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Social attitudes modulate automatic imitation

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ABSTRACT

In naturalistic interpersonal settings, mimicry or "automatic imitation" generates liking, affiliation, cooperation and other positive social attitudes. The purpose of this study was to find out whether the relationship between social attitudes and mimicry is bidirectional: Do social attitudes have a direct and specific effect on mimicry? Participants were primed with pro-social, neutral or anti-social words in a scrambled sentence task. They were then tested for mimicry using a stimulus-response compatibility procedure. In this procedure, participants were required to perform a pre-specified movement (e.g. opening their hand) on presentation of a compatible (open) or incompatible (close) hand movement. Reaction time data were collected using electromyography (EMG) and the magnitude of the mimicry/automatic imitation effect was calculated by subtracting reaction times on compatible trials from those on incompatible trials. Pro-social priming produced a larger automatic imitation effect than anti-social priming, indicating that the relationship between mimicry and social attitudes is bidirectional, and that social attitudes have a direct and specific effect on the tendency to imitate behavior without intention or conscious awareness.

There is evidence that unconscious mimicry[1] promotes smooth and harmonious social interactions and strengthens social relationships (Chartrand & Bargh, 1999; Lakin & Chartrand, 2003). It has been demonstrated that, when people are not aware that their behavior is being copied, being mimicked increases rapport (Chartrand & Bargh, 1999), feelings of closeness (van Baaren, Holland, Karremans, & van Knippenberg, in press), altruistic behavior (van Baaren, Holland, Kawakami, & van Knippenberg, 2004) and trust (Bailenson & Yee, 2005). In a study where half the participants were mimicked by a confederate and half were not, participants who were mimicked reported liking the confederate more than those who were not (Chartrand & Bargh, 1999). In another study, waitresses who were instructed to mimic their customers received bigger tips than those who were instructed not to mimic (van Baaren, Holland, Steenaert, & van Knippenberg, 2003). Thus, a range of studies suggest that unconscious mimicry is linked to increased positive social attitudes.

Although the effects of mimicry on social attitudes have been studied extensively (e.g., Bavelas, Black, Lemery, & Mullett, 1986; Chartrand & Bargh, 1999), only a small number of studies have examined the converse relationship—the impact of social attitudes on mimicry. Some early research suggested that among romantic couples there is a correlation between the amount of rapport they feel with each other and the amount of mimicking that takes place during their interactions (Bernieri, 1988; see LaFrance, 1979, 1982; LaFrance & Broadbent, 1976 for related work). Furthermore, Heider and Skowronski (submitted for publication) have shown that individuals are more likely to mimic those of their own race, rather than those of a different race. The difference in the degree of mimicry towards own and other races was explained by differences in explicit and implicit racial attitudes.

Two recent studies (Lakin & Chartrand, 2003, see also Lakin, Chartrand & Arkin, 2008; van Baaren, Maddux, Chartrand, De Bouter, & Van Knippenberg, 2003) have directly investigated the effect of social attitudes on mimicry. Lakin and Chartrand (2003) manipulated the extent to which participants aimed to affiliate with an interaction partner and found that an increased desire to affiliate resulted in greater mimicry. Van Baaren and colleagues varied self construal orientation, and found that participants with either a temporarily induced, or chronic, dominant interdependent self construal were more likely to match the behaviors of a confederate than those with an independent self construal (van Baaren, Maddux, et al., 2003).

In previous research on the relationship between social attitudes and mimicry, including that of Lakin and Chartrand (2003) and van Baaren, Holland, et al. (2003), van Baaren, Maddux, et al. (2003), mimicry was measured by scoring matching behavior in naturalistic social interactions. In the majority of these studies, a participant interacted with a confederate who either shook their foot or rubbed their face with above average frequency. The interaction was recorded and subsequently scored. Judges measured the frequency of each action for each participant, yielding a 'mimicry score'. For example, mimicking behavior is foot shaking in the presence of a foot shaking confederate and non-

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[1] Copying of familiar, observed body movements is known as mimicry in the literature on social interaction, and as imitation or automatic imitation in cognitive neuroscience. Here we use mimicry and automatic imitation as synonyms or, as indicated in the text, automatic imitation as a subset of mimicry which is not subject to intentional control.

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mimicking behavior is foot shaking in the presence of a face rubbing confederate. In another technique used by van Baaren, Holland, et al. (2003), van Baaren, Maddux, et al. (2003), the confederate manipulated a pen, and judges then scored how much time each participant spent manipulating a similar pen.

The naturalistic approach has many strengths–most notably, its ecological validity–but this approach inevitably leaves unanswered a number of important questions about the relationship between social attitudes and mimicry: First, do social attitudes influence mimicry directly, or by modulating the amount of attention given by the participant (or "observer") to the body movements of the confederate (or "model")? In the latter case, the reported effect of positive social attitudes on mimicry would be merely a secondary consequence of the effect of social attitudes on attention to interaction partners. In other words, social attitudes may influence the probability that a person will process or attend to a model's body movements, but not the probability that attended body movements will be copied. This kind of attentional hypothesis has been advanced, but not tested, by others. For example, van Baaren, Holland, et al. (2003), van Baaren, Maddux, et al. (2003) suggested that an independent self-construal leads to increased attention towards the self and reduced attention towards others. The authors proposed that in this case "fewer mannerisms of others would be observed, decreasing the likelihood of mimicry" (p1100, van Baaren, Holland, et al., 2003, van Baaren, Maddux, et al., 2003). Additionally, Lakin and Chartrand (2003), argued that, "the desire to affiliate may cause people to pay more attention to what occurs in their social environments (i.e. they perceive more), which would result in a stronger relationship between perception and behavior."

A second question concerns the specificity of the effects of social attitudes on mimicry: Do social attitudes influence the frequency with which observers copy the specific *movements* of a model (e.g. face *rubbing*, foot *shaking*), or merely the frequency with which they move the same *effector*, or part the body, as the model (e.g. *hand/face* movements, *foot* movements). For example, an observer with a foot shaking model may be more likely to perform a variety of foot movements - not just foot shaking - than an observer with a face-rubbing model, and this difference may be greater when the observers have more positive social attitudes. Non-specific effects of this kind are known in the motor control literature as 'effector priming' (Bach & Tipper, 2007; Berger & Hadley, 1975; Gillmeister, Catmur, Liepelt, Brass, & Heyes, 2008). Similarly, rather than promoting copying of the specific movements of the model, positive social attitudes may enhance attention to, and thereby contact with, the object of the model's movements. For example, when a model is observed manipulating a pen (van Baaren, Holland, et al., 2003, van Baaren, Maddux, et al., 2003), increased attention to the pen may result in an increase in frequency of all pen-directed behavior, not just the manipulative movements used by the model. Effects of this kind are known in the comparative animal literature as 'stimulus enhancement' (Spence, 1937).

A third outstanding question concerns the automaticity of the mimicry that is modulated by social attitudes. Previous studies have shown that this kind of mimicry is automatic in the sense that, in post-test interviews, participants do not report awareness of the model's focal behavior (e.g. foot shaking, face rubbing), an intention to mimic, or awareness that they mimicked the model's behavior in the course of the experiment (e.g. Chartrand & Bargh, 1999). However, previous research in this area has not examined whether the mimicry that can be modulated by social attitudes is automatic in another important sense; whether it can occur even when it is counter to the participant's intention. "Automatic imitation" is the term used in the motor control literature for mimicry–copying of body movements–that occurs even when it conflicts with the demands of the participant's current task, and is therefore understood to be un- or counter-intentional.

Rather than assessing mimicry in a naturalistic setting, the present study used a stimulus-response compatibility, reaction time paradigm (e.g. Bird, Leighton, Press, & Heyes, 2007; Bird et al., 2007; Brass, Bekkering, & Prinz, 2001; Brass, Bekkering, Wohlschlager, & Prinz, 2000; Leighton & Heyes, in press) to address these questions about the directness and specificity of the relationship between social attitudes and mimicry, and to find out whether the kind of mimicry that is modulated by social attitudes occurs when counter to intention, i.e. whether it is 'automatic imitation'.

Each participant completed two tasks: first a social attitude priming task, and then an automatic imitation task. In the priming task, participants formed sentences from sets of words that included pro-social, neutral or anti-social terms (three groups). In each trial of the automatic imitation task, participants were required to perform a pre-specified hand movement (open or close) as soon as they saw a hand on a computer screen begin to move. They were required to make the same movement response (open or close) in every trial within a block of trials. The nature of the hand movement stimulus (open or close) varied randomly over trials. Therefore, the hand movement stimulus was either the same as the pre-specified response (compatible trials, e.g. open stimulus and open response), or the hand movement stimulus was the opposite of the pre-specified response (incompatible trials, e.g. close stimulus and open response). Previous studies using this paradigm, which did not manipulate social attitudes, have found an automatic imitation effect: participants make their hand movement responses faster in compatible than in incompatible trials (Heyes, Bird, Johnson, & Haggard, 2005; Leighton & Heyes, in press; Press, Bird, Walsh, & Heyes, 2008; Stürmer, Aschersleben, & Prinz, 2000). Therefore, the automatic imitation task provides an index of mimicry: any difference in response time between compatible and incompatible trials is attributable to the relationship (matching or non-matching) between the observed and executed actions.

If social attitudes have a direct and specific effect on mimicry, and if the mimicry that they modulate is not intentional, then participants primed with pro-social words should show a larger automatic imitation effect than those primed with anti-social words, and the neutral group should show an intermediate automatic imitation effect.

Materials and methods

Participants

Thirty six consenting healthy participants with an average age of 31.3 years, 20 male, were recruited from the University College London's subject database and paid a small honorarium for their participation. All were right-handed, had normal or correct-to-normal vision, and were proficient in the English language. Participants were randomly assigned to one of three groups and were all naïve with respect to the purpose of the experiment. The experiment was performed with local ethical committee approval and in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

Stimuli

In both the priming and automatic imitation tasks, stimuli were presented on a computer screen (60 Hz, 400 mm, 96DPI). Viewing was unrestrained at a distance of approximately 600 mm. In the priming task, words were presented in color on a grey background. Each trial showed five words arranged horizontally across the screen. Words were presented in Arial, font size 24 and the color of the words varied randomly over trials. Words were either presented in green, blue, red or yellow.

Three versions of the scrambled-sentence test were constructed: One was intended to prime the pro-social attitude, another the anti-social attitude and a third was intended to prime neither attitude (the neutral priming condition). For both the pro-social and the anti-social priming versions, 12 of the 24 trials contained an adjective or verb semantically related to the trait in question. For the pro-social priming version, the critical priming words were: *affiliate, friend, cooperate,*