The Role of Emotional Mimicry in Intergroup Relations

Ursula Hess and Agneta Fischer

Summary

What is the role of emotional mimicry in intergroup relations? There are different theoretical accounts of the function and underlying processes of emotional mimicry. A review of research on emotional mimicry suggests that in general, emotional mimicry reinforces existing group boundaries, rather than breaks or dissolves them. Specifically, there is consistent evidence that people tend to mimic similar others more than dissimilar others. Given that in-group members are by definition more similar to each other than to outgroup members, this implies that the former are more likely to be mimicked than the latter. In turn, mimicry improves social bonds with others, which then facilitates in-group relations.
The most primitive and implicit pathway for mimicry is via embodiment and can only take place when there is an actual interaction between group members. To the degree that such processes are presumed to be automatic, it is likely that they tend to reinforce social exclusion of outgroup members. By contrast, the most explicit pathway to mimicry is via perspective taking, in which one deliberately tries to take the other's perspective. This process does not require the actual presence of members of other groups, but some form of empathy when judging or expecting to meet other group members. This process is more amenable to top down influences. The research on mimicry also converges on the notion that when mimicry (or in fact other forms of behavior matching) are present, interactions can be expected to be more affiliative. Thus, with effort, mimicry can also be a tool for improving intergroup relations. As always, however, it requires more effort to cross group boundaries than to stay within.

Keywords
Mimicry, emotions, contagion, perspective taking, ingroup-outgroup, synchrony, social context, intergroup communication

Introduction

Mimicry is defined as the imitation or matching of the nonverbal behaviors of others. These behaviors can be facial expressions (Hess & Fischer, 2013), bodily postures (Bavelas, Black, Lemery, & Mullett, 1986; Bernieri & Rosenthal, 1991), vocal expressions (Neumann & Strack, 2000) or pitch (Karthikeyan & Ramachandra, 2016), pupil dilations or constrictions (Kret, Fischer, & De Dreu, 2015), or gestures such as face touching (Chartrand & Bargh, 1999). As such, mimicry is a ubiquitous phenomenon that can be readily observed in everyday life, both in interpersonal and intergroup contexts. In fact, mimicry is not restricted to humans. Primates also mimic facial expressions. For example, play face mimicry has been observed in orangutans (Davila Ross, Menzler, & Zimmermann, 2008) and in more egalitarian, but not in more "despotic," macaque species (Scopa & Palagi, 2016) suggesting a social context moderator; mimicry of play signals has also been found in dogs (Palagi, Nicotra, & Cordoni, 2015).

In order to discuss the possible role of emotional mimicry in intergroup relations, we first give a definition of the various concepts related to emotional mimicry. An overview over the burgeoning literature on mimicry shows that the specific forms of matching behaviors that are investigated vary considerably. In addition, in many cases, different terms are used interchangeably to refer to some form of matching behavior. This has not only led to conceptual confusion, but also to unjustified generalizations with regard to the phenomenon under study. In the second part of this article, we will focus on different theoretical perspectives and the associated different functions of mimicry, which are all relevant for its role in intergroup relations. In the third section, we will explore the role of emotional mimicry in intergroup relations.

What is mimicry? Terms and definitions

Not all instances where two individuals show the same behaviors can be called mimicry (see also, Elfenbein, 2014). At a minimum, the two behaviors should be related to each other. Thus, situations where matching behavior is unrelated would not qualify as mimicry. For example, when individuals show the same emotion expression because the same emotion was elicited in both of them by the same event at the same time, we refer to the resulting match as *parallel* emotion elicitation. Also, some matching behavior occurs when a facial expression is an emotional reaction *to* the expression of the other. For example, when faced with an angry other, a person may well feel irritation and anger, because of the implied insult. In such contexts, the two angry faces match, but the match cannot be considered mimicry. We refer to such reactions as a *reactive* emotion.

Mimicry according to our definition is a goal dependent automatic behavior that is time locked and occurs shortly after the mimicked behavior. In the case of facial expressions usually within a second (Dimberg & Thunberg, 1998). Importantly, it is not a mere reaction to the other behavior, but rather a sharing of responses and perspectives. Different phenomena and terms that have been associated with emotional mimicry have to be distinguished for reasons of conceptual clarification.

Facial versus Behavioral mimicry

We distinguish two forms of mimicry: *facial or emotional* mimicry*,* the imitation of the emotional (facial) expressions of others and *behavioral* mimicry, the imitation of non-emotional behaviors, such as face touching or foot tapping. The important difference is that emotional behaviors are intrinsically meaningful. Emotions are based on an appraisal of an emotion-eliciting event (Scherer, 1987), which in turn is based on an individual's preferences, values and

motivations. Thus, emotion expressions provide us with information about the expressers' interpretation of the event, their behavioral intentions and dispositions. By contrast, behaviors such as foot tapping or face touching generally do not carry such information about an expresser's appraisals, intentions or dispositions, unless they are interpreted as signaling someone's nervousness or irritation, that is, interpreted as emotion signals in their own right. As different emotions have different meanings in a given social context, it is important to distinguish between the emotions that are mimicked when considering the potential functions of emotion mimicry.

Emotional contagion

A process that is often confused with mimicry is emotional contagion. We follow Hatfield, Cacioppo, and Rapson (1992)'s definition stating that emotional contagion is the "catching" of the emotional state of someone else. However, they refer to "primitive contagion" as "the tendency to automatically mimic and synchronize expressions, vocalizations, postures, and movements with those of another person and, consequently, to converge emotionally" (pp. 153-154). That is, in their view mimicry is a causal antecedent to contagion. This explains why mimicry is sometimes referred to as motor contagion (e.g., de Gelder, 2009; Spengler, Brass, Kühn, & Schütz-Bosbach, 2010). However, the important aspect of contagion is the focus on a shared emotional state. Yet, while both mimicry and emotion contagion have been found in the same studies, they do not necessarily co-occur (e.g., Hess & Blairy, 2001; Lundqvist & Dimberg, 1995), nor is emotional mimicry a necessary precondition of emotional contagion.

Synchrony

Another concept that has especially been used in group contexts, is interpersonal synchrony, which is typically defined as the matching of behavior as well as the coordination of

movement between individuals in a temporally organized fashion during interpersonal communication (Bernieri, Reznick, & Rosenthal, 1988; Miles, Griffiths, Richardson, & Macrae, 2010; Vacharkulksemsuk & Fredrickson, 2012; Valdesolo & DeSteno, 2011). Whereas in mimicry there is usually an initiator – the mimicked person -- and a time-locked response by the mimicker, synchrony can also refer to simultaneous behavior and does not depend on the matching of specific behaviors. As synchrony is characterized by a more global quality of movement and postures, it is usually (Bernieri, Davis, Rosenthal, & Knee, 1994; Bernieri et al., 1988) assessed via a coding procedure based on the idea that human observers are able to perceive the higher level Gestalt qualities of synchrony (Vacharkulksemsuk & Fredrickson, 2012), which are not grounded in any specific behavior (Ramseyer & Tschacher, 2011). It is assumed that interpersonal synchrony produces feelings of connectedness and rapport (Bernieri et al., 1988; Hove & Risen, 2009; Lumsden, Miles, Richardson, Smith, & Macrae, 2012; Wiltermuth & Heath, 2009), because it generates a feeling of "oneness" that connects people.

Automatic imitation

Heyes (2011, p. 463) defines automatic imitation as "a type of stimulus-response compatibility effect in which the topographical features of task-irrelevant action stimuli facilitate similar, and interfere with dissimilar responses." A typical paradigm involves participants making a hand movement in response to a cue while at the same time observing another hand making the same or a different movement. In her review, Heyes (2011) observes that automatic imitation is often measured with reaction times rather than with accuracy, and so one can wonder whether this research speaks to imitation at all. At minimum, such operationalization would reflect a covert form of imitation. Heyes concludes that automatic imitation provides an important tool for the investigation of the mirror neuron system, motor mimicry, and complex

forms of imitation. She distinguishes automatic imitation from motor mimicry, but notes that some moderators seem to work similarly for both phenomena. Both work when the observed behavior is effectuated by an avatar (Pan & Hamilton, 2015; Weyers, Mühlberger, Hefele, & Pauli, 2006) and are facilitated by social priming (Leighton, Bird, Orsini, & Heyes, 2010; van Baaren, Maddux, Chartrand, de Bouter, & van Knippenberg, 2003). Mutual gaze as well facilitates both emotional mimicry (Rychlowska, Zinner, Musca, & Niedenthal, 2012) and automatic imitation (Wang, Newport, & Hamilton, 2010).

In sum, whereas there is considerable overlap in the phenomena that are covered by these different definitions, it is also clear that there are some important differences. All phenomena refer to matched behaviors, but they differ in whether they constitute emotional signals, occur in reaction to each other, require shared intentions (reactive emotions), result from a shared stimulus (parallel), or from an automatic tendency to synchronize. These differences are important, because they may imply different underlying processes and may therefore also occur in different contexts, and have different boundary conditions.

In the present overview, we will focus our analysis on the mimicry of emotion expressions (mostly based on research on facial expressions, but some studies on vocal expressions), as this is most pertinent when discussing the role of mimicry for emotion communication. However, we will also adduce evidence from research on (non-emotional) behavioral mimicry and occasionally other forms of behavioral synchronization when discussing the role of mimicry in intergroup relations. In fact, there is considerable convergence with regard to some (but not all) relevant facets of emotion mimicry and other synchronization behaviors. For example, a recent study showed that the tendency to mimic both emotional and non-

emotional (facial) behaviors is correlated (Moody & McIntosh, 2011). In addition, as noted above, automatic imitation also seems to share core features with mimicry.

Different theoretical perspectives on mimicry

Over the years, a number of different accounts of the role and function as well as the underlying processes related to mimicry have been proposed. It is important to emphasize that these accounts are generally not contradictory. Rather, we argue that they focus on different aspects of mimicry. Depending on the presumed roles and functions of mimicry, different consequences for intergroup relations can be predicted.

Mimicry as embodiment

An early account by Lipps (1907) proposed a model according to which individuals tend to imitate the emotional displays of their interaction partners. These imitated behaviors elicit - via a feedback process - corresponding emotional states. Through introspection the observers then relate their own feeling state to their knowledge about emotional experiences and attribute the emotional state to the interaction partner. This bodily basis of emotional experiences (see also James, 1890), has been debated, especially because the feedback signals from the body are too diffuse to account for specific emotional experiences. The embodiment perspective sparked new interest, however, since the beginning of this century (Niedenthal et al., 2005) and has also been proposed as an account for emotional mimicry.

Modern day accounts focus on the action of mirror neurons rather than introspection. These accounts do not necessarily stipulate overt mimicry as a necessary component, but allow for a mediation via efferent copies (Goldman & Sripada, 2005). The basic notion is that when people make social judgments they simulate relevant aspects of the stimulus in a form of embodied cognition (Niedenthal, Barsalou, Winkielman, Krauth-Gruber, & Ric, 2005). From this

perspective, people simulate the expression in sensorimotor cortex when judging emotion expressions. The resulting motor output would then be (facial) mimicry (for more detail see, Wood, Rychlowska, Korb, & Niedenthal, 2016).

The notion of a simulation process that underpins social perception, in particular with regard to emotions, has been more recently supported by research on EEG mu responses. Specifically, the mu frequency band of the EEG, measured over sensorimotor cortex, is suppressed when a person performs a motor act, but also when the person observes motor acts performed by someone else (Oberman, McCleery, Ramachandran, & Pineda, 2007; Pineda, 2005). Based on this finding, the mu response has been linked to mirror neuron activity.

Pineda and Hecht (2009) compared mirror neuron involvement in two different components of Theory of Mind: social perception and social cognition. The first component refers to the representation of the mental state of another person as if it was one's own (simulation), whereas the second component entails explicit or declarative reasoning and would not involve mirror neuron activity (theory theory). To the degree that a task relies on mirror neuron activity, mu suppression should predict how well people perform the task. The correct responses for social perception tasks (including the reading of the mind in the eyes task; Baron-Cohen, Wheelwright, Hill, Raste, & Plumb, 2001), correlated with mu suppression, suggesting a role of simulation for these tasks, whereas the correlation with the correct responses on the social cognitive task was much smaller. A more recent study found a distinct mu suppression-response during the observation of positively and negatively valenced emotional faces (Moore, Gorodnitsky, & Pineda, 2012). These findings suggest a role for mirror neurons for social perception.

In sum, simulation accounts postulate a facilitative effect of facial mimicry on emotion recognition. As they are based on the notion of an exact motor simulation, they also require that mimicry closely mirrors the observed expression if it is shown at all. Alternatively, it has been suggested that only efferent copies of a not actually effectuated movement could be the used for the simulation (Goldman & Sripada, 2005). However, the view is not compatible with situations where individuals "mimic" expressions that were not actually seen such as in cross-model mimicry, where facial reactions to vocal emotion expressions have been found (Hawk & Fischer, 2016). A lesser known theory by Laird et al. (1994), also proposes a process whereby mimicry leads to emotional contagion, but suggests a causal process congruent with self-perception theory (Bem, 1972).

Mimicry as a matched motor response

The standard view on behavioral mimicry is compatible with the mirror neuron account above (which however, does not *require* an overt mimicry response). From this account, mimicry is an automatic, matched motor response, based on a perception-behavior link (Chartrand & Bargh, 1999; Preston & de Waal, 2003). We refer to this idea as the Matched Motor Hypothesis, which assumes that merely perceiving a specific non-verbal display automatically entrains the same expression in the perceiver.

Various mechanisms have been proposed to underlie this link between perception and behavior, such as shared schemas (Barresi & Moore, 1996), shared representations (Prinz, 1997), or spreading activation (see Chartrand & Dalton, 2009). In either case, the perceptual activity is presumed to spread to behavioral representations, which in turn increases the probability of imitating that same behavior, without conscious awareness, control, or intent. Emotional mimicry would then just be one instantiation of such motor behavior. Following the original

Matched Motor Hypothesis, the movements in the face are thus spontaneously copied, independently of the intentions of the observer or expresser. More recent theorizing allows for social influence as an important moderator in this process (see Chartrand & Lakin, 2013).

Mimicry as a social regulator

The sociality of the response is the key element in the mimicry as a social regulator view, which focuses specifically on emotional mimicry (Hess & Fischer, 2013, 2014). The theory notes a number of phenomena that cannot be explained by views that presume an exact motor match between the mimicked expressions and the observed expression.

Specifically, based on a review of the literature Hess and Fischer (2013) concluded that in general specific facial movements are not mimicked. Rather, the findings suggest a valence-based account in which observing negative emotions leads to increased Corrugator Supercilii (the muscle which draws the eyebrows down and together in a frown) activity and observing positive emotions leads to increased Zygomaticus Major (the muscles that pulls the corners of the lips up in a smile) activity. Even when other facial muscles were measured, mimicry of discrete emotion patterns often has not been found. On the other hand, there is ample evidence that mimicry is sensitive to the emotional and social context and depends on various contextual cues, such as the type of the emotional signal, the identity of the target, the emotional state or disposition of the observer, and the relationship between observer and target. When social context is explicitly varied, emotional mimicry is stronger, or more likely to occur, when it reinforces social bonds or rapport. In contrast, emotional mimicry is absent or only occurs in a limited way if the relationship is negative or when one appraises the emotional signal as having a negative consequence for oneself. Also, not all expressions seem to be mimicked to the same extent. Affiliative expressions such as smiles or sadness expressions tend to be mimicked to a

larger extent than disgust or anger expressions. Note, that in the cases of primates and dogs mentioned above, the mimicked expressions were also of an affiliative nature (Palagi et al., 2015; Scopa & Palagi, 2016).

Based on these considerations, we have suggested that emotional mimicry is not merely based on the perception of a facial display, but on the interpretation of the motives underlying this display in a specific context, and thus on understanding the emotion (Hess & Fischer, 2013, 2014). Rather than merely seeing a movement of the eyebrow, people see anger in reaction to a threat or worry in reaction to a concern, and they mimic an angry or worried face rather than the contraction of specific muscles. This also means that the perception of a muscle movement as an emotional expression precedes mimicry. In other words, emotional mimicry involves the interpretation of signals as *emotions*, conveying emotional intentions, in a specific context. This is in line with one of the main functions of mimicry, namely smoothing social interactions, and establishing or maintaining social bonds.

The functions of mimicry

Four different functions of mimicry have been discussed in the literature, which are also associated with different theoretical accounts. Overall, these functions are not necessarily mutually exclusive. We already mentioned the putative role of mimicry for the facilitation of the understanding of others' emotions, as proposed by embodiment views of mimicry. These views assume that the mimicry is part of a simulation process that aides in emotion understanding. The social regulation view (Hess & Fischer, 2014, 2015) by contrast considers the understanding of another person's social aims as a prerequisite for mimicry. The second, widely agreed upon function of mimicry is the fostering of affiliation. This includes such specific effects as the increase of liking, prosocial behavior, and other positive acts. Third, a related, more specific

function concerns the facilitation of social standing. A fourth function that has been proposed more recently is the facilitation of social learning. We will describe each of these functions below.

Facilitating emotion understanding

The evidence on whether mimicry facilitates emotion understanding is complex. Most research has focused on the recognition of emotions from facial expressions. A number of well controlled studies in which participants saw a series of standardized facial expressions found no relation between mimicry and emotion recognition accuracy (Blairy, Herrera, & Hess, 1999; Bogart & Matsumoto, 2010; Hess & Blairy, 2001). There is some evidence that mimicry can speed up the emotion recognition process (Niedenthal, Brauer, Halberstadt, & Innes-Ker, 2001; Stel & van Knippenberg, 2008), but the reverse effect has also been found (Hawk, Fischer, & Van Kleef, 2012). The most consistent evidence regards studies that demand subtle judgments regarding smiles, either because the smiles are weak (Oberman, Winkielman, & Ramachandran, 2007), or because more difficult judgements are required, such as genuineness (Ipser & Cook, 2015; Maringer, Krumhuber, Fischer, & Niedenthal, 2011; Magdalena Rychlowska et al., 2014), but other studies found conflicting results (Hess, Philippot, & Blairy, 1998; Stel, van Dijk, & Olivier, 2009). Most of these studies aimed to block mimicry in one condition by a variety of means and then compared accuracy in blocked versus unblocked trials. Interestingly, however, a recent study suggests that some of the methods used to block mimicry (such as holding a pen with puckered lips) does not actually block mimicry efficiently (Hess & Blaison, 2016). However, most of these methods do block subvocalization. In this context, it is interesting that Ipser and Cook (2005) found that smile decoding accuracy was reduced when participants produced a vowel – a very efficient way to block subvocalization – but not necessarily one that

would impede smiling.

Another line of research focused on patient groups with known reductions in mimicry. Thus, high functioning individuals with autism do not spontaneously mimic others' facial expressions (McIntosh, Reichmann-Decker, Winkielman, & Wilbarger, 2006); however, they are as competent as non-autistic individuals in recognizing categories of facial expressions of emotion (Castelli, 2005; Spezio, Adolphs, Hurley, & Piven, 2007). By contrast, a more recent study with Parkinson patients found both disturbances of facial mimicry and disturbances in recognition accuracy, which the authors cautiously attribute to lack of feedback from the face in line with embodiment accounts (Argaud et al., 2016), again in particular for smiles.

As such, the evidence favors no general effect of mimicry on emotion recognition, but points to the possibility that mimicry can be helpful for smile related judgments and difficult decoding tasks. The mimicry in social context model assumes that expressions are mimicked as a function of their meaning. This fits the observation that non affiliative emotions are mimicked less (see Hess & Fischer, 2013) and suggests that some level of emotion recognition precedes mimicry.

Yet, there is evidence for the notion that mimicry may nonetheless contribute to a feeling of emotion understanding. Thus, Yabar and Hess (2007) found that an interaction partner who shows congruent sad affect during an interaction is perceived as more understanding – even when the person is an outgroup member. More recently, Mauersberger et al. (2015) found that the tendency to mimic sadness (an affiliative emotion) in a laboratory task predicted the positivity of daily interactions in a following diary task over seven days. Conversely, the tendency to mimic disgust (which was much rarer) predicted negative interactions. The effects of happiness and anger mimicry in turn were moderated by personality characteristics. These data

suggest that indeed, one positive function of some forms of mimicry may be to create an atmosphere of mutual understanding, which then may well result in actual better understanding.

Mimicry promotes human affiliation

Both motor mimicry (Chartrand & Lakin, 2013) and emotional mimicry (Hess & Fischer, 2013, 2014) have been shown to both depend on affiliation and to foster affiliation. Hess and Fischer (2013, 2014) reviewed studies that have shown that people mimic others' emotions more in contexts when participants have positive rather negative attitudes towards each other, or when they are similar rather than dissimilar, or when they belong to the same rather than a different group (Bourgeois & Hess, (Study 2, 2008); Van der Schalk et al., 2011; Weisbuch & Ambady, 2008), or want to cooperate rather than to compete with each other. This is not only the case for emotional mimicry; Lakin and Chartrand (2013) also reported more behavioral mimicry when participants have a goal to affiliate. Thus, the variation in the amount of behavioral and emotional mimicry is sensitive to social context, that is, to the nature of the relationship with the other person. Whether, or at least the extent to which, one mimics the other's emotion depends on the intentions of the expresser and the observer. These intentions can be inferred from the direction and type of the emotional signal, the relationship between observer and target, and the emotional state or disposition of the observer. Moreover, the relationship is not uni-directional, because emotional mimicry also serves to increase perceived similarity and liking (Hess, Philippot, & Blairy, 1999; Stel, van Baaren, & Vonk, 2008; Van der Schalk et al., 2011; Yabar & Hess, 2007).

Mimicry enhances social standing

The STORM (social top-down response modulation) model (Wang & Hamilton, 2012) also emphasizes the social function of mimicry and its dependence on social context. However, it

sees the function of mimicry in a Machiavellian strategy for enhancing one's social standing or a strategic intervention to change the social world for self- advancement. Wang and Hamilton base their model on the observation that people increase mimicry toward those who are important for their social welfare. Some of the evidence for this notion has also been adduced by the affiliation theories mentioned above, such that people preferentially mimic others who are nice (Likowski, Mühlberger, Seibt, Pauli, & Weyers, 2008) or those who are in-group members (Bourgeois & Hess, 2008; Van der Schalk et al., 2011). They also note that people increase mimicry when they feel that their social relationship is endangered such as when they fail to affiliate with other individuals (Lakin & Chartrand, 2003) or when they are ostracized by their group members (Lakin, Chartrand, & Arkin, 2008).

They further add that participants show stronger mimicry to a human hand compared to a virtual (Longo & Bertenthal, 2009) or a wooden hand (Liepelt & Brass, 2010), as well as to targets who are powerful and have high social status (Cheng & Chartrand, 2003). This latter evidence is somewhat more complex, however. In this study mimicry was moderated by levels of self-monitoring and only in the case of high self-monitors more mimicry of the confederate in the leader role compared to the worker role was found. The authors argue that high self-monitors pay more attention to context, and thus more readily identify affiliation cues. A recent study on emotion mimicry by contrast (Carr, Winkielman, & Oveis, 2014) is more in line with Wang and Hamilton's argument in that they found emotion specific effects of both observer and target power, congruent with the notion that social hierarchy influences mimicry in meaningful ways.

The human centricity of mimicry is also not undisputed. The studies on automatic imitation found reduced imitation effects for non-human hands. Research on emotion mimicry by contrast found good evidence for strong mimicry to avatars which is also moderated by social

context (Likowski et al., 2008; Weyers et al., 2006; Weyers, Mühlberger, Kund, Hess, & Pauli, 2009) and comparable mu suppressions has been found to humans, androids and robots (Urgen, Plank, Ishiguro, Poizner, & Saygin, 2013), Yet other research on robots and androids suggests a more complex moderation of emotion mimicry as a function of context and the "humanity" of the agent (Winkielman, Carr, Chakrabarti, Hofree, & Kavanagh, 2016).

In essence, however, the main message of the model is that mimicry processes (and these include in this case automatic imitation) serve to regulate the social distance to socially attractive versus unattractive targets. As such, despite many differences in conceptualization, the model is surprisingly compatible with the mimicry as social regulator model.

Mimicry and (social) learning

Another important potential function of mimicry regards (social) learning. This aspect is emphasized by Kavenaugh and Winkielman (2016). In fact, one of the first reviews on mimicry by Hess et al. (1999) noted an older developmental literature that conceptualized mimicry as a "primitive motor code," which might be a primary cognitive medium for learning about other people during early development. Similarly, Kavenaugh and Winkielman (2016) consider mimicry as an implicit social learning mechanism. Specifically, they argue that this learning process helps to produce the appropriate bodily and emotional responses to relevant social situations. They emphasize that this learning process and the resulting knowledge are *implicit.* Thus, it cannot easily be rejected, criticized, revised, or employed by the learner in a deliberative or deceptive manner. The function of mimicry as a mechanism for social learning also explains why people generally preferentially mimic in-group members who by definition have the proper knowledge. As such they conclude that mimicry can be considered an honest signal of group affiliation.

According to Kavenaugh and Winkielman (2016), it is the focus on the in-group that explains why mimicry can appear strategic. They further point out that mimicry that is too precise might in fact appear strategic and that the actual subtle and approximate expressions that are typically shown are more likely to serve as an honest signal. In this view, the fostering of affiliation is more of a side effect to the learning of appropriate group signals.

Emotion mimicry in intergroup relations

As noted in the review above, mimicry is strongly influenced by social context and this includes the social group context. Thus, much of the research on mimicry has direct relevance for intergroup relations, even when this is not spelled out explicitly. On the basis of this research, we suggest that emotional mimicry mainly serves to maintain group distinctions and to create ingroup bonds. The first important observation , however, is that emotional mimicry is not a one-way street, but a reciprocal process that affects all parties involved.

Antecedents of (emotion) mimicry: whom do we mimic and when?

Even though people mimic a wide variety of human and non-human expressions and behaviors, there is a clear trend to preferentially mimic people who are close to us or at least members of our own group. People also tend to preferentially mimic behaviors that are socially meaningful rather than incidental.

As such, people mimic facial expressions of stick figures (Hess, Hühnel, van der Schalk, & Fischer, 2016), avatars (Weyers et al., 2006), and robots (Winkielman et al., 2016) as well as humans. Yet, even in those cases social context factors remain important, especially for an intergroup context.

Thus, evidence from both behavioral and emotion mimicry converges to the factors of liking and affiliation (for reviews see, Chartrand & Lakin, 2013; Hess & Fischer, 2013). "Good"

avatars are mimicked, whereas "bad" ones are not (Likowski et al., 2008). People also prefer to mimic individuals with whom they expect to cooperate rather than to compete (Lanzetta & Englis, 1989; Weyers et al., 2009). Mimicry is also more pronounced for individuals with whom we share attitudes (Bourgeois & Hess, 2008, Study 1; McHugo, Lanzetta, & Bush, 1991) or whom we consider part of our group (Bourgeois & Hess, 2008, Study 2; Van der Schalk et al., 2011). We do not mimic all emotions to an equal extent, however. Some studies (Bourgeois & Hess, 2008, Study 2; Van der Schalk et al., 2011) have found that smiling behavior, which signals affiliation by itself, tends to be mimicked in outgroup members as well. This has been explained by the suggestion that smile mimicry has a very low social cost. Returning a smile is easy, and generally signals that all is well, and therefore does not lead an awkward situation or require immediate action. Mimicking sadness, however, signals understanding of the other person's suffering and hence may result in requests for aid and succor. Thus, whereas people would probably not smile in reaction to a truly disliked other (Herrera, Bourgois, & Hess, 1998; Likowski et al., 2008), they may mimic the smile of a stranger, at least as long as it is effortless and costless, and affiliation can be expected. In fact, the smile of a stranger might even signal that no animosity should be expected.

Other studies appear to have found the opposite effect of what would be expected on the basis of the group affiliation function, namely that people mimic angry outgroup members more than angry in-group members (Rauchbauer, Majdandžić, Stieger, & Lamm, 2016). However, here mimicry was defined as the congruent movement of a finger in response to a short video with finger movements while above the hand a photo of a White or Black person was shown who displayed either a smile or a frown. The more frequent mimicry of an angry outgroup member

suggests an appeasement signal, trying to affiliate, but it cannot be conceived of as the mimicry of an angry outgroup face.

The fact that people differentially mimic in-groups and outgroups also suggests that mimicry is goal dependent. In particular, the presence of a conscious or unconscious affiliation goal facilitates behavioral (Cheung, Slotter, & Gardner, 2015; Lakin et al., 2008) and emotion mimicry (Hühnel, Kuszynski, Asendorpf, & Hess, 2016), as well as automatic imitation (Leighton, Bird, Orsini, & Heyes, 2010). Mimicry is also more likely when the expression that is mimicked is relevant (Cannon, Hayes, & Tipper, 2009; Hess, Blaison, & Semin, 2013) or when participants are motivated to infer the target's emotional state, either because they were instructed to do so (Murata, Saito, Schug, Ogawa, & Kameda, 2016) or because they can get a reward (Hess, Dandeneau, & Blaison, in press).

In sum, these findings suggest that mimicry is most likely to occur when individuals are in a socially relevant context with people they wish to affiliate with and motivated to attend to them. This is why the Emotion in social context model (Hess & Fischer, 2013) conceives the function of mimicry as social regulation. Mimicry is a social signal of a benign interpersonal and intergroup stance. As such, it creates the basis for social warmth. When people do not mimic, the send a subtle but potent signal of social rejection and create social cold.

The research on the individual differences in mimicry is also in line with this argument. Interpersonal difference variables that predict mimicry include a tendency for perspective taking (Chartrand & Bargh, 1999), interdependent self-construal (van Baaren et al., 2003), self-reported empathy (Sonnby-Borgström, Jönsson, & Svensson, 2003; Van der Graaff et al., 2016), and attachment style (Sonnby-Borgström & Jõnsson, 2004). Big five personality characteristics are also related to mimicry, but the relationship depends on the specific behavior mimicked. Thus,

agreeableness is positively related to mimicry of positive behaviors and extraversion to mimicry of negative behaviors in behavioral mimicry (Kurzius & Borkenau, 2015). For emotion mimicry an even more complex pattern was found. For example, agreeableness correlated positively with sadness mimicry and negatively with disgust mimicry. Extraversion correlated positively with sadness mimicry and neuroticism with disgust mimicry. But emotion regulation ability (happiness) and self-esteem (anger) were also found to predict mimicry (Mauersberger et al., 2015). In sum, individual difference measures related to a positive attitude towards in others tend to be positively related to mimicry.

The notion that mimicry is fundamental for the relationship with others is also supported by studies on clinical syndromes that characterized by interpersonal problems. Thus, individuals with autistic traits (McIntosh et al., 2006; Neufeld, Ioannou, Korb, Schilbach, & Chakrabarti, 2015), suffering from schizophrenia (Varcin, Bailey, & Henry, 2010) or boys with disruptive behavior disorders all show reduced mimicry (de Wied, van Boxtel, Zaalberg, Goudena, & Matthys, 2006). Fitting this picture are also experiments that try to affect other orientation experimentally. Thus, the administration of testosterone reduces mimicry (Hermans, Putman, & van Honk, 2006) whereas the administration of oxytocin increases it (Korb, Malsert, Strathearn, Vuilleumier, & Niedenthal, 2016).

Overall, the consideration of the antecedents of mimicry – be it behavioral, emotional, or automatic imitation converges to a picture of mimicry serving group relations. People are more likely to mimic people they know, or feel familiar with, like members of their group.

Consequences of emotion mimicry

With regard to the consequences of mimicry, we need to distinguish between the consequences for the person being mimicked and the consequences for the person who mimics.

As regards the former, a common paradigm consists of employing a confederate who either mimics or does not mimic the participant during an interaction, who is consequently asked to evaluate aspects of the interaction or whose behavior during the interaction is observed. Due to the differences in timing between behavioral mimicry – which has time delays in the order of several seconds – and emotion mimicry, which occurs normally within one second, the majority of these studies has focused on behavioral mimicry. Exceptions are a study by Yabar and Hess (Yabar & Hess, 2007) where mimicry was shown several times during an extended emotion display by the participant so that timing issues did not arise or research using computer avatars who can mimic in real time (Demeure, Niewiadomski, & Pelachaud, 2011).

The consequences of being mimicked

As can be expected from the above, being mimicked generally fosters prosocial or positive behaviors as well as positive feelings towards the mimicker. People who are mimicked are more likely to help others (Fischer-Lokou, Martin, Guéguen, & Lamy, 2011; Van Baaren, Holland, Kawakami, & Van Knippenberg, 2004) or agree to complete tedious tasks at their request (Ashton-James, van Baaren, Chartrand, Decety, & Karremans, 2007; Nicolas Guéguen, Martin, & Meineri, 2011). This effect of mimicry even applies to 18-month old toddlers (Carpenter, Uebel, & Tomasello, 2013). People who are mimicked are also more honest (Guéguen, 2013) and more willing to answer intimate questions (Guéguen, Martin, Meineri, & Simon, 2013).

Conversely, people who mimic others are perceived by the mimickee as more likable, warm and attractive (e.g., Guéguen, 2009; Lakin & Chartrand, 2003; Yabar & Hess, 2007) and this applies to avatars as well (Demeure, Niewiadomski, & Pelachaud, 2011). As such, mimicry does have a number of positive effects which have the potential to apply to intergroup

interactions. However, whereas Yabar and Hess (2007) found that mimicry resulted in a more positive evaluation of both ingroup and outgroup mimickers, these effects did not generalize to attitudes about the outgroup.

Mimicking others also has consequences for the mimicking person. In a series of studies Stel and colleagues found that engaging in mimicry can increase liking (Stel et al., 2010) encourages a more positive view of the world (Stel, van den Bos, Sim, & Rispens, 2013) and reduces the blaming of victims (Stel, van den Bos, & Bal, 2012). Engaging in mimicry or synchronous behavior also opens individuals up to persuasion. Thus, engaging in synchronous behavior increases the tendency to conform to others' preferences in an unrelated choice situation (Dong, Dai, & Wyer Jr, 2015).

Conclusion: Emotional mimicry and synchrony in groups

We have shown that emotional mimicry and contagion for that matter, more readily occurs within than across specific groups. Emotional mimicry thus helps to maintain group boundaries and to facilitate emotion communication within groups. In most cases emotional mimicry is not a deliberate, but an automatic response of which we are not aware. This does not mean that more deliberate forms of mimicry do not have effects. In various studies by Stel (e.g., Stel et al., 2008) for example, participants were instructed to mimic. Another form of mimicry that is more explicit and based on deliberate acts is synchrony. Synchrony refers to simultaneous behaviors that are not clearly the antecedent or consequence of a specific, matching behavior of another person and may especially occur in groups. Marching, dancing, singing and so on, may all induce synchronous movements that further strengthen group-based feelings of rapport, liking and oneness (Bernieri, 1988; Miles, Nind, & Macrae, 2009; Wiltermuth & Heath, 2009). Further, synchrony may also enhance perceptual and motor ability, such that increased perceptual ability

mediates the successful performance on a joint action task (Valdesolo, Ouyang, & DeSteno, 2010). This suggests that synchrony enhances one's attention to others, in fact, this is a requirement to maintain synchrony and prosocial behaviors or collective task efforts are a direct result of this. This could mean that groups can be created on the basis of synchrony.

As may be inferred from the above review on the different theories and functions of mimicry, there is not one path way leading to emotional mimicry, but several, and they do not necessarily exclude each other, but occur in different settings (Hess & Fischer, 2014; Hess, Houde, & Fischer, 2014). The most primitive and implicit pathway is via embodiment, as a subtle mimicry response to a similar other. The most explicit way is via perspective taking, in which one deliberately tries to take the other's perspective. In most of these cases, emotional mimicry will reinforce existing group boundaries rather than break or dissolve them. This does not mean that this is always the case. Deliberately engaging in synchrony with members of other groups, or taking their perspective, can create rapport or pro-social behavior towards others. As always, however, it requires effort to do this, and to cross boundaries of groups.

Further Reading

Chartrand, T. L., & Lakin, J. L. (2013). The antecedents and consequences of human behavioral mimicry. *Annual Review of Psychology, 64*, 285-308.

Dong, P., Dai, X., & Wyer Jr, R. S. (2015). Actors conform, observers react: The effects of behavioral synchrony on conformity. *Journal of personality and social psychology, 108*(1), 60-75. doi:10.1037/pspi0000001

Hess, U., & Fischer, A. (2013). Emotional mimicry as social regulation. *Personality and Social Psychology Review, 17*, 142-157.

Hess, U., & Fischer, A. (Eds.)(2016). Emotional mimicry in social context. London: Cambridge University Press.

Lakin, J. L., Chartrand, T. L., & Arkin, R. M. (2008). I Am Too Just Like You: Nonconscious Mimicry as an Automatic Behavioral Response to Social Exclusion. *Psychological Science, 19*(8), 816-822.

Preston, S. D., & de Waal, F. B. M. (2003). Empathy: Its ultimate and proximate bases. *Behavioral and Brain Sciences, 25*, 1-20.

Yabar, Y., & Hess, U. (2007). Display of empathy and perception of out-group members. *New Zealand Journal of Psychology, 36*, 42-50.

Van der Schalk, J., Fischer, A. H., Doosje, B. J., Wigboldus, D., Hawk, S. T., Hess, U., & Rotteveel, M. (2011). Congruent and incongruent responses to emotional displays of ingroup and outgroup. *Emotion, 11*, 286-298.

Wang, Y., & Hamilton, A. F. d. C. (2012). Social top-down response modulation (STORM): a model of the control of mimicry in social interaction. *Towards a neuroscience of social interaction*, 160.

References

Argaud, S., Delplanque, S., Houvenaghel, J.-F., Auffret, M., Duprez, J., Vérin, M., . . . Sauleau, P. (2016). Does Facial Amimia Impact the Recognition of Facial Emotions? An EMG Study in Parkinson's Disease. *PLoS ONE, 11*(7), e0160329. doi:10.1371/journal.pone.0160329

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-Cohen, S., Wheelwright, S., Hill, J., Raste, Y., & Plumb, I. (2001). The "Reading the Mind in the Eyes" test revised version: A study with normal adults, and adults with Asperger syndrome or high-functioning autism. *Journal of child psychology and psychiatry, 42*(2), 241-251.

Barresi, J., & Moore, C. (1996). Intentional relations and social understanding. *Behavioral and Brain Sciences, 19*, 107-122. doi:10.1017/S0140525X00041790

Bavelas, J. B., Black, A., Lemery, C. R., & Mullett, J. (1986). "I show how you feel": Motor mimicry as a communicative act. *Journal of personality and social psychology, 50*, 322-329.

Bernieri, F. J., & Rosenthal, R. (1991). Interpersonal coordination: Behavior matching and interactional synchrony. In R. S. Feldman & B. Rimé (Eds.), *Fundamentals of nonverbal behavior* (pp. 401-432). Cambridge: Cambridge University Press.

Blairy, S., Herrera, P., & Hess, U. (1999). Mimicry and the Judgment of Emotional Facial Expressions. *journal of nonverbal behavior, 23*, 5-41.

Bogart, K. R., & Matsumoto, D. (2010). Facial Mimicry is Not Necessary to Recognize Emotion: Facial Expression Recognition by People with Moebius Syndrome. *Social Neuroscience, 5*, 241-251.

Bourgeois, P., & Hess, U. (2008). The impact of social context on mimicry. *Biological Psychology, 77*, 343-352.

Cannon, P., Hayes, A., & Tipper, S. (2009). An electromyographic investigation of the impact of task relevance on facial mimicry. *Cognition & Emotion, 23*, 918 – 929.

Carpenter, M., Uebel, J., & Tomasello, M. (2013). Being mimicked increases prosocial behavior in 18-month-old infants. *Child Development, 84*(5), 1511-1518. doi:10.1111/cdev.12083

Carr, E. W., Winkielman, P., & Oveis, C. (2014). Transforming the mirror: Power fundamentally changes facial responding to emotional expressions [Press release]

Castelli, F. (2005). Understanding emotions from standardized facial expressions in autism and normal development. *Autism, 9*, 428-449. doi:10.1177/1362361305056082

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.

Chartrand, T. L., & Dalton, A. N. (2009). Mimicry: Its ubiquity, importance, and functionality. Oxford handbook of human action, 458-483.

Chartrand, T. L., & Lakin, J. L. (2013). The antecedents and consequences of human behavioral mimicry. *Annual Review of Psychology, 64*, 285-308.

Cheng, C. M., & Chartrand, T. L. (2003). Self-Monitoring Without Awareness: Using Mimicry as a Nonconscious Affiliation Strategy. *Journal of personality and social psychology, 85*, 1170-1179.

Cheung, E. O., Slotter, E. B., & Gardner, W. L. (2015). Are you feeling what I'm feeling? The role of facial mimicry in facilitating reconnection following social exclusion [Press release]

Davila Ross, M., Menzler, S., & Zimmermann, E. (2008). Rapid facial mimicry in orangutan play. *Biology Letters, 4*(1), 27.

de Gelder, B. (2009). Why bodies? Twelve reasons for including bodily expressions in affective neuroscience. *Philosophical Transactions of the Royal Society London B, 364*, 3475–3484.

de Wied, M., van Boxtel, A., Zaalberg, R., Goudena, P. P., & Matthys, W. (2006). Facial EMG responses to dynamic emotional facial expressions in boys with disruptive behavior disorders. *Journal of Psychiatric Research, 40*, 112-121. doi:10.1016/j.jpsychires.2005.08.003

Demeure, V., Niewiadomski, R., & Pelachaud, C. (2011). How is believability of a virtual agent related to warmth, competence, personification, and embodiment? *Presence: Teleoperators and Virtual Environments, 20*(5), 431-448.

Dimberg, U., & Thunberg, M. (1998). Rapid facial reactions to emotional facial expressions. *Scandinavian Journal of Psychology, 39*, 39-45.

Dong, P., Dai, X., & Wyer Jr, R. S. (2015). Actors conform, observers react: The effects of behavioral synchrony on conformity. *Journal of personality and social psychology, 108*(1), 60-75. doi:10.1037/pspi0000001

Fischer-Lokou, J., Martin, A., Guéguen, N., & Lamy, L. (2011). Mimicry and propagation of prosocial behavior in a natural setting. *Psychological Reports, 108*(2), 599-605.

Goldman, A., & Sripada, C. S. (2005). Simulationist models of face-based emotion recognition. *Cognition, 94*, 193-213.

Guéguen, N. (2009). Mimicry and seduction: An evaluation in a courtship context. *Social Influence, 4*(4), 249-255. doi:10.1080/15534510802628173

Guéguen, N. (2013). Mimicry and honesty: People give more honest responses to their mimicker. *International Journal of Psychological Research, 6*(1), 53-57.

Guéguen, N., Martin, A., & Meineri, S. (2011). Mimicry and helping behavior: An evaluation of mimicry on explicit helping request. *The Journal of Social Psychology, 151*(1), 1-4.

Guéguen, N., Martin, A., Meineri, S., & Simon, J. (2013). Using mimicry to elicit answers to intimate questions in survey research. *Field Methods, 25*(1), 47-57. doi:10.1177/1525822X12449710

Hawk, S., & Fischer, A. (2016). More than just a mirror: examining the cross-channel mimicry of emotional expressions. In U. Hess & A. Fischer (Eds.), *Emotional Mimicry in Social Context* (pp. 107-124). Cambridge, UK: Cambridge University Press.

Hawk, S. T., Fischer, A. H., & Van Kleef, G. A. (2012). Face the noise: Embodied responses to nonverbal vocalizations of discrete emotions. *Journal of Personality and Social Psychology, 102, 796-814*.

Hermans, E. J., Putman, P., & van Honk, J. (2006). Testosterone administration reduces empathetic behavior: A facial mimicry study. *Psychoneuroendocrinology, 31*, 859-866.

Herrera, P., Bourgois, P., & Hess, U. (1998, September 23 – 27). *Counter mimicry effects as a function of racial attitudes*. Paper presented at the 38th Annual Meeting of the Society for Psychophysiological Research, Denver, CO,.

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., & Blaison, C. (2016). *Blocking Mimicry – Or not?* Paper presented at the 56th Annual Meeting of the Society for Psychophysiological Research, Minneapolis, Minnesota, September 21-25.

Hess, U., Blaison, C., & Semin, G. R. (2013). *Ignored emotions are processed but not mimicked*. Paper presented at the 53rd Annual Meeting of the Society for Psychophysiological Research, Florence, Italy, October 2-6.

Hess, U., Dandeneau, S., & Blaison, C. (in press). The impact of rewards on empathic accuracy and emotional mimicry. *Motivation and Emotion*.

Hess, U., & Fischer, A. (2013). Emotional mimicry as social regulation. *Personality and Social Psychology Review, 17*, 142-157.

Hess, U., & Fischer, A. (2014). Emotional Mimicry: Why and When We Mimic Emotions. *Social and Personality Psychology Compass, 8*, 45-57.

Hess, U., Houde, S., & Fischer, A. (2014). Do we mimic what we see or what we know? In C. von Scheve & M. Salmela (Eds.), *Collective Emotions* (pp. 94-107). Oxford, UK: Oxford University Press.

Hess, U., Hühnel, I., van der Schalk, J., & Fischer, A. (2016). The social dimension as antecedent and effect of emotional mimicry. In U. Hess & A. Fischer (Eds.), *Emotional Mimicry in Social Context* (pp. 90-106). Cambridge, UK: Cambridge University Press.

Hess, U., Philippot, P., & Blairy, S. (1998). Facial reactions to emotional facial expressions: Affect or cognition? *Cognition and Emotion, 12*, 509-532.

Hess, U., Philippot, P., & Blairy, S. (1999). Mimicry: Facts and fiction. In P. Philippot & R. S. Feldman (Eds.), *The social context of nonverbal behavior. Studies in emotion and social interaction.* (pp. 213-241). Cambridge, UK: Cambridge University Press.

Heyes, C. (2011). Automatic imitation. *Psychological Bulletin, 137*, 463-483. doi:10.1037/a0022288

Hühnel, I., Kuszynski, J., Asendorpf, J., & Hess, U. (2016). Facial mimicry of older adults' expressions: Effects of partial inclusion in a Cyberball paradigm. *Manuscript in submitted for publication*.

Ipser, A., & Cook, R. (2015). Inducing a Concurrent Motor Load Reduces Categorization Precision for Facial Expressions. *Journal of Experimental psychology: Human Perception and Performance*, No Pagination Specified. doi:10.1037/xhp0000177

James, W. (1890). The principles of psychology New York. *Holt and company*.

Karthikeyan, S., & Ramachandra, V. (2016). Are Vocal Pitch Changes in Response to Facial Expressions of Emotions Potential Cues of Empathy? A Preliminary Report. *Journal of Psycholinguistic Research*, 1-12. doi:10.1007/s10936-016-9446-y

Kavanagh, L. C., & Winkielman, P. (2016). The Functionality of Spontaneous Mimicry and Its Influences on Affiliation: An Implicit Socialization Account. *Frontiers in Psychology, 7*, 458. doi:10.3389/fpsyg.2016.00458

Korb, S., Malsert, J., Strathearn, L., Vuilleumier, P., & Niedenthal, P. (2016). Sniff and mimic — Intranasal oxytocin increases facial mimicry in a sample of men. *Hormones and Behavior, 84*, 64-74. doi:http://dx.doi.org/10.1016/j.yhbeh.2016.06.003

Kret, M. E., Fischer, A. H., & De Dreu, C. K. W. (2015). Pupil mimicry correlates with trust in in-group partners with dilating pupils. *Psychological Science, 26*(9), 1401-1410. doi:10.1177/0956797615588306

Kurzius, E., & Borkenau, P. (2015). Antecedents and Consequences of Mimicry: A Naturalistic Interaction Approach. *European Journal of Personality, 29*(2), 107-124.

Lakin, J. L., & Chartrand, T. L. (2003). Using nonconscious behavioral mimicry to create affiliation and rapport. *Psychological Science, 14*, 334-339.

Lakin, J. L., Chartrand, T. L., & Arkin, R. M. (2008). I Am Too Just Like You: Nonconscious Mimicry as an Automatic Behavioral Response to Social Exclusion. *Psychological Science, 19*(8), 816-822.

Lanzetta, J. T., & Englis, B. G. (1989). Expectations of cooperation and competition and their effects on observers' vicarious emotional responses. *Journal of personality and social psychology, 56*, 543-554.

Leighton, J., Bird, G., Orsini, C., & Heyes, C. (2010). Social attitudes modulate automatic imitation. *Journal of Experimental Social Psychology, 46*(6), 905-910. doi:http://dx.doi.org/10.1016/j.jesp.2010.07.001

Liepelt, R., & Brass, M. (2010). Top-Down Modulation of Motor Priming by Belief About Animacy. *Experimental Psychology, 57*(3), 221-227. doi:10.1027/1618-3169/a000028

Likowski, K. U., Mühlberger, A., Seibt, B., Pauli, P., & Weyers, P. (2008). Modulation of facial mimicry by attitudes. *Journal of Experimental Social Psychology, 44*, 1065–1072.

Lipps, T. (1907). Das Wissen von fremden Ichen. In T. Lipps (Ed.), *Psychologische Untersuchungen (Band 1)* (pp. 694-722). Leipzig: Engelmann.

Longo, M. R., & Bertenthal, B. I. (2009). Attention modulates the specificity of automatic imitation to human actors. *Experimental Brain Research, 192*(4), 739-744. doi:10.1007/s00221-008-1649-5

Lumsden, J., Miles, L. K., Richardson, M. J., Smith, C. A., & Macrae, C. N. (2012). Who syncs? Social motives and interpersonal coordination. *Journal of Experimental Social Psychology, 48*(3), 746-751.

Lundqvist, L. O., & Dimberg, U. (1995). Facial expressions are contagious. *Journal of Psychophysiology, 9*, 203-211.

Maringer, M., Krumhuber, E. G., Fischer, A. H., & Niedenthal, P. M. (2011). Beyond smile dynamics: Mimicry and beliefs in judgments of smiles. *Emotion, 11*(1), 181-187. doi:10.1037/a0022596

Mauersberger, H., Blaison, C., Kafetsios, K., Kessler, C.-L., & Hess, U. (2015). Individual Differences in Emotional Mimicry and Their Differential Effects on Social Interaction Quality. *European Journal of Personality, 29*, 512-529.

McHugo, G. J., Lanzetta, J. T., & Bush, L. K. (1991). The effect of attitudes on emotional reactions to expressive displays of political leaders. *journal of nonverbal behavior, 15*, 19-41.

McIntosh, D. N., Reichmann-Decker, A., Winkielman, P., & Wilbarger, J. L. (2006). When the social mirror breaks: Deficits in automatic, but not voluntary mimicry of emotional facial expressions in autism. *Developmental Science, 9*, 295–302.

Moody, E. J., & McIntosh, D. N. (2011). Mimicry of Dynamic Emotional and Motor-Only Stimuli. *Social Psychological and Personality Science, 2*(6), 679-686.

Moore, A., Gorodnitsky, I., & Pineda, J. A. (2012). EEG mu component responses to viewing emotional faces. *Behavioural Brain Research, 226*(1), 309-316. doi:http://dx.doi.org/10.1016/j.bbr.2011.07.048

Murata, A., Saito, H., Schug, J., Ogawa, K., & Kameda, T. (2016). Spontaneous Facial Mimicry Is Enhanced by the Goal of Inferring Emotional States: Evidence for Moderation of "Automatic" Mimicry by Higher Cognitive Processes. *PLoS ONE, 11*(4), e0153128. doi:10.1371/journal.pone.0153128

Neufeld, J., Ioannou, C., Korb, S., Schilbach, L., & Chakrabarti, B. (2015). Spontaneous facial mimicry is modulated by joint attention and autistic traits. *Autism Research*, No Pagination Specified. doi:10.1002/aur.1573

Neumann, R., & Strack, F. (2000). "Mood Contagion": The automatic transfer of mood between persons. *Journal of personality and social psychology, 79*, 211-223.

Niedenthal, P. M., Barsalou, L. W., Winkielman, P., Krauth-Gruber, S., & Ric, F. (2005). Embodiment in Attitudes, Social Perception, and Emotion. *Personality and Social Psychology Review, 9*, 184–211.

Niedenthal, P. M., Brauer, M., Halberstadt, J., & Innes-Ker, A. H. (2001). When did her smile drop? Facial mimicry and the influences of emotional state on the detection of change in emotional expression. *Cognition and Emotion, 15*, 853-864.

Niewiadomski, R., Prepin, K., Bevacqua, E., Ochs, M., & Pelachaud, C. (2010). Towards a smiling ECA: studies on mimicry, timing and types of smiles. Paper presented at the Proceedings of the 2nd international workshop on Social signal processing, Firenze, Italy.

Oberman, L. M., McCleery, J. P., Ramachandran, V. S., & Pineda, J. A. (2007). EEG evidence for mirror neuron activity during the observation of human and robot actions: Toward an analysis of the human qualities of interactive robots. *Neurocomputing, 70*(13), 2194-2203.

Oberman, L. M., Winkielman, P., & Ramachandran, V. S. (2007). Face to face: Blocking facial mimicry can selectively impair recognition of emotional expressions. *Social Neuroscience, 2*(3-4), 167-178.

Palagi, E., Nicotra, V., & Cordoni, G. (2015). Rapid mimicry and emotional contagion in domestic dogs. *Royal Society Open Science, 2*(12).

Pan, X., & de C. Hamilton, A. F. (2015). Automatic imitation in a rich social context with virtual characters. *Frontiers in Psychology, 6*.

Pineda, J. A. (2005). The functional significance of mu rhythms: translating "seeing" and "hearing" into "doing". *Brain Research Reviews, 50*(1), 57-68.

Pineda, J. A., & Hecht, E. (2009). Mirroring and mu rhythm involvement in social cognition: are there dissociable subcomponents of theory of mind? *Biological Psychology, 80*(3), 306-314.

Preston, S. D., & de Waal, F. B. M. (2003). Empathy: Its ultimate and proximate bases. *Behavioral and Brain Sciences, 25*, 1-20.

Prinz, W. (1997). Perception and Action Planning. *European Journal of Cognitive Psychology, 9*, 129-154. doi:10.1080/713752551

Rauchbauer, B., Majdandžić, J., Stieger, S., & Lamm, C. (2016). The Modulation of Mimicry by Ethnic Group-Membership and Emotional Expressions. *PLoS ONE, 11*, e0161064.

Rychlowska, M., Cañadas, E., Wood, A., Krumhuber, E. G., Fischer, A., & Niedenthal, P. M. (2014). Blocking Mimicry Makes True and False Smiles Look the Same. *PLoS ONE, 9*(3), e90876. doi:10.1371/journal.pone.0090876

Rychlowska, M., Zinner, L., Musca, S. C., & Niedenthal, P. M. (2012). *From the eye to the heart: eye contact triggers emotion simulation*. Paper presented at the Proceedings of the 4th Workshop on Eye Gaze in Intelligent Human Machine Interaction, Santa Monica, California.

Scherer, K. R. (1987). Towards a dynamic theory of emotion: The component process model of affective states. *Geneva Studies in Emotion and Communication, 1*, 1-98. Retrieved from http://www.affective-sciences.org/node/402

Scopa, C., & Palagi, E. (2016). Mimic me while playing! Social tolerance and rapid facial mimicry in macaques (Macaca tonkeana and Macaca fuscata) [Press release]

Sonnby-Borgström, M., & Jõnsson, P. (2004). Dismissing-avoidant pattern of attachment and mimicry reactions at different levels of information processing. *Scandinavian Journal of Psychology, 45*, 103-113.

Sonnby-Borgström, M., Jönsson, P., & Svensson, O. (2003). Emotional empathy as related to mimicry reactions at different levels of information processing. *journal of nonverbal behavior, 27*, 3-23.

Spengler, S., Brass, M., Kühn, S., & Schütz-Bosbach, S. (2010). Minimizing motor mimicry by myself: Self-focus enhances online action-control mechanisms during motor contagion *Consciousness and Cognition, 19*, 98–106.

Spezio, M. L., Adolphs, R., Hurley, R. S. E., & Piven, J. (2007). Abnormal Use of Facial Information in High-Functioning Autism *Journal of Autism and Developmental Disorders, 37*, 929–939 doi:10.1007/s10803-006-0232-9

Stel, M., Blascovich, J., McCall, C., Mastop, J., van Baaren, R. B., & Vonk, R. (2010). Mimicking disliked others: Effects of a priori liking on the mimicry-liking link. *European Journal of Social Psychology, 40*(5), 867-880.

Stel, M., van Baaren, R. B., & Vonk, R. (2008). Effects of mimicking: acting prosocially by being emotionally moved. *European Journal of Social Psychology, 38*(6), 965-976. doi:10.1002/ejsp.472

Stel, M., van den Bos, K., & Bal, M. (2012). On mimicry and the psychology of the belief in a just world: Imitating the behaviors of others reduces the blaming of innocent victims. *Social Justice Research, 25*(1), 14-24. doi:10.1007/s11211-012-0150-2

Stel, M., van den Bos, K., Sim, S., & Rispens, S. (2013). Mimicry and just world beliefs: Mimicking makes men view the world as more personally just. *British Journal of Social Psychology, 52*(3), 397-411. doi:10.1111/j.2044-8309.2011.02084.x

Stel, M., van Dijk, E., & Olivier, E. (2009). You Want to Know the Truth? Then Don't Mimic! *Psychological Science, 20*, 693-699. doi:10.1111/j.1467-9280.2009.02350

Stel, M., & van Knippenberg, A. (2008). The Role of Facial Mimicry in the Recognition of Affect. *Psychological Science, 19*, 984 - 985.

Urgen, B. A., Plank, M., Ishiguro, H., Poizner, H., & Saygin, A. P. (2013). EEG theta and Mu oscillations during perception of human and robot actions. *Front. Neurorobotics, 7*(19), 10.3389.

Vacharkulksemsuk, T., & Fredrickson, B. L. (2012). Strangers in sync: Achieving embodied rapport through shared movements. *Journal of Experimental Social Psychology, 48*(1), 399-402. doi:http://dx.doi.org/10.1016/j.jesp.2011.07.015

Van Baaren, R. B., Holland, R. W., Kawakami, K., & Van Knippenberg, A. (2004). Mimicry and prosocial behavior. *Psychological Science, 15*(1), 71-74.

van Baaren, R. B., Maddux, W. W., Chartrand, T. L., de Bouter, C., & van Knippenberg, A. (2003). It takes two to mimic: Behavioral consequences of self-construals. *Journal of personality and social psychology, 84*, 1093-1102.

Van der Graaff, J., Meeus, W., de Wied, M., van Boxtel, A., van Lier, P. A. C., Koot, H. M., & Branje, S. (2016). Motor, affective and cognitive empathy in adolescence: Interrelations between facial electromyography and self-reported trait and state measures. *Cognition and Emotion, 30*(4), 745-761. doi:10.1080/02699931.2015.1027665

Van der Schalk, J., Fischer, A. H., Doosje, B. J., Wigboldus, D., Hawk, S. T., Hess, U., & Rotteveel, M. (2011). Congruent and incongruent responses to emotional displays of ingroup and outgroup. *Emotion, 11*, 286-298.

Varcin, K. J., Bailey, P. E., & Henry, J. D. (2010). Empathic deficits in schizophrenia: The potential role of rapid facial mimicry. *International Neuropsychological Society. Journal, 16*, 621-629. doi:10.1017/s1355617710000329

Wang, Y., & Hamilton, A. F. d. C. (2012). Social top-down response modulation (STORM): a model of the control of mimicry in social interaction. *Towards a neuroscience of social interaction*, 160.

Wang, Y., Newport, R., & Hamilton, A. F. d. C. (2010). Eye contact enhances mimicry of intransitive hand movements. *Biology Letters*.

Weisbuch, M., & Ambady, N. (2008). Affective divergence: Automatic responses to others' emotions depend on group membership. *Journal of personality and social psychology, 95*, 1063-1079.

Weyers, P., Mühlberger, A., Hefele, C., & Pauli, P. (2006). Electromyographic responses to static and dynamic avatar emotional facial expressions. *Psychophysiology, 43*, 450-453.

Weyers, P., Mühlberger, A., Kund, A., Hess, U., & Pauli, P. (2009). Modulation of facial reactions to avatar emotional faces by nonconscious competition priming. *Psychophysiology, 46*, 328-335.

Winkielman, P., Carr, E. W., Chakrabarti, B., Hofree, G., & Kavanagh, L. C. (2016). Mimicry, emotion, and social context: insights from typical and atypical humans, robots, and androids. *Emotional Mimicry in Social Context*, 162-191.

Wood, A., Rychlowska, M., Korb, S., & Niedenthal, P. (2016). Fashioning the Face: Sensorimotor Simulation Contributes to Facial Expression Recognition. *Trends in Cognitive Sciences, 20*(3), 227-240. doi:http://dx.doi.org/10.1016/j.tics.2015.12.010

Yabar, Y., & Hess, U. (2007). Display of empathy and perception of out-group members. *New Zealand Journal of Psychology, 36*, 42-50.