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Is It What You Do, or When You Do It? The Roles of Contingency and Similarity in Pro-Social Effects of Imitation

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Abstract

Being imitated has a wide range of pro-social effects, but it is not clear how these effects are mediated. Naturalistic studies of the effects of being imitated have not established whether pro-social outcomes are due to the similarity and/or the contingency between the movements performed by the actor and those of the imitator. Similarity is often assumed to be the active ingredient, but we hypothesized that contingency might also be important, as it produces positive affect in infants and can be detected by phylogenetically ancient mechanisms of associative learning. We manipulated similarity and contingency between performed and observed actions in a computerized task. Similarity had no positive effects; however, contingency resulted in greater enjoyment of the task, reported closeness to others, and helping behavior. These results suggest that the pro-social effects of being imitated may rely on associative mechanisms.

Keywords: Imitation; Pro-social behavior; Contingency; Synchrony; Associative learning; Perception and action

1. Introduction

Imitation—where one agent reproduces the actions of another—plays a crucial role in social interaction from infancy through adult life. Being imitated by an adult makes children prefer that adult to another (Thelen, Dollinger, & Roberts, 1975). In adults, being imitated increases positive evaluation of the interaction (Bailenson & Yee, 2005; Chartrand & Bargh, 1999; Kouzakova, van Baaren, & van Knippenberg, 2010; Suzuki,

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Takeuchi, Ishii, & Okada, 2003), and after being imitated people are more helpful, increase the amount they donate to charity (van Baaren, Holland, Kawakami, & van Knippenberg, 2004), and feel closer to others (Ashton-James, van Baaren, Chartrand, Decety, & Karremans, 2007). These effects are not confined to the laboratory: Waitresses who verbally imitated their customers received larger tips than those who simply acknowledged the order (van Baaren, Holland, Steenaert, & van Knippenberg, 2003).

In general, imitation in these experiments is manipulated via an interaction with a confederate, who either imitates or refrains from imitating the participant's body language, posture, and gestures. Although this method is valuable in producing a naturalistic situation, it is not well controlled: The imitation and non-imitation conditions may differ in many ways besides the core property, specific to imitation, of whether the participant's actions are reproduced by the confederate. For example, the number of gestures and general activity level of the confederate may differ between the two conditions. Furthermore, using naturalistic methods, it is difficult to find out exactly what it is about being imitated that generates pro-social effects. Labeling the phenomena as effects of "imitation" suggests that the critical factor is the *similarity* between the actions of the participant and the confederate; that pro-social effects result from the confederate producing actions that are topographically isomorphic to those of the participant, for example, touching his face when the participant touches her face. However, it is also possible that *contingency* is responsible for, or contributes to, the effects; that pro-sociality results from there being a predictive relationship between the participant's movements and those of the confederate. In this case, pro-sociality would result from interactions in which the "imitator" produces a certain action after the "imitatee" has produced another particular action—for example, foot bobbing after face touching—regardless of whether the imitator's actions are isomorphic to those of the imitatee. Naturalistic studies of the effects of being imitated are part of a broader social psychological literature which demonstrates that similarity between individuals results in increased affiliation (e.g., people prefer others who have similar attitudes to themselves; Byrne, 1961). Here, however, we focus specifically on action similarity: topographical isomorphism between the actions of social partners.

It is plausible that contingency contributes to the pro-social effects of being imitated for three reasons. First, there is long-standing evidence that infants, at least, enjoy contingent experience. They prefer to watch contingent rather than non-contingent events, whether these contingencies are between two sets of environmental stimuli (Bahrick, 1983) or between the infant's own actions and observed outcomes (Bahrick & Watson, 1985). They also show positive affect when, for example, the operation of a noisy toy, which would normally cause distress, is controlled by the infant's own actions (Gunnar, Leighton, & Peleaux, 1984). Thus, it is possible that in adults, contingent action by a social partner generates positive affect and thereby pro-sociality.

Second, synchrony between interaction partners can have positive effects (Hove & Risen, 2009; Miles, Nind, & Macrae, 2009). For example, Hove and Risen (2009)

demonstrated that participants who tapped in synchrony with an experimenter liked that experimenter more than did participants who tapped asynchronously (not out of phase, but slower, hence non-contingently). In such studies, the role of similarity cannot be ascertained because the participant and experimenter perform the same actions in both synchronous and asynchronous conditions. However, for the same reason, synchrony effects demonstrate that the temporal relationship between interaction partners' actions may contribute to pro-social effects of being imitated.

Third, contingency is likely to be important because similarity between performed and observed actions may be difficult to compute. Consider face touching. When I touch my face, I see my hand moving toward me, I do not see my face, but I feel contact between my face and fingers. When I watch you touching your face, I see your hand moving away from me toward your face, which is visible, and I do not feel any contact. Given that the sensory inputs are so different, how do I know that, from a third-person perspective, your action is similar to mine: How do I detect the similarity between an action that is felt but unseen, and an action that is seen but unfelt? No clearly articulated psychological theories answer this "correspondence problem" (Brass & Heyes, 2005). Theories of how imitative behavior is produced (rather than detected) suggest the problem is solved in an unspecified manner by an innate mechanism (Meltzoff & Moore, 1997), or that production of imitative behavior does not require the imitator to compute the similarity between observed and executed actions (Heyes, 2001). The current lack of theoretical solutions to the correspondence problem may be due to lack of imagination on the part of researchers, but it is also possible that the correspondence problem is a hard one, not only for scientists but also for neurocognitive systems to solve. In contrast, contingency can be detected by simple mechanisms, present in a broad range of species: the mechanisms of associative learning that produce Pavlovian and instrumental conditioning. Therefore, given that similarity detection across performed and observed actions may require complex computations, and that contingency detection is known to require only simple computations, it could be adaptive for the pro-social effects of being imitated to depend on contingency instead of, or in addition to, similarity.

The present experiment had two aims. First, we wanted to discover whether the pro-social effects of being imitated could be replicated in a more controlled procedure, where the number and type of actions performed and observed by participants are systematically varied. Second, we aimed to investigate the relative roles of similarity and contingency in producing the pro-social effects of being imitated, by varying both similarity and contingency between the actions performed and observed by participants. To accomplish this, a computerized imitation procedure was used. Although such a procedure differs from some of the more naturalistic experiments described above, it permits systematic investigation of similarity and contingency in a way not possible in other settings. Positive effects of imitation have previously been observed using highly constrained computerized procedures with unnatural stimuli (e.g., Bailenson, Yee, Patel, & Beall, 2008; Experiment 1), but no previous study has manipulated both contingency and similarity across the same, natural stimuli. For example,

Bailenson et al. (2008) varied contingency but not similarity using unnatural stimuli (colored circles) and varied similarity but not contingency using natural stimuli (avatar head movements).

The participants' task during the imitation treatment was to perform hand or foot lifting actions at random, while observing hand and foot lifting actions on the computer screen. As shown in Fig. 1, the observed actions varied in similarity to those performed according to a participant's group assignment (similar/S+: the observed hand lifted when the participant lifted his or her hand, and the foot lifted when the participant lifted his or her foot; dissimilar/S−: the foot lifted when the participant lifted his or her hand, and the hand lifted when the participant lifted his or her foot). In addition, and orthogonally to the factor of similarity, the observed actions varied in their contingency with respect to those performed. In the contingent groups (C+), participants observed their outcome action (similar or dissimilar) whenever they performed an action, whereas in the non-contingent groups (C−), participants observed their outcome action on 50% of trials, resulting in no contingency between performed and observed actions.

To measure the pro-social effects of being imitated in this controlled procedure, we chose several measures from the literature. As being imitated improves evaluation of the interaction, we assessed participants' reported enjoyment of the task via a feedback form. Reported closeness to another person was measured using the inclusion of other in the self (IOS) scale (Aron, Aron & Smollan, 1992), a measure sensitive to being imitated (Ashton-James et al., 2007). We also included the twenty statements task (TST) (Kuhn & McPartland, 1954): The proportion of interdependent responses on this measure is sometimes, although not always (Ashton-James et al., 2007), affected by being imitated. Finally we assessed helping behavior (van Baaren et al., 2004) indexed by likelihood of returning the next day for follow-up.

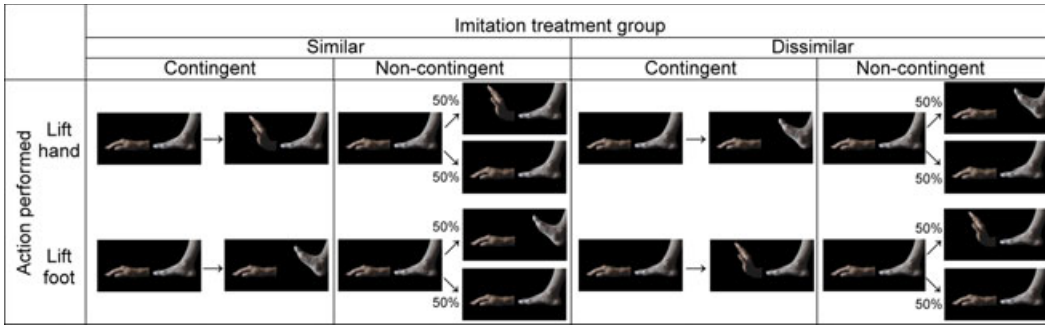

Fig. 1. Actions observed in response to those performed by the participant for the four imitation treatment groups. The resting hand and foot were presented on the screen until the participant performed an action, after which the participant observed the same or different action outcome depending on group allocation. For the non-contingent groups, on 50% of trials no outcome occurred. Left/right location of the hand and foot was randomized across trials.

2. Methods

2.1. Participants

Eighty paid participants (22 male) were recruited through University College London Psychology Department's participant database. The experiment was approved by the departmental Ethics Committee and performed in accordance with the 1964 Declaration of Helsinki. All participants gave written consent. Participants were randomly assigned to one of four groups by computer program. Thus, the experimenter did not know participants' group assignments until response scoring had been completed.

2.2. Stimuli

The imitation treatment stimuli comprised images of the resting and endpoint positions of hand and foot lifting actions (Gillmeister, Catmur, Liepelt, Brass, & Heyes, 2008). Both hand and foot were present in the resting position, centered vertically on the screen, on every trial. The left/right position of the hand and foot varied randomly across trials.

2.3. Procedure

The imitation treatment took place first. Each trial commenced with the participant pressing and holding hand and foot keys with his or her right hand and right foot. The foot key was a keyboard pedal (Cherub Sustain), connected via parallel port to the computer. The participant's foot was out of sight below the table. The hand key was the space bar. The participant's hand was occluded by a box covering his or her hand and forearm. Once both keys were pressed, the hand and foot images appeared on the screen in the resting position. They remained in this position until the participant released either key with a lifting action. For participants in the similar, contingent group (S+C+), lifting the hand resulted in the hand on the screen immediately lifting to the endpoint position. After 500 ms it was replaced with a blank screen for 1,000 ms, when the next trial began. Lifting the foot produced the equivalent outcome for the foot on the screen. For participants in the dissimilar, contingent group (S−C+), lifting the hand produced a foot action, and lifting the foot produced a hand action. Participants in the non-contingent groups (S+C− and S−C−) received equivalent mappings between hand/foot lifting actions and hand/foot actions on the screen (S+: hand>hand, foot>foot; S−: hand>foot, foot>hand), but these outcomes only occurred on 50% of trials. On the other trials, no outcome occurred: The hand and foot remained in the resting position for 500 ms and were then replaced with a blank screen for 1,000 ms.

Participants were instructed to produce roughly half hand and half foot lifting actions in the course of the treatment, while being as random as possible. Each participant received 400 trials, divided into five blocks of 80 trials. An attentional task ensured that participants were attending to the outcome of their actions. On four trials per block,

rather than lifting, the hand or foot rotated downward by 45°. Participants were instructed to say "yes" whenever they detected a downward movement. The experimenter was not present in the room during the imitation treatment; thus, these responses were recorded by Dictaphone (Edirol R1, Roland Corp).

The imitation treatment was followed by the pro-social tests. The feedback form came first. It was explained that this experiment had not been run before, and therefore we were interested in participants' experience. Participants were asked five questions with 7-point Likert response scales. As previous research has demonstrated that being imitated increases positive evaluation of the interaction, the question of interest was "How much did you enjoy the experiment? 1 = Not at all, 7 = Very much." Four other questions were included as filler items.

The IOS scale followed. Participants selected the picture which best described their relationship with the person to whom they were closest from a set of seven differentially overlapping circles. They also indicated whether this person was the same or different gender to themselves. Participants then completed the TST, providing up to 20 answers to the question "Who am I?" After completing these tasks, participants were unexpectedly asked whether they could return the following day "for a short follow-up experiment." If they were able to return, a time was arranged.

Finally, participants indicated whether they identified themselves as belonging to an individualist or collectivist culture (definitions of these terms were given if required), as this may influence scores on tests such as the IOS and TST (Dhawan, Roseman, Naidu, Thapa, & Rettek, 1995; Gardner, Gabriel, & Lee, 1999; Li, 2001; Uskul, Hynie, & Lalonde, 2004), independent of any effects of the imitation treatment; they were thanked and paid.

3. Results

3.1. Scoring and data analysis

3.1.1. Imitation treatment

Responses to the attentional task ("yes" responses) were counted. Performance was high (96.3 ± 0.9% of downward movements were detected), indicating that participants were attending to the outcome of their actions. It is still possible, however, that participants differed in their level of motivation toward the task. This could result in variations in the imitation treatment received. For instance, participants who made multiple errors (lifting both hand and foot), produced very predictable patterns of actions, or deviated from the requirement to produce an equal number of hand and foot actions, might have had less opportunity to experience the similarity and contingency between their actions and those on the screen than participants who did none of these things. Therefore, these measures of imitation treatment received were calculated in the following way. Errors were expressed as percentage of trials on which both hand and foot were lifted. Randomness was calculated on the basis of the expected distribution of consecutive quadruplets of responses: The number of occurrences of each possible quadruplet (e.g., hand, foot,

foot, hand) was counted and compared to that expected by chance, with closer results receiving higher scores. Finally, percentage of hand (vs. foot) actions performed was calculated.

3.1.2. Pro-social tests

The feedback question was coded directly from the response (1–7) given, such that a low score indicated low enjoyment. The IOS was coded from 1 (non-overlapping) to 7 (most overlapping), such that a low score indicated low closeness. Each TST statement was classified as independent or interdependent by two raters (Ashton-James et al., 2007). Inter-rater reliability (Cohen's kappa) was 0.79. The proportion of interdependent statements was calculated for each participant, such that a low score indicated low interdependence. For helping behavior, whether participants returned the following day was noted.

3.1.3. Multiple regression analyses

Multiple regression analysis was used to test the effects of similarity and contingency on scores for the pro-social tests (feedback, IOS, and TST) while controlling for factors such as culture, gender, and variations in imitation treatment experienced. For each test, the following basic model was constructed (variations noted below). At the first level, gender, age, and culture were entered into the model (these factors may influence scores on tests such as the IOS and TST; Aron et al., 1992; Dhawan et al., 1995; Gardner et al., 1999; Li, 2001; McCrae & Costa, 1988; Uskul et al., 2004). At the second level, the errors, randomness scores, and percentage of hand actions during the imitation treatment were entered. At the third level, similarity, contingency, and a similarity by contingency interaction factor were entered as predictive factors. Similarity was coded as similar (S+): 1, dissimilar (S−): −1; contingency as contingent (C+): 1, non-contingent (C−): −1; the interaction factor was calculated by multiplying these values, thus: S+C+: 1; S+C−: −1; S−C+: −1; and S−C−: 1. As multiple regression is particularly sensitive to outlying values, participants were removed if their scores were more than 2.5 standard deviations from the mean on the following measures: age, randomness score, proportion of hand versus foot actions, or errors during the imitation treatment. A further participant whose English was not adequate to complete the TST was also excluded. Data analysis was therefore performed on 70 participants (16 male) aged 18–36 years, distributed across the groups as follows: S+C+: 19; S+C−: 17; S−C+: 16; and S−C−: 18. All significant effects of similarity, contingency, or the similarity by contingency interaction factor are reported.

3.2. Pro-social tests

Table 1 shows the scores for each group for the pro-social tests.

3.2.1. Enjoyment (feedback)

Multiple regression analysis revealed that similarity significantly predicted responses to the question "How much did you enjoy the experiment?" ($\beta = -0.257$, $p = .033$).

Table 1
Mean and standard error of the mean (*SEM*) scores on the pro-social tests for the four imitation treatment groups

	Imitation Treatment Group							
	Similar				Dissimilar			
	Contingent		Non-contingent		Contingent		Non-contingent	
Pro-social test	Mean	*SEM*	Mean	*SEM*	Mean	*SEM*	Mean	*SEM*
Enjoyment (feedback) How much did you enjoy the experiment?	5.32	0.19	4.71	0.29	5.69	0.25	5.50	0.20
Closeness (inclusion of other in the self)	4.74	0.29	4.76	0.42	5.06	0.38	4.06	0.40
Twenty statements task Proportion of interdependent statements	0.17	0.03	0.23	0.04	0.21	0.04	0.22	0.04
Helping behavior (attending follow-up) Number of no shows; number of shows	0; 19	–	3; 14	–	0; 16	–	1; 17	–

However, participants receiving similar experience enjoyed the experiment *less* than participants receiving dissimilar experience. Contingency also predicted responses to this question ($\beta = 0.265$, $p = .032$): Participants receiving contingent experience enjoyed the experiment *more* than those receiving non-contingent experience.

3.2.2. Closeness (inclusion of other in the self)

A further factor, consisting of whether the other was the same or different gender to the participant, was entered into the multiple regression model at the second level. Multiple regression analysis revealed that contingency significantly predicted IOS scores ($\beta = 0.232$, $p = .029$): Participants receiving contingent experience rated the other as closer to themselves than those receiving non-contingent experience.

3.2.3. Twenty statements task

Multiple regression analysis revealed no significant effects. This result supports Ashton-James et al. (2007), who found inconsistent effects of being imitated on this measure.

3.2.4. Helping behavior: Returning for follow-up

Six participants (one per similar group; two per dissimilar group) were unable to schedule a suitable time the next day for a follow-up experiment. Of particular interest, four participants (three in the similar, non-contingent and one in the dissimilar, non-contingent group; none in either contingent group) scheduled a time for the follow-up experiment but failed to attend without informing the experimenter. The numbers of "shows" versus

"no-shows" was submitted to two separate chi-square analyses with factors of similarity (similar, dissimilar) and contingency (contingent, non-contingent). An effect of contingency was observed ($\chi^2_{(1,\ n\ =\ 70)} = 4.242$, $p = .039$, $\phi = 0.25$): Participants receiving contingent experience were more likely to show up for the subsequent experiment than those receiving non-contingent experience.

4. Discussion

We have shown that being imitated in a controlled experimental setting has effects on several pro-social measures. Participants receiving contingent responses to their actions—regardless of similarity—reported greater enjoyment of the task, greater feelings of closeness to another person, and were more likely to help the experimenter by returning for a follow-up experiment. These results suggest that, in this experiment, the pro-social effects of being imitated were due to the contingency between participants' actions and those of the interaction partner. They imply that pro-social attitudes and behavior were engendered when participants detected, consciously or unconsciously, that their own actions predicted or caused the actions of another person, regardless of whether the other person's actions were the same as their own.

The computerized procedure used here differs in several ways from more naturalistic studies of the effects of being imitated. First, the actions used were generated through apparent motion, rather than being videos of movements or real movements. Previously we have shown equivalent or greater imitation effects for movements generated through apparent motion as compared to real motion (Heyes, Bird, Johnson, & Haggard, 2005; Press, Bird, Flach, & Heyes, 2005), suggesting that our results would generalize to video presentation; but these results are in need of extension: to more naturalistic stimuli, to more interactive settings, and to actions with different levels of emotional valence (e.g., body posture and facial expression). To manipulate contingency and similarity in a controlled fashion, an immersive virtual environment might be the best way to address these questions.

Second, no delay was detectable between the movements of the participant and those observed on the screen. In this respect, our method was similar to that used in studies of the pro-social effects of synchrony: In these studies, participant and experimenter movements occur within 100 ms of each other (e.g., Hove & Risen, 2009). In more naturalistic studies, the delay between participant and confederate movements is not usually reported, but studies using virtual reality incorporate a delay of around 2–4 s (Bailenson & Yee, 2005; Bailenson et al., 2008; Kühn et al., 2010). Studies of causal learning have found contingency effects when outcomes were presented up to 4 s after participants' actions (Shanks, Pearson, & Dickinson, 1989), suggesting that the present contingency effects can be generalized to more naturalistic imitation occurring at longer delays.

Third, participants were instructed to attend to the actions on the screen, and therefore it is likely that they were aware of these actions. This may differ from naturalistic studies in which it is not clear whether participants are aware of the confederate's actions. In

neither case, however, would awareness of the *occurrence* of another's actions imply awareness of the contingency or similarity between one's own and the other's actions. Anecdotally, awareness that another person is imitating oneself leads to discomfort, but to our knowledge this has been tested only once (Bailenson et al., 2008). In that study, participants who were aware of being imitated rated the confederate as less trustworthy and friendly; however, these participants were not naïve to the possibility that imitation might occur and consequently their detection rates were eight times higher than a naïve group. Interestingly, the negative effects of detection of imitation were the same regardless of similarity: They also occurred for dissimilar but contingent actions. Thus, the findings of Bailenson et al. suggest that, if the participants in our study had detected the contingency or similarity between their actions and those on the screen, we should have seen negative effects of both contingency and similarity. Again, the synchrony literature is relevant here: In Hove and Risen's experiments, participants were aware of the experimenter's actions but positive effects of synchrony were still observed.

Some studies of the effects of being imitated have used "antimimicry" control conditions in which each of the participant's actions is followed by one of several dissimilar actions performed by the imitator. For example, in the imitation condition of Kühn et al. (2010), crossing legs was always followed by crossing legs, but in the antimimicry condition, crossing legs was followed either by folding hands or arranging hair. Under these circumstances, both similarity and contingency are greater in the imitation than in the antimimicry condition; for example, crossing my legs is a better predictor of you crossing your legs in the imitation condition than it is of you folding your hands in the antimimicry condition. Therefore, the fact that some studies have found greater pro-social effects in imitation than in antimimicry conditions does not necessarily mean that similarity, rather than contingency, plays a role in generating pro-sociality under naturalistic conditions. Further research, manipulating similarity and contingency independently under naturalistic conditions, will be necessary to establish whether the detection of similarity plays any role in linking the experience of being imitated with pro-social effects.

In conclusion, the present experiment demonstrates for the first time that contingency between one's own actions and experienced events, as occurs during imitation, not only produces positive affect in infants but also pro-social attitudes and behavior in adults. Contingency can be detected via the mechanisms that mediate Pavlovian and instrumental conditioning, and these mechanisms are known to be present in a wide range of species. Therefore, our results suggest that the link between imitation and pro-sociality, so important in human social life, may be mediated by phylogenetically ancient processes of associative learning. On a practical level, our results suggest that, when it comes to establishing rapport with a social partner, it may not be what you do, but when you do it.

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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*(4), 596.

Ashton-James, C. E., 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*(4), 518–535.

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., Holland, R. W., Steenaert, B., & van Knippenberg, A. (2003). Mimicry for money: Behavioral consequences of imitation. *Journal of Experimental Social Psychology*, *39*(4), 393–398.

Bahrick, L. E. (1983). Infants' perception of substance and temporal synchrony in multimodal events. *Infant Behavior and Development*, *6*(4), 429–451.

Bahrick, L. E., & Watson, J. S. (1985). Detection of intermodal proprioceptive-visual contingency as a potential basis of self-perception in infancy. *Developmental Psychology*, *21*(6), 963–973.

Bailenson, J. N., & Yee, N. (2005). Digital chameleons: Automatic assimilation of nonverbal gestures in immersive virtual environments. *Psychological Science*, *16*(10), 814–819.

Bailenson, J. N., Yee, N., Patel, K., & Beall, A. C. (2008). Detecting digital chameleons. *Computers in Human Behavior*, *24*, 66–87.

Brass, M., & Heyes, C. (2005). Imitation: Is cognitive neuroscience solving the correspondence problem? *Trends in Cognitive Sciences*, *9*(10), 489–495.

Byrne, D. (1961). Interpersonal attraction and attitude similarity. *Journal of Abnormal and Social Psychology*, *62*, 713–715.

Chartrand, T. L., & Bargh, J. A. (1999). The chameleon effect: The perception-behavior link and social interaction. *Journal of Personality and Social Psychology*, *76*(6), 893–910.

Dhawan, N., Roseman, I. J., Naidu, R. K., Thapa, K., & Rettek, S. I. (1995). Self-concepts across two cultures: India and the United States. *Journal of Cross-cultural Psychology*, *26*(6), 606–621.

Gardner, W. L., Gabriel, S., & Lee, A. Y. (1999). "I" Value freedom, but "we" value relationships: Self-construal priming mirrors cultural differences in judgment. *Psychological Science*, *10*(4), 321.

Gillmeister, H., Catmur, C., Liepelt, R., Brass, M., & Heyes, C. (2008). Experience-based priming of body parts: A study of action imitation. *Brain Research*, *1217*, 157–170.

Gunnar, M. R., Leighton, K., & Peleaux, R. (1984). Effects of temporal predictability on the reactions of 1-year-olds to potentially frightening toys. *Developmental Psychology*, *20*(3), 449–458.

Heyes, C. (2001). Causes and consequences of imitation. *Trends in Cognitive Sciences*, *5*(6), 253–261.

Heyes, C., Bird, G., Johnson, H., & Haggard, P. (2005). Experience modulates automatic imitation. *Brain Research Cognitive Brain Research*, *22*(2), 233–240.

Hove, M. J., & Risen, J. L. (2009). It's all in the timing: Interpersonal synchrony increases affiliation. *Social Cognition*, *27*, 949–961.

Kouzakova, M., van Baaren, R. B., & van Knippenberg, A. (2010). Lack of behavioral imitation in human interactions enhances salivary cortisol levels. *Hormones and Behavior*, *57*(4–5), 421–426.

Kuhn, M. H., & McPartland, T. S. (1954). An empirical investigation of self-attitudes. *American Sociological Review*, *19*(1), 68–76.

Kühn, S., Müller, B. C. N., van Baaren, R. B., Wietzker, A., Dijksterhuis, A., & Brass, M. (2010). Why do I like you when you behave like me? Neural mechanisms mediating positive consequences of observing someone being imitated. *Social Neuroscience*, *5*(4), 384–392.

Li, H. (2001). Culture, gender and self-close-other(s) connectedness in Canadian and Chinese samples. *European Journal of Social Psychology*, *32*(1), 93–104.

McCrae, R. R., & Costa, P. T. (1988). Age, personality and the spontaneous self-concept. *Journal of Gerontology: Social Sciences*, *43*, S177–S185.

Meltzoff, A. N., & Moore, M. K. (1997). Explaining facial imitation: A theoretical model. *Early Development and Parenting*, *6*(34), 179–192.

Miles, L. K., Nind, L. K., & Macrae, C. N. (2009). The rhythm of rapport: Interpersonal synchrony and social perception. *Journal of Experimental Social Psychology*, *45*, 585–589.

Press, C., Bird, G., Flach, R., & Heyes, C. (2005). Robotic movement elicits automatic imitation. *Brain Research Cognitive Brain Research*, *25*(3), 632–640.

Shanks, D. R., Pearson, S. M., & Dickinson, A. (1989). Temporal contiguity and the judgement of causality by human subjects. *Quarterly Journal of Experimental Psychology*, *41*(B), 139–159.

Suzuki, N., Takeuchi, Y., Ishii, K., & Okada, M. (2003). Effects of echoic mimicry using hummed sounds on human-computer interaction. *Speech Communication*, *40*(4), 559–573.

Thelen, M. H., Dollinger, S. J., & Roberts, M. C. (1975). On being imitated: Its effects on attraction and reciprocal imitation. *Journal of Personality and Social Psychology*, *31*(3), 467–472.

Uskul, A. K., Hynie, M., & Lalonde, R. (2004). Interdependence as a mediator between culture and interpersonal closeness for Euro-Canadians and Turks. *Journal of Cross-Cultural Psychology*, *35*(2), 174–191.