



Mimicry in social interaction: Benefits for mimickers, mimicees, and their interaction

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Mimicry has benefits for people in social interactions. However, evidence regarding the consequences of mimicry is incomplete. First, research on mimicry has particularly focused on effects of being mimicked. Secondly, on the side of the mimicker evidence is correlational or lacks real interaction data. The present study investigated effects for mimickers and mimicees in face-to-face interaction. Feelings towards the immediate interaction partner and the interaction in which mimicry takes place were measured after an interaction between two participants in which mimicry did or did not occur. Results revealed that mimickers and mimicees became more affectively attuned to each other due to bidirectional influences of mimicry. Additionally, both mimickers and mimicees reported more feelings of having bonded with each other and rated the interaction as smoother.

Mimicry is defined broadly as 'doing what others are doing'. This 'doing' can take many forms, both verbal and non-verbal. For example, one might mimic the words someone uses, the rate at which they speak, or the accent with which they deliver. In the non-verbal realm, one might mimic postures, gestures, and facial expressions. Evidence for the existence of mimicry stems from developmental, neurological, and social psychological research. Developmental researchers have found newborns and very young infants to imitate eye blinking, vocalizations (Kugiumutzakis, 1996), facial gestures, like tongue protrusion (Meltzoff, 1988), and emotional facial expressions, like happiness and anger (Haviland & Lelwica, 1987; O'Toole & Dubin, 1968). Neurological evidence of mimicry shows that common brain areas serve both perception and execution of actions, indicating that there is a link between observed and mimicked actions (e.g. Decety *et al.*, 1997). Further evidence for the existence of mimicry comes from social psychologists. Dimberg (1990) demonstrated that people spontaneously and rapidly react to facial stimuli with distinct facial electromyographic reactions in the face as a function of the facial expression of the stimuli, reflecting the existence of facial mimicry. Other evidence comes from Chartrand and Bargh (1999) demonstrating that

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unconscious behavioural mimicry occurs even among strangers in the most minimal circumstances.

This mimicry has important functions for us as human beings. First, mimicry is proposed to serve a function in social and empathic development. For instance, infants can use mimicry to shape and modulate their environment (Bates, 1975), to communicate with persons they have seen before, and to recognize those persons in a next encounter (Meltzoff & Moore, 1994). Second, in clinical settings, mimicry is proposed to foster understanding and has beneficial effects for the therapeutic relationship and the patient's health. For example, Charney (1966) demonstrated that congruency in posture between two people positively relates to a more positive, interpersonal, specific, and bound evaluation of the therapeutic session. Third, social approaches to mimicry propose that mimicry has beneficial effects for all relationships and serves to create bonds between people. For both persons who mimic (mimickers) and persons who are being mimicked (mimickees), mimicry has been shown to enhance feelings of empathy and bonding towards each other (Bernieri & Rosenthal, 1991; Chartrand & Bargh, 1999; LaFrance, 1979; Lakin, Jefferis, Cheng, & Chartrand, 2003; Stel, van Baaren, & Vonk, 2008).

However, evidence for the assumption that mimicry serves human interactions is incomplete. First of all, research on mimicry has particularly focused on effects of being mimicked. Secondly, the studies that do exist on the consequences of mimicry for the *mimicker* have merely been either correlational (Bernieri, 1988; LaFrance, 1979; LaFrance & Broadbent, 1976) or, in experimental studies, have relied on video materials rather than live interaction (Stel, van Baaren, *et al.*, 2008; Stel & Vonk, 2009), or both (Chrisholm & Strayer, 1995). This means that at present, we do not know whether the beneficial effects for the mimicker occur in interactions between people where the thoughts, feelings, and behaviours of both people are continuously and dynamically affected by each other. An interactive setting is less controlled and more fraught with error variance, but enables us to look at the dynamics of mimicry between two real participants. Therefore, in the present study, we examine beneficial effects of mimicry in face-to-face interactions.

Mimicry can have benefits for feelings towards (a) the immediate interaction partner (e.g. empathy and bonding) and (b) the interaction in which mimicry takes place (smoothness of the interaction). Effects of mimicry on *empathy* involve facial feedback processes. Via mimicry (either spontaneous or instructed) one adopts the same facial expression as the interaction partner. The activated facial muscles, in turn, send signals to the brain so that the corresponding emotions are felt. This feedback mechanism from muscles to the brain was proposed by Darwin (1872/1965), and further elaborated by Izard (1977) and Tomkins (1982; see Hess, Kappas, McHugo, Lanzetta, & Kleck, 1992, for empirical evidence). Thus, mimicry in combination with this facial feedback mechanism helps one to feel what others are experiencing. This affective form of empathy has been referred to as emotional contagion (Hatfield, Cacioppo, & Rapson, 1992).

However, Blairy, Herrera, and Hess (1999), Gump and Kulik (1997), and Hess and Blairy (2001) failed to find a causal relation between mimicry and emotional contagion. These studies relied on static (photographs, Blairy *et al.*, 1999; Gump & Kulik, 1997) or very brief stimulus materials (15 s; Hess & Blairy, 2001). Recently, Stel, van Baaren, *et al.* (2008) demonstrated that when using longer stimulus materials (video materials of 3 min) that allowed participants to gradually 'get into' the target person's emotions, mimicry is related to emotional contagion. They demonstrated

that when mimicry is absent, participants felt less empathy towards the person on the video, i.e. they caught the emotions of the person less strongly than when they did mimic. However, it remains uninvestigated whether, when mimicry is present and the interaction is live, mimicee and mimicker actually become to experience the same emotions. Therefore, in the present study we examine whether mimicker and mimicee come more emotionally attuned to one another in face-to-face interaction.

A second benefit of mimicry is feelings of *bonding* towards the interaction partner. Recently, Ashton-James, van Baaren, Chartrand, Decety, and Karremans (2007) showed that being mimicked makes mimicees feel closer to others *in general*. We examine whether this effect occurs *within* the relation between the mimicee and mimicker, i.e. whether the mimicee feels more interpersonal closeness towards the mimicker, and whether these effects are mirrored in the mimicker's sense of closeness towards the mimicee.

Finally, mimicry can also affect feelings towards the interaction. Chartrand and Bargh (1999) showed that participants who were mimicked by a confederate perceived the interaction as smoother than non-mimicked participants. The present study allows us to test whether these effects can be replicated in real interactions and whether the mimicker feels the same. This question is important because mimickers are instructed to consciously mimic the target, so they are aware of what they are doing and actually must take extra effort to do it. In spite of this deliberate effort, we expect that the interaction is modulated by mimicry so that mimickers rate the interaction as smoother than non-mimicked interactions, just as mimicees do.

To summarize, in our study we investigated benefits for the mimicker and mimicee in social interactions. To test whether mimickers and mimicees become more emotionally attuned to one another, whether they feel closer to one another and rate the interaction as smoother compared to non-mimickers and non-mimicees, we manipulated the number of mimicry by instructing participants to either mimic or not mimic the expressions of their interaction partner (another participant). Previous studies already demonstrated that the amount and effects of spontaneous mimicry in a control condition are similar to those in an instructed mimicry condition (Nishitani *et al.*, 2004; Stel, van den Heuvel, & Smeets, 2008; Stel, van Dijk, & Olivier, 2009). Both forms of mimicry lead mimickers to adopt the facial expressions of the mimicee, which as a result, influences the activation of associated emotions and cognitions (Barsalou, Niedenthal, Barbey, & Ruppert, 2003).

Method

Participants and design

Participants were 164 (46 male and 118 female) students at Radboud University Nijmegen. Their ages ranged from 17 to 37 years with an average of 21.00. They participated for payment (€2,-) and were randomly assigned to the role of target or observer. The unit of observation in the study is a couple and there were 82 couples. Forty-four couples consisted of two women, eight of two male, and 30 were of mixed sex. Each couple was randomly assigned to the conditions of a 2 (imitation by observer: yes vs. no) × 2 (video seen by target: positive vs. negative) between-couples factorial design.

Materials

Videos

All target participants saw a film of 5 min inducing positive or negative emotions. The positive video was a fragment from Walt Disney's *Jungle Book*, which showed a little boy and a bear singing a catchy song and dancing on it. This film fragment elicits happy emotions (Beukeboom & Semin, 2006). The negative video showed a fragment of *Sophie's Choice* in which a mother is forced to choose which one of her two children is sent away with a Nazi soldier, it elicits sad as well as angry emotions (Beukeboom & Semin, 2006).

The questionnaires

The questionnaire for observers and targets contained 11 emotion scales on which they indicated on a 7-point scale how happy, sad, or angry they felt during the interaction. The emotions were: tense, enthusiastic, pleased, worried, irritated, angry, confused, cheerful, dreary, happy, and sad. We defined happiness, sadness, and anger as distinct constructs and did not measure positive versus negative items as polar opposites, because positive and negative emotions can be felt at the same time (Larsen, McGraw, & Cacioppo, 2001).

The questionnaire also contained a measure of bonding: an adjusted version of Aron, Aron, and Smollan's (1992) Inclusion of Other in Self Scale. This scale presents six pictures, each containing two circles where one of the circles represents the participant, and the other their interaction partner. The six pictures vary in the distance and degree of overlap between the two circles. Participants were asked to choose the picture that best represented how close they felt with respect to their interaction partner.

A third part of the questionnaire was a rating of the smoothness of the interaction. Both targets and observers indicated on a 7-point scale how smooth they thought their interaction had been.

The questionnaire also included some distractor questions about the specific contents the target had talked about in order to support the cover story regarding the purpose of the experiment. Finally, background variables were assessed and all participants were asked an open-ended question about whether they knew what the experiment was about. At the end of the questionnaire, observers in the imitation and no imitation conditions were asked to rate how difficult they thought the instruction was on a 7-point scale.

Procedure

Participants signed an informed consent form stating that answers, reactions, video-, and audio-tapings could be used as measurements. They were told that they were going to interact with another participant and talk about a video fragment one of them had to watch beforehand. The cover story informed participants that we were interested in communication skills. After being introduced to each other, participants were randomly assigned to be target or observer. The target person is the person who will be or not be mimicked, whereas the observer will or will not mimic their partner (the target) in the interaction. To make sure that observers could easily mimic or not mimic targets, targets watched a film fragment that the mimicker did not watch. Targets were asked to tell observers what they had seen on the video and how it made them feel, and observers could ask questions. This way, targets were talking most of the time and observers

were listening. As people who are talking usually show accompanying non-verbal movements, these non-verbal movements could easily be or not be mimicked.

The target watched either a positive or negative video fragment of about 5 min (see Materials), while the observer received imitation instructions. Targets thought their interaction partner was working on another short task at this time. Half of the observers received an instruction to imitate the facial expressions and behaviours the target would display, while the other half received an instruction to suppress the natural tendency to mimic. These two conditions were designed to be optimally comparable with regard to the instructions. Both instructions described examples of expressions and behaviours that their partner could display and how they should react to these movements. In all conditions, these examples concerned positive, negative, and neutral displays of behaviours. Observers were told to remind themselves of the instructions throughout the interaction and that they should not feel awkward about imitating or not imitating targets facial expressions, because, they were told, people never notice this. These instructions to mimic or not to mimic have gotten very high levels of compliance in prior studies (Stel, van Baaren, *et al.*, 2008; Stel, van den Heuvel, *et al.*, 2008; Stel *et al.*, 2009). In order to make sure the imitation instructions were carried out by observers in the present study, both observers and targets were recorded during the interaction. There was a camera hidden in the smoke detector, which was located in the middle of the room on the ceiling. Participants were unaware that they were being videotaped. After a 4-min interaction, they each went to a different room and filled out a questionnaire. Finally, participants were funnelled debriefed and were asked for permission to use the recordings.

Results

Because sex-composition of the couples did not produce any significant effects, it was discarded from the analyses below. On the open-ended question none of the targets mentioned spontaneously that they were intentionally being mimicked or not being mimicked, nor did they recognize this when it was suggested during funnelled debriefing. Thus, none of the targets were aware of being mimicked. A one-way analysis of variance (ANOVA) with observers' rated difficulty of the instructions demonstrated that observers did not rate the imitation or no imitation instruction as more difficult, $F(1, 80) = 1.23$, $p = .27$, $\eta^2 = .02$. In the analyses below, the unit of observation is a couple.

Manipulation check

To check whether observers carried out the instructions, we coded the facial expressions of all observers and compared these with the coded facial expressions of the targets. First, the targets were coded using event sampling, i.e. a facial movement was coded whenever it was observed. Next, we further developed the coding system for the expressions of the observers, so that it included all relevant expressions and movements (head and hand movements) that the targets had shown. The behaviours of the observers were matched with the behaviours of the targets, using a time limit of 10 s (as in previous studies, e.g. Stel, van Baaren, *et al.*, 2008). A behaviour was scored as mimicry when the behaviour of the observer matched the behaviour of the target person and occurred after the target's behaviour within the time of 10 s. Four independent naive raters, who were blind to conditions, coded the facial expressions of

the targets and observers. They each rated different parts of the material, except for an overlap of 10%. The inter-rater reliability of the number of behaviours coded as mimicry between any given two raters varied between .84 and .97. We expressed the number of mimicry as the proportion of mimicked movements out of all the observers' movements, to take movement tendency into account; when one has a general tendency to move a lot, the number of mimicry increases, but this is a side-effect of overall movement and could have biased our results. This mimicry coding procedure has been used in our previous studies (e.g. Stel, van Baaren, *et al.*, 2008).

Two couples were not included in the current analysis because their mimicry data was missing due to camera problems. A 2 (imitation) \times 2 (video) ANOVA with proportion of mimicry as a dependent variable demonstrated that participants who were instructed to intentionally mimic the target's facial expressions imitated the target 7.33% more (24.97% out of all their behaviours) than participants who were instructed to suppress mimicry (17.64%),¹ $F(1, 76) = 8.64, p = .004, \eta^2 = .10$. Thus, the imitation instructions affected actual mimicry.

Closeness

A 2 (imitation: yes vs. no) \times 2 (video: happy vs. sad) \times 2 (role: target vs. observer) repeated measures ANOVA with role as a within-subjects factor showed a main effect of imitation on closeness, $F(1, 78) = 14.02, p < .001, \eta^2 = .15$: observers ($M = 2.40, SD = 0.96$) as well as targets ($M = 2.10, SD = 0.85$) felt less close to one another in the no mimicry than in the mimicry condition (respectively $M = 2.85, SD = 1.03$ vs. $M = 2.70, SD = 0.94$).

Smoothness of the interaction

A 2 (imitation) \times 2 (video) \times 2 (role) repeated measures ANOVA on rated smoothness of the interaction showed a main effect of imitation, $F(1, 78) = 2.12, p = .05, \eta^2 = .05$: observers ($M = 3.88, SD = 1.52$) as well as targets ($M = 4.14, SD = 1.28$) rated the interaction as less smooth in the no mimicry than in the mimicry condition (respectively $M = 4.28, SD = 1.22$ vs. $M = 4.78, SD = 1.40$). In addition, a main effect of role, $F(1, 78) = 4.58, p = .04, \eta^2 = .06$, indicated that targets in general rated the interaction as smoother ($M = 4.45, SD = 1.37$) than observers ($M = 4.07, SD = 1.39$).

Affective empathy

To establish whether mimicry influences affective empathy (emotional contagion), we analysed whether targets and observers actually felt different emotions during the interaction due to no mimicry. A factor analysis showed that the items of the emotion scale can be classified into three factors. For each factor, we took the set of items that the factor analysis regarded as one factor with the highest Cronbach's alpha. The final set for the first factor, happiness, consisted of enthusiastic, pleased, cheerful, and happy

¹ To ensure observers did not compensate inhibiting mimicry behaviour by nodding, a 2 (imitation) \times 2 (video) ANOVA was conducted with number of nods as a dependent variable. There was no difference in nodding behaviour between the imitation conditions, $F(1, 76) = 1.39, p = .24, \eta^2 = .02$. We could not ensure whether targets in the mimicry and no mimicry condition had equal attention for the target, i.e. looked at the target to the same extent, because we recorded target and observer separately in order to independently code movements of target and observer. This makes it impossible to estimate whether the observer is looking at the target or not.

($\alpha = .79$). The second factor consisted of sad emotions: worried, dreary, and sad ($\alpha = .73$). Finally, for the third factor, only the item angry was used.² The target of one couple did not fill in this part of the questionnaire. Therefore, one couple was not included in the affective empathy analyses.

A 2 (imitation: yes vs. no) \times 2 (video: happy vs. sad) \times 3 (emotion: happiness vs. sadness vs. anger) \times 2 (role: target vs. observer) repeated measure ANOVA was conducted with emotion and role as a within-subjects factors. The dependent variables were happy, sad, and angry emotions. The pertinent means and contrast tests are presented in Table 1.

A main effect of emotion, $F(2, 154) = 159.49, p < .001, \eta^2 = .67$, indicated that participants in all conditions reported being more happy ($M = 4.07, SD = 0.91$) than sad ($M = 2.60, SD = 1.24$), $t(81) = 6.60, p < .001$ or angry ($M = 1.66, SD = 1.00$), $t(81) = 12.82, p < .001$. The difference between sadness and anger was also significant, $t(81) = 10.13, p < .001$.

This main effect was qualified by an emotion \times video interaction, $F(2, 154) = 54.99, p < .001, \eta^2 = .42$, demonstrating the effects of the emotions displayed in the video that the targets watched. Targets and observers in the positive video condition reported being more happy ($M = 4.58, SD = 0.74$) than sad ($M = 1.79, SD = 0.59$), $t(40) = 15.53, p < .001$, and angry ($M = 1.11, SD = 0.26$), $t(40) = 24.78, p < .001$ and more sad than angry, $t(40) = 9.62, p < .001$, compared to participants who watched the video with the sad event: in the sad video condition participants felt more sadness ($M = 3.43, SD = 1.19$) and happiness ($M = 3.55, SD = 0.77$) than anger ($M = 2.23, SD = 1.16$), respectively $t(39) = 7.32, p < .001$, $t(39) = 5.14, p < .001$. The difference between sadness and happiness was not significant, $t < 1$.

A main effect of role, $F(1, 77) = 5.82, p = .02, \eta^2 = .07$, indicated that targets' mean across all emotion items was higher ($M = 2.87, SD = 0.69$) than observers' mean ($M = 2.68, SD = 0.58$). A marginally significant role \times imitation interaction, $F(1, 77) = 3.06, p = .08, \eta^2 = .04$, demonstrated that this difference in emotions between target and observer was not significant in the imitation, $t < 1$, but was significant in the no imitation condition, $t(41) = 2.96, p = .01$. Thus, targets felt more intense emotions than observers but only in the no imitation condition.

Furthermore, an imitation \times emotion \times role interaction, $F(2, 154) = 3.04, p = .05, \eta^2 = .04$, demonstrated a differential influence of reported emotions in this difference between targets' and observers' emotion. Results in the no imitation condition revealed that targets reported significantly higher levels of happy, $t(41) = 2.98, p = .01$ and angry emotions, $t(41) = 2.60, p = .01$, while they did not differ on ratings of sadness, $t < 1$. In the imitation condition the emotions between target and observers did not significantly differ, $ts < 1$. As can be seen in Table 1, the differential effects between targets' and observers' happy and angry emotions in the no imitation condition are driven by two effects: (1) lowered emotions of the observer in the happy video condition regarding happiness and in the sad video condition regarding anger (i.e. when not mimicking, the observer is less attuned to the target), (2) heightened emotions of the target in the sad video condition regarding happiness (i.e. when the target is not being mimicked, the target becomes to feel happier in the sad video condition) and in

² Conceptually, irritated and angry belong together, but because of their low alpha (.29) we excluded irritated. We excluded irritated and not angry because irritation might also measure annoyance due to the person on the video or the video itself instead of the core emotion that is elicited due to the event in the video.

Table 1. Means and standard deviations of target and observers' feelings of happiness, sadness, and anger by imitation for the positive and negative video (1, totally not; 7, very strong)

Video	Imitation	Dependent variable: emotions											
		Happiness				Sadness				Anger			
		Target		Observer		Target		Observer		Target		Observer	
		M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Positive video	Imitation	4.96 ^a	0.94	4.78 ^a	0.50	1.67 ^c	0.72	1.77 ^c	0.76	1.05 ^c	0.23	1.05 ^c	0.23
	No imitation	4.72 ^a	1.00	3.95 ^b	1.05	1.67 ^c	0.87	2.05 ^c	0.87	1.23 ^d	0.61	1.09 ^c	0.29
	Total	4.83	0.97	4.34	0.93	1.67	0.79	1.92	0.83	1.15	0.48	1.07	0.26
Negative video	Imitation	3.21 ^b	0.92	3.53 ^b	0.84	3.87 ^b	1.59	3.42 ^b	1.54	2.45 ^e	1.82	2.35 ^e	1.53
	No imitation	3.93 ^c	0.94	3.54 ^b	1.15	3.25 ^b	1.32	3.17 ^b	1.17	2.55 ^e	1.67	1.55 ^d	0.69
	Total	3.57	0.99	3.53	0.99	3.56	1.48	3.29	1.36	2.50	1.72	1.95	1.24

Note. Means with non-common superscripts differ significantly ($p < .05$).

the happy video condition regarding anger (i.e. when the target is not being mimicked, the target becomes more angry in the happy video condition). Thus mimicry not only influences whether emotions are less strongly caught but also influences the emotions of the target.

In general, these results suggest that targets and observers were less emotionally attuned to one another in the no mimicry than in the mimicry condition.

Mimicry mediation

We used the regression method proposed by Baron and Kenny (1986) to demonstrate that the effects of affective empathy were due to mimicry. To obtain a single score of affective empathy, we used the observers' happy emotion in the happy video condition and observers' sad emotion in the sad video condition. First, the dummy variable imitation produced a significant effect for affective empathy ($B = -0.74$, $t = -2.06$, $p = .04$). This effect fully disappeared when we included the actual proportion of mimicked facial expressions in the regression ($B = -0.43$, $t = -1.18$, $p = .24$). In addition, the effect of actual mimicry on affective empathy was also significant ($B = 0.10$, $t = 2.59$, $p = .01$). According to the Goodman version of the SOBEL test, the indirect effect of imitation on affective empathy via mimicry is significant, $z = -2.03$, $p = .02$. Thus, actual mimicry mediates the effect of imitation on emotional contagion.

Discussion

This study demonstrates that mimicry has benefits in social interactions. We showed that restraining from mimicry produced less attuning of observers' and targets' emotions than in the mimicry condition. In addition, we showed that restraining mimicry leads both target and observer to feel less close to one another and experience the interaction as less smooth. On the whole, it seems that mimicry leads target and observer to experience more similar emotions and to feel a stronger bond with one another.

These results emerged across emotions and targets and despite the disadvantage of studying real interactions, that is, being fraught with error variance due to individual differences of observers and targets, which can dramatically affect the benefits of mimicry and severely reduce the power of the test of mimicry effects on these variables.

The present study includes more females than males. However, previous research showed no differential results between men and women on mimicry or the effects of mimicry (e.g. Ashton-James *et al.*, 2007; van Baaren, Holland, Kawakami, & van Knippenberg, 2004). A study in which gender differences were found demonstrated an advantage of women when using mimicry in the speed of recognizing emotions from facial expressions (Stel & van Knippenberg, 2008). This advantage of women with regard to mimicry and emotion processing is reduced when both male and female participants are granted sufficient time to assess the stimulus person's emotions, as in our study (Stel & van Knippenberg, 2008).

We have no indication that other aspects of the instruction could account for the effects obtained in our studies. First of all, in contrast to the explanation that suppressing the tendency to mimic might have caused more effort and, as a result, decreases feelings of empathy and bonding for the target, results showed that observers in the imitation and no imitation condition did not report any differences in the difficulty of carrying out the instruction. A critical reader might suggest it is possible that a

depletion effect may not be accessible to conscious awareness. Thus, despite that participants reported no differences in difficulty of carrying out the instructions, depletion may still constitute a valid alternative explanation. We are unable to address this issue with the current study. However, Stel and van Knippenberg (2008) excluded the possibility that the instruction to refrain from mimicry results in depletion. As addressed above, in this study women were slower in recognizing the affective valence of emotional facial expressions when instructed to refrain from mimicry, whereas men did not differ in recognition speed between a constraint and no constraint to mimic condition. These effects were ascribed to the fact that refraining from mimicry hinders women's capacity to empathize by obstructing spontaneous facial mimicry. When the constraint condition would detract cognitive resources from the focal task of speedy affect recognition, one would expect the same constraint effect on speed of affect recognition for male participants. However, there is no obvious way to explain differential distraction due to refraining from mimicry for males and females, and therefore enhanced distraction in the no mimicry condition seems unlikely.

Nor can the results be explained by assuming that participants in mimicry conditions received more detailed information about the regions of the face involved in mimicry. Both the mimicry and no mimicry conditions contained instructions to pay attention to the specific features, but one group was instructed to imitate them and one group not to. A related alternative explanation concerns attention. One could argue that the imitation instructions have differential influence on the attention to the targets. In the present study, it was not possible to measure actual attention of the observer towards the target,¹ but previous studies using videos did not show differential attention due to the instructions (Stel, van den Heuvel, *et al.*, 2008). Additionally, the face-to-face interaction in the present studies makes it more likely that the observers paid attention to the targets.

Another possible alternative explanation of our findings is that the results are due to demand characteristics. However, targets did not even notice whether they were being imitated, so they could not have been influenced by demand characteristics. Additionally, most observers thought the study was about what kind of information was transferred and whether their interaction partner transferred the information accurately. Additionally, previous studies (e.g. Stel, van den Heuvel, *et al.*, 2008) using the same procedure argued that demand characteristics should have produced more positive results in the imitation condition compared to a control condition in which participants mimicked without being instructed, which was not the case. Moreover, in the present study we showed that mimicry itself, and not the instruction to mimic, is responsible for the obtained effects.

Targets' and observers' ratings on happiness and anger significantly differed only in the no imitation condition. For feelings of sadness, the pattern was the same in the happy video, but not in the sad video condition. It is possible that some emotions are more easily caught than others (i.e. are more contagious, even in the absence of mimicry). Sadness may be one of them, because in social interaction it is almost always functional to respond in tune with a sad person (whereas anger, on the other hand, may often require calming the person down rather than catching the anger oneself). At present, however, this explanation is speculative. In future research, it will be interesting to examine if some emotions are inherently more contagious than others.

Emotional contagion effects due to mimicry were already demonstrated in previous studies using videos (Stel, van Baaren, *et al.*, 2008). This study shows that emotional

contagion effects occur in live interactions as well with different targets and shows that not mimicking actually causes target and observer to experience significantly different levels of emotions. Moreover, the results demonstrated that the emotional attunement between mimickers and mimicees were not only caused by mimickers who caught the emotions of mimicees, but also by targets whose emotions were influenced by being or not being mimicked. The finding that targets felt more emotions that were not related to the emotional content of the video when they were not being mimicked (i.e. the target became to feel happier in the sad video condition and the target became more angry in the happy video condition when not being mimicked) can be interpreted as follows: the targets' experience of emotions are not strengthened by non-mimicking observers because these observers do not return non-verbal expressions belonging to these emotions, which may lead targets to experience opposite emotions. Thus, we demonstrated that mimicry has a bidirectional effect, influencing both the emotions of target and observer.

Additionally, we demonstrated that both observers and targets reported less closeness towards their interaction partner when there was less mimicry, thereby supporting the assumption that mimicry enhanced interpersonal closeness *within* their relationship. The results suggest that mimicry not only brings people closer together and makes them feel closer to others in general (as was shown by Ashton-James *et al.*, 2007), but actually creates a special bond between observer and target by making them feel closer to one another.

Regarding the smoothness of the interaction, we replicated Chartrand and Bargh's (1999) finding in a real interaction situation: mimicked targets perceived the interaction as smoother than non-mimicked targets. In addition, observers felt the same. Mimicry smoothed the interaction so that observers rated the interaction in the mimicry condition as smoother just as targets did, despite their deliberate effort to carry out their instructions.

Thus, mimicry influenced both mimickers' and mimicees' ratings of each other and of the interaction. Both effects can occur independently (see the studies of Chartrand & Bargh, 1999 and Stel, Vonk, van Baaren & Smeets, 2009), but it is conceivable that the change in the evaluation of the interactant and the interaction is picked up by the other person, resulting in returning this affection. This study provided evidence for this bidirectional nature: in live interactions, both targets and observers become more emotionally attuned and close to each other due to mimicry.

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References

- Aron, A., Aron, E. N., & Smollan, D. (1992). Inclusion of Other in the Self Scale and the structure of interpersonal closeness. *Journal of Personality and Social Psychology*, *63*, 596-612.
- Ashton-James, C., van Baaren, R. B., Chartrand, T. L., Decety, J., & Karremans, J. (2007). Mimicry and me: The impact of mimicry on self-construal. *Social Cognition*, *25*, 518-535.
- Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social and psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, *51*, 1173-1182.

- Barsalou, L. W., Niedenthal, P. M., Barbey, A., & Ruppert, J. (2003). Social embodiment. In B. Ross (Ed.), *The psychology of learning and motivation* (Vol. 43, pp. 43-92). San Diego, CA: Academic Press.
- Bates, J. E. (1975). Effects of a child's imitation versus nonimitation on adults' verbal and nonverbal positivity. *Journal of Personality and Social Psychology, 31*, 840-851.
- Bernieri, F. J. (1988). Coordinated movement and rapport in teacher-student interactions. *Journal of Nonverbal behavior, 12*, 120-138.
- Bernieri, F. J., & Rosenthal, R. (1991). Interpersonal coordination: Behavior matching and interactional synchrony. In B. Rime & R. S. Feldman (Eds.), *Fundamentals of nonverbal behavior: Studies in emotion and social interaction*. New York/Paris: Cambridge University Press.
- Beukeboom, C. J., & Semin, G. R. (2006). How mood turns on language. *Journal of Experimental Social Psychology, 42*, 553-566.
- Blairy, S., Herrera, P., & Hess, U. (1999). Mimicry and the judgment of emotional facial expressions. *Journal of Nonverbal behavior, 23*, 5-41.
- Charney, E. J. (1966). Psychosomatic manifestations of rapport in psychotherapy. *Psychosomatic Medicine, 28*, 305-315.
- Chartrand, T. L., & Bargh, J. A. (1999). The chameleon effect: The perception-behavior link and social interaction. *Journal of Personality and Social Psychology, 76*, 893-910.
- Chrisholm, K., & Strayer, J. (1995). Verbal and facial measures of children's emotion and empathy. *Journal of Experimental Child Psychology, 59*, 299-316.
- Darwin, C. (1965). *The expressions of the emotions in man and animals*. Chigago, IL: University of Chigago Press. (Original work published 1872).
- Decety, J., Perani, D., Jeannerod, M., Bettinardi, V., Tadary, B., Woods, R., et al. (1997). Mapping motor representations with positron emission tomography. *Nature, 371*, 600-602.
- Dimberg, U. (1990). Facial electromyography and emotional reactions. *Psychophysiology, 27*, 481-494.
- Gump, B. B., & Kulik, J. A. (1997). Stress, affiliation and emotional contagion. *Journal of Personality and Social Psychology, 72*, 305-319.
- Hatfield, E., Cacioppo, J. T., & Rapson, L. R. (1992). Primitive emotional contagion. In M. S. Clark (Ed.), *Review of personality and social psychology: Emotion and social behavior* (Vol. 14, pp. 151-177). Newbury Park, CA: Sage.
- Haviland, J. M., & Lelwica, M. (1987). The induced affect response: 10-week-old infants' responses to three emotion expressions. *Developmental Psychology, 23*, 97-104.
- Hess, U., & Blairy, S. (2001). Facial mimicry and emotional contagion to dynamic emotional facial expressions and their influence on decoding accuracy. *International Journal of Psychophysiology, 40*, 129-141.
- Hess, U., Kappas, A., McHugo, G. J., Lanzetta, J. T., & Kleck, R. E. (1992). The facilitative effect of facial expression on the self-generation of emotion. *International Journal of Psychophysiology, 12*, 251-265.
- Izard, C. E. (1977). *Human emotions*. New York: Plenum.
- Kugiumutzakis, G. (1996). The development of facial and vocal imitation in early infancy [Le développement de l'imitation precoce de modeles de faciaux et vocaux]. *Enfance, 1*, 21-25.
- LaFrance, M. (1979). Nonverbal synchrony and rapport: Analysis by the cross-lag panel technique. *Social Psychology Quarterly, 42*, 66-70.
- LaFrance, M., & Broadbent, M. (1976). Group rapport: Posture sharing as a nonverbal indicator. *Group and Organization Studies, 1*, 328-333.
- Lakin, J. L., Jefferis, V. E., Cheng, C. M., & Chartrand, T. L. (2003). The chameleon effect as social glue: Evidence for the evolutionary significance of nonconscious mimicry. *Journal of Nonverbal Behavior, 27*, 145-162.
- Larsen, J. T., McGraw, A. P., & Cacioppo, J. T. (2001). Can people feel happy and sad at the same time? *Journal of Personality and Social Psychology, 81*, 684-696.

- Meltzoff, A. N. (1988). Infant imitation after a 1-week delay: Long-term memory for novel acts and multiple stimuli. *Developmental Psychology, 24*, 470-476.
- Meltzoff, A. N., & Moore, N. K. (1994). Imitation memory, and the representation of persons. *Infant Behavior and Development, 17*, 83-99.
- Nishitani, N., Avikainen, S., & Hari, R. (2004). Abnormal imitation-related cortical activation sequences in Asperger's syndrome. *Annals of Neurology, 55*, 558-562.
- O'Toole, R., & Dubin, R. (1968). Baby feeding and body sway: An experiment in George Herbert Mead's 'taking the role of the other'. *Journal of Social and Personality Psychology, 10*, 59-65.
- Stel, M., van Baaren, R. B., & Vonk, R. (2008). Effects of mimicking: Acting prosocially by being emotionally moved. *European Journal of Social Psychology, 38*, 965-976.
- Stel, M., van den Heuvel, C., & Smeets, R. C. (2008). Facial feedback mechanisms in Autistic Spectrum Disorders. *Journal of Autism and Developmental Disorders, 38*, 1250-1258.
- Stel, M., van Dijk, E., & Olivier, E. (2009). You want to know the truth? Then don't mimic! *Psychological Science, 20*, 693-699.
- Stel, M., & van Knippenberg, A. (2008). The role of social mimicry in the recognition of affect. *Psychological Science, 19*, 984-985.
- Stel, M., & Vonk, R. (2009). Empathizing via mimicry depends on whether emotional expressions are seen as real. *European Psychologist, 14*(4), 342-350.
- Stel, M., Vonk, R., van Baaren, R. B., & Smeets, R. C. (2009). *The social consequences of mimicry: Effects on empathy and bonding*. Manuscript submitted for publication.
- Tomkins, S. S. (1982). Affect theory. In P. Ekman (Ed.), *Emotion in the human face* (2nd ed., pp. 353-395). Cambridge: Cambridge University Press.
- van Baaren, R. B., Holland, R. W., Kawakami, K., & van Knippenberg, A. (2004). Mimicry and pro-social behavior. *Psychological Science, 15*, 71-74.

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