants performed in Experiment 2 were uncommon, and during the debriefing several participants underlined this aspect. Instructions to not move were employed to present a more ecologically valid facial task. This procedure was used successfully by Graziano, Smith, Tassinary, Pilkington, Sun, and Pilkington (1996).
9. Regarding the reliability of the judgment scales, the psychometric characteristics of the French translation was assessed using Cronbach's alpha's for the eight scales. The results show that the scales had adequate reliabilities (ranging from .71 to .92). However, the French translation of the low dominance/ low affiliation dimension did not achieve adequate reliability. After the "unsparkling" item was excluded, this scale had a Cronbach alpha of .60.
10. Results regarding the main effects and interactions for Emotion and Stimulus person's sex for the voluntary mimicry versus spontaneous mimicry comparison as well as for the voluntary mimicry versus no-mimicry comparison can be obtained from the authors.

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Appendix A

Instructions for the display of incompatible facial expressions

During the decoding of happy expressions. You have to lift your eyebrows up, and purse your lips.

During the decoding of angry expressions. You have to lift your eyebrows up, open your mouth, and purse your lips.

During the decoding of sad expressions. You have to lift your eyebrows up and open your mouth.

During the decoding of disgusted expressions. You have to lift your eyebrows up and put your upper lip over your lower lip.

During the decoding of fear expressions. You have to knit your brows and purse your lips.