

Being Mimicked Increases Prosocial Behavior in 18-Month-Old Infants

Malinda Carpenter, Johanna Uebel, and Michael Tomasello
Max Planck Institute for Evolutionary Anthropology

Most previous research on imitation in infancy has focused on infants' learning of instrumental actions on objects. This study focused instead on the more social side of imitation, testing whether being mimicked increases prosocial behavior in infants, as it does in adults (van Baaren, Holland, Kawakami, & van Knippenberg, 2004). Eighteen-month-old infants ($N = 48$) were either mimicked or not by an experimenter; then either that experimenter or a different adult needed help. Infants who had previously been mimicked were significantly more likely to help both adults than infants who had not been mimicked. Thus, even in infancy, mimicry has positive social consequences: It promotes a general prosocial orientation toward others.

By far, most research on imitation in young children has focused on its learning function: Children use imitation to learn novel skills from others. However, there is another, more purely social function of imitation that is just as important: We use imitation to affiliate with and communicate mutuality to others (Uzgiris, 1981). When we imitate others, or when others imitate us, we connect with them, communicating that there is a likeness between us. This second type of imitation is thought to be a sort of "social glue" that promotes liking and rapport in interpersonal interactions (e.g., Chartrand & Bargh, 1999) as well as identification and cohesion within larger social groups (Lakin, Jeffers, Cheng, & Chartrand, 2003).

Most of the research on the "social glue" functions of imitation has been done with adults, and involves a special type of imitation: unconscious, automatic mimicry. As adults, we routinely and automatically copy each other's movements, postures, and facial expressions, and this has a variety of positive social consequences (see Chartrand & van Baaren, 2009, for a review). For example, when someone mimics us, we subsequently judge our interaction as having gone more smoothly and we like the mimicker more (e.g., Chartrand & Bargh, 1999). Importantly, this translates into

We thank Luke Jersbach, Roger Munday, Maria Tech, Corinda Schulze, Ulrike Schneider, Kathi Schuchman, Elin Rosal, and Pirra Jain for help with data collection, coding, and analyses, and we also thank the infants and parents for their cooperation.

Correspondence concerning this article should be addressed to Malinda Carpenter, Department of Developmental and Comparative Psychology, Max Planck Institute for Evolutionary Anthropology, Deutscher Platz 6, 04103 Leipzig, Germany. Electronic mail may be sent to carpenter@eva.mpg.de.

1512 Carpenter, Uebel, and Tomasello

would provide further evidence for the social function of imitation in infants and show just how basic the links are between imitation and prosocial, group-beneficial behavior.

In this study, therefore, we investigated whether being mimicked increases prosocial behavior already in infancy. We adapted the procedure van Baaren et al. (2004, Experiments 1 and 2) used with adults. While their participants were describing a set of advertisements, an experimenter either subtly mimicked or did not mimic the participants' posture (e.g., their arm and leg positions) and whether they were leaning forward or not). Then the experimenter left for a moment to get materials for an unrelated task, and when she returned she "accidentally" dropped six pens. van Baaren et al. found that participants who had just previously been mimicked helped the experimenter pick up the pens more often than participants who had not been mimicked. Intriguingly, they also found that the positive effects of being mimicked were not limited solely to the mimicker: Participants who were mimicked by the experimenter, but who then watched a second, different adult enter and drop her pens, also helped this second adult more often than participants who had not been mimicked. Mimicry thus resulted in a general prosocial orientation toward others, despite the fact that participants did not consciously recognize that they had been mimicked.

We were interested in whether infants would show the same effect, basically from the beginning of their ability to help others. We thus tested 18-month-olds, as infants have just started being able to help others instrumentally in a variety of contexts around this age (Warneken & Tomasello, 2006, 2007). We followed van Baaren et al.'s (2004) procedure as closely as possible, first mimicking or not mimicking infants during an initial play period and then presenting them with one of two adults who needed help. However, we made two main changes to their procedure. First, we added another helping test—helping the experimenter open a cabinet (Warneken & Tomasello, 2006)—to give infants another opportunity to help. Second, we had to change the type of mimicry used. During piloting, it quickly became obvious that the subtle mimicry of body postures used by van Baaren et al. would not work with infants, as infants' behavior was naturally much more active than that of adults. Thus, while in the initial play period we presented a series of pictures for infants to look at (similar to the adults' advertisements), when infants did not wish to look at the pictures they were free to wander

around the room, climb on the furniture, and so forth, and in the mimic condition the experimenter copied all these actions immediately. This is thus a different type of mimicry from the unconscious, subtle, and slightly delayed bodily mimicry studied in adults. However, recent work has bridged the two types of copying behavior by showing that more overt imitation serves some of the same social functions as unconscious mimicry during childhood (Over & Carpenter, 2009b), so we expected it to have some of the same social consequences as well. We thus predicted that infants, like adults, would show more helping behavior after having been mimicked, but that perhaps infants might do so especially when the person who needed help was the experimenter who had just mimicked them.

Method

Participants

Participants were forty-eight 18-month-olds (mean = 18:15, range = 17:26–19:12; only 1 infant in the E2 no mimic condition, was older than 18 months, due to a caller error discovered after the study was completed). Half of the infants in each condition and group were boys and half were girls. No demographic information was collected. Participants were recruited from a database of parents who had volunteered to participate in child development studies.

Additional infants were tested but dropped from analyses for parental interference (1), crying during one of the helping tests (7, all but 1 in the E2 group), or not cooperating or playing long enough to be mimicked or not mimicked for enough time during the play period (16). Fifteen of these latter infants were in the mimic condition. The greater number of infants who cried during the helping tests in the E2 group was to be expected due to the fact that E2 was far less familiar to infants than E1, and thus infants were probably more uncomfortable or wary around E2. The large number of infants dropped for not playing for long enough in the mimicry condition was cause for potential concern, however, due to the possibility, suggested by reviewers, that infants who do not like being mimicked could be generally less sociable or more inhibited than infants who enjoy being mimicked. Dropping these infants could result in a larger number of sociable infants in the mimic condition, which in turn could explain a finding of more helping in that condition. We thus had a coder who was unaware of condition rate: a randomly chosen

subset of 50% of the final infants in both conditions on a variety of relevant temperamental characteristics (sociability, inhibition, interest/attentiveness) and social behavior (spontaneous approaches to the experimenter) during the brief introductory phase with the test materials before the play period (see the Procedure section). This phase lasted on average just over 1 min. There were no differences between conditions in how sociable, inhibited, or interested/attentive the coder rated infants to be (each on a 5-point scale; Mann-Whitney U tests, all three p s > .47), and there was also no difference in how often infants spontaneously approached the experimenter during this period (range = 0–6 times; $p > .11$). This suggests that our results were due to the experimental manipulation and not to differences in sociability and so forth across infants.

Materials and Design

The testing room was furnished with a long, low platform (84 × 80 × 37 cm) with a computer monitor at one end. During the initial play period, six color pictures of interesting objects appeared automatically on the monitor, one every 60 s. For the subsequent helping tests there was also a child-sized table, a cabinet (153 × 80 × 44 cm) with two doors, a large, flat cardboard box (32 × 46 × 10 cm), and six wooden chopsticks (sticks were used instead of pens because pilot infants were too distracted by pens).

To test whether infants would increase their helping behavior both toward the person who mimicked them and toward someone else who was not involved in the mimicry situation, for half the infants, the same experimenter who had played with infants during the play period later needed help (E1 group) and for the other half a different experimenter later needed help (E2 group). In each group, half the infants were randomly assigned to the mimic and the other half to the no mimic condition, with an equal number of boys and girls in each condition.

Procedure

Following a brief warm-up period with E1 (E1 group) or both experimenters (E2 group), infants entered the test room with E1. Their parent sat at the back of the room and read a magazine throughout the procedure. E1 showed infants the sticks and box briefly (to familiarize infants with them) before putting them just outside the door. She also opened the cabinet and showed something inside, to show

small table, she stumbled, bumped her arm on the table, and the sticks "accidentally" flew out of her hand and onto the floor (see Figure 1a). A standardized, timed procedure was then followed for the response period (similar to that used in Warneken & Tomasello, 2006). First, to give infants the chance to help spontaneously, the experimenter reacted simply by alternating gaze between the sticks and infants' faces with a mildly concerned facial expression for 10 s. If infants did not begin helping during this period, the experimenter then said, "Look, [infant's name]! My sticks fell down," and attempted to reach (unsuccessfully) over the table and box for the sticks twice. Next, if infants still had not begun helping, she said, "Look, [infant's name]! My sticks, I need them," and again reached twice, still alternating gaze occasionally between the sticks and infants' faces. Finally, if necessary, she said, "[infant's name], could you please help me?" and held out her hand, palm up, again while alternating gaze. If infants helped by giving the experimenter at least one stick at any point during this procedure, she said, "Thank you," and the response period for this test was terminated. If infants did not help within approximately 10 s after the experimenter's request for help, the response period was over and the experimenter said, "Oh well, then I'll get them myself." She then took her box, got up, and picked up the sticks with effort, while still holding the box.

For the second helping test, the "cabinet" test, the experimenter then told infants she was going to put her things away, gesturing (with her hands occupied by holding the box and sticks) toward the

cabinet. To give infants the chance to help spontaneously, during the first 10-s phase she stood approximately a meter away from the cabinet and bent forward toward it, alternating gaze between it, the box, and infants' faces. She then gradually made her need for help more explicit, as in the previous test, by first approaching the cabinet and bending to try to open the cabinet door with her elbow twice (see Figure 1b), then saying, "Look, [infant's name]! These things have to go in here," with another gesture toward the cabinet and two further attempts to open the door. Finally, if needed, she directly asked infants for help as in the other test.

Coding and Reliability

For the sticks test, we coded from videotapes whether infants picked up any of the sticks and gave them to the experimenter (when they gave one, they usually continued to give all the others, so we did not analyze number of sticks given). For the cabinet test, we coded whether infants opened (or clearly attempted to open) the cabinet door. For both tests, we also noted whether or not infants' first helping response took place during the first 10-s phase, before the experimenter started reaching for the sticks or trying to open the cabinet herself. To investigate whether or not infants recognized that they were being mimicked, during the initial play period in the mimic condition, we coded for "testing behavior," that is, performing "sudden and unexpected movements while staring at the adult, as if to check whether the adult was intentionally



Figure 1. The experimenter (a) dropping the sticks at the beginning of the first helping test and (b) attempting unsuccessfully to open the cabinet in the second helping test.

mimicking" them (Meltzoff, 1990; Meltzoff & Moore, 1999, p. 25).

To assess interobserver reliability, a coder who was unaware of hypotheses, condition, and group independently coded the test periods of a randomly chosen 25% of infants in each condition and group. For the percentage of infants who helped (both overall and spontaneously), 100% agreement was achieved. For testing behavior, reliability was assessed separately on 10 randomly chosen infants (42%) in the mimic condition. One coder saw testing behavior in all 10 of these infants and the other saw it in only nine, thus agreement was 90%.

Results

Figure 2 shows the percentage of infants who helped the experimenter in each test, both spontaneously (i.e., within the first 10 s, before she asked for help or started trying to reach the sticks or open the cabinet) and throughout the rest of the response period. We did two generalized linear mixed model analyses (GLMM; Baayen, 2008) of the between-subjects factors condition (mimic, no mimic) and experimenter (E1, E2), and the within-subjects factor test (sticks, cabinet), one on the number of infants who helped spontaneously and one on the number of infants who helped overall (i.e., who helped at any point during the response period). There was a significant overall effect for both the spontaneous and the overall helping measures: spontaneous, $\chi^2(7, N = 48) = 14.85, p = .038$; overall, $\chi^2(7, N = 48) = 18.23, p = .011$. When the nonsignificant interactions were removed from the model, for both helping measures there was a main effect of condition (spontaneous: $z = 2.23, p = .026$; overall: $z = 2.18, p = .030$), indicating that significantly more infants helped in the mimic than the no mimic condition. There was also a significant main effect of test for both helping measures (spontaneous: $z = 2.66, p = .008$; overall: $z = 2.14, p = .032$), with significantly more infants helping in the sticks than the cabinet test (perhaps because the sticks test was first, or because what the experimenter needed help with was more obvious in the sticks test). There was no reliable main effect of experimenter: Infants were no more likely to help E1 than E2 (spontaneous: $z = 1.06, p = .288$; overall: $z = 1.67, p = .095$). As inspection of Figure 2 suggested that the effect for overall helping might have been driven by the differences in spontaneous helping, we conducted an additional, similar GLMM on nonspontaneous helping (i.e., just the gray bars in Figure 2). There

generally more active in the mimic condition (mean number of actions divided by number of seconds in the play period = .36 in the mimic condition and .24 in the no mimic condition) ($t(22) = 5.65, p = .00001$, but there was no significant correlation between infants' activity level during the play period and the percentage of tasks in which they subsequently helped in either condition (Spearman's $\rho_{\text{mimic}} = .35$ for the mimic condition and $.29$ for the no mimic condition, both $ps > .25$). As a manipulation check, we assessed whether E1 responded highly and equally contingently to infants' actions in both conditions. We found no significant difference between conditions: A coder who was naive to the hypotheses of the study judged that E1 responded to 95.8% of infants' actions in the mimic condition and 93.2% in the no mimic condition, ($t(22) = 1.85, p = .077$). In addition, there was no significant correlation between the percentage of actions E responded to and the percentage of tasks in which infants subsequently helped in either condition (Spearman's $\rho_{\text{mimic}} = .11$ for the mimic condition and $-.03$ for the no mimic condition, both $ps > .74$).

Discussion

Eighteen-month-old infants helped an adult more often, and more quickly and spontaneously, if that adult had just mimicked them than if she had played with them contingently without mimicking them. Infants also helped a different adult more often after having been mimicked by the first adult. Being mimicked thus increased infants' prosocial behavior not just toward the particular person who mimicked them, but also toward someone who had not been involved in the mimicry situation at all. It apparently triggered a general prosocial orientation toward others, just as it did for adults in the study by van Baaren et al. (2004).

We thus replicated van Baaren et al.'s (2004) findings with infants, and extended them to a slightly different type of mimicry. Whereas van Baaren et al. mimicked their adult participants subtly, in a way that participants did not consciously notice, for practical reasons we mimicked infants much more openly—and almost all infants showed signs of noticing this, as evidenced by their testing behavior. This study thus provides further evidence that unconscious mimicry in adulthood and some types of imitation in childhood apparently serve parallel, affiliative functions (see Lakin & Chartrand, 2003; Over & Carpenter, 2009b, 2012). It should be noted that there are surely limits to this, as

though, as this type of overt mimicry can be aversive if it is done in a mocking or teasing fashion. Indeed, we found that some infants apparently experienced even this friendly type of overt mimicry as unpleasant in this study, so our conclusions only apply to infants who enjoyed the mimicry. In any case, imitation is not just useful for learning and faithful cultural transmission; it can also have other positive social consequences: It increases helping, both of one's immediate interaction partners and of other members of the group.

Mimicry and affiliation are linked in adults (Chartrand & Bargh, 1996; Lakin & Chartrand, 2003), imitation and affiliation are linked in young children (Over & Carpenter, 2009b), and even some monkeys show more signs of affiliation (e.g., increased proximity) toward people who mimic them than toward people who do not (Paulkner, Suomi, Visalbergi, & Ferrari, 2009). There are also links between affiliation and helping in infants, even in the general way seen in the E2 group of this study: Eighteen-month-olds who have been primed with affiliation help adults (who were not involved in the priming situation) more often than infants who have not been primed with affiliation (Over & Carpenter, 2009a). It is thus easy to explain mimicked infants' increased helping of E1 in terms of interpersonal affiliation and liking. It is not quite so easy to explain infants' increased helping of E2 in this way, however. The mimicry would have to put infants in a generally affiliative mood or orientation, which would then benefit the next person who comes along—typically, another group member (see van Baaren et al., 2004; Lakin et al., 2003, for more on the role of mimicry in promoting cohesion in social groups).

A potential objection to our conclusions is that perhaps it was not that being mimicked increased infants' helping, but rather that not being mimicked decreased it. However, a comparison between our findings and those of Over and Carpenter (2009a) suggests that this was not the case. In that study, which used an almost identical helping test to our sticks test, a baseline condition was included to assess whether priming with affiliation increased helping or priming with individuality decreased it. They found that priming with affiliation increased helping significantly over baseline rates, whereas priming individuality resulted in helping rates that were identical to baseline rates. The results of our E1 mimic condition are strikingly similar to those of their affiliation condition: Sixty percent of their infants helped spontaneously, compared to 67% in our study. The results of our E2 no mimic condition are also very similar to

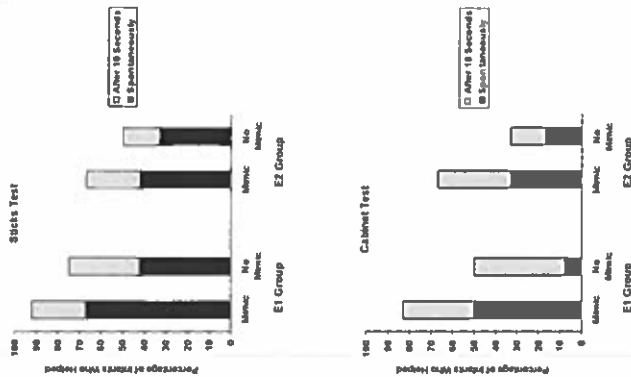


Figure 2. The percentage of infants who helped (i.e., gave at least one stick to the adult or opened the cabinet door for her), either spontaneously (before she started reaching or trying to open the cabinet herself) or not, in each condition in each test.

were no significant effects for any factor. Thus, the mimicry mainly affected infants' early, spontaneous tendency to help (rather than, not surprisingly, their tendency to respond to the experimenter's increasingly direct requests for them to help).

Almost all infants in the mimic condition recognized that E1 was mimicking them, as demonstrated by their testing behaviors. Eleven of the 12 infants in the E1 group and 10 of the 12 infants in the E2 group performed testing behaviors. Finally, we investigated whether, beyond the effects of mimicry, infants' general activity level or the experimenter's degree of responsiveness to them during the 6-min. play period affected infants' tendency to help, by having a naive coder code 50% of infants for these two measures. Infants were

- those of their baseline (and individuality) conditions: Twenty percent of their infants helped spontaneously in those conditions, compared to 33% in our study. This suggests that mimicry does indeed increase helping over baseline rates, to a similar degree as priming infants with affiliation.
- Infants help others at a surprisingly early age (e.g., Warneken & Tomasello, 2006, 2007). They help even at a cost, with no regard for direct rewards (Warneken & Tomasello, 2008). Because they help so readily, infants have been called indiscriminate helpers (Warneken & Tomasello, 2009). However, there are now several studies that show that helping and other types of prosocial behavior like sharing can be influenced by a variety of social factors in infants and young children. Young children's decisions about whether to help or share with others are based on relevant characteristics of the recipient, for example, the potential or observed helpfulness of the recipient (Dunfield & Kuhlmeier, 2010; Olson & Spelke, 2008) and the intentions or moral character of the recipient (Vaish, Carpenter, & Tomasello, 2010). More interestingly in the current context, young children also help or share more when they feel some bond or connection with the recipient. They help more after being primed with affiliation (Over & Carpenter, 2009a), and when they sympathize or empathize with someone (Eisenberg & Miller, 1987; Vaish, Carpenter, & Tomasello, 2009), and they share more according to the closeness of the recipient's relationship to the sharer (Olson & Spelke, 2008). And here we show that they help more after being mimicked. Affiliative connections with others help foster group cohesion, and thus their ties to helping behavior are socially adaptive. As Meltzoff and Moore (1999, p. 11) put it, "We do unto others in a special way because there is a deeply felt equivalence between self and other." Mimicry highlights this equivalence (apparently in a generalized way) and thus promotes prosocial behavior toward others, already in infancy.
- Agnetta, B., & Rochat, P. (2004). Imitative games by 9-, 14-, and 18-month-old infants. *Infancy*, 6, 1-36. doi:10.1207/s15327078inf0601_1
- Asendorpf, J. B., Warkentin, V., & Baudonnière, P. (1996). Self-awareness and other-awareness II: Mirror self-recognition, social contingency awareness, and synchronic imitation. *Developmental Psychology*, 32, 313-321. doi:10.1037/0012-1649.32.2.313
- Baayen, R. H. (2008). *Analyzing linguistic data*. Cambridge, UK: Cambridge University Press. Retrieved January 15, 2013, from http://www.cambridge.org/9780521875666/9780521875666/01164647/1s1c_locale=de
- 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. doi:10.1037/0022-3514.76.6.893
- Chartrand, T. L., & van Baaren, R. B. (2009). Human mimicry. *Advances in Experimental Social Psychology*, 41, 219-274. doi:10.1016/S0065-2601(08)00405-X
- Dunfield, K. A., & Kuhlmeier, V. A. (2010). Intention-mediated selective helping in infancy. *Psychological Science*, 21, 523-527. doi:10.1177/0956797610364119
- Eisenberg, N., & Miller, P. A. (1987). The relation of empathy to prosocial and related behaviors. *Psychological Bulletin*, 101, 91-119. doi:10.1037/0033-2909.101.1.91
- Lakin, J. L., & Chartrand, T. L. (2003). Using nonconscious behavioral mimicry to create affiliation and rapport. *Psychological Science*, 14, 334-339. doi:10.1111/1467-9728.14481
- Lakin, J. L., Jeffers, V. E., Cheng, C. M., & Chartrand, T. L. (2003). The chameleon effect as social glue: Evidence for the evolutionary significance of nonconscious mimicry. *Journal of Nonverbal Behavior*, 27, 145-162. doi:10.1023/A:1025389814290
- Meltzoff, A. N. (1990). Foundations for developing a concept of self: The role of imitation in relating self to other and the value of social mirroring, social modeling, and self-practice in infancy. In D. Cicchetti & M. Beeghly (Eds.), *The self in transition: Infancy to childhood* (pp. 139-164). Chicago: University of Chicago Press. Retrieved January 15, 2013, from <http://www.press.uchicago.edu/ucp/books/book/chicago/S/bs3652702.html>
- Meltzoff, A. N., & Moore, M. K. (1999). Persons and representations: Why infant imitation is important for theories of human development. In J. Nadel & G. Butterworth (Eds.), *Imitation in infancy* (pp. 9-35). Cambridge, UK: Cambridge University Press. Retrieved January 15, 2013, from http://www.cambridge.org/9780521875666/9780521875666/01164647/1s1c_locale=de
- Nielson, M., Simcock, G., & Jenkins, L. (2008). The effect of social engagement on 24-month-olds' imitation from live and televised models. *Developmental Science*, 11, 722-731. doi:10.1111/j.1467-7687.2008.00722.x
- Olson, K. R., & Spelke, E. S. (2008). Foundations of cooperation in young children. *Cognition*, 108, 222-231. doi:10.1016/j.cognition.2007.12.003
- Over, H., & Carpenter, M. (2009a). Eighteen-month-old infants show increased helping following priming with affiliation. *Psychological Science*, 20, 1189-1193. doi:10.1111/j.1467-9280.2009.02419.x
- Over, H., & Carpenter, M. (2009b). Priming third-party ostracism increases affiliative imitation in children. *Developmental Science*, 12, F1-F8. doi:10.1111/j.1467-7687.2008.00820.x
- van Baaren, R. B., Holland, R. W., Kawakami, K., & van Knippenberg, A. (2004). Mimicry and prosocial behavior. *Psychological Science*, 15, 71-74. doi:10.1111/j.0963-7214.2004.01501012.x
- Warneken, F., & Tomasello, M. (2006). Altruistic helping in human infants and young chimpanzees. *Science*, 311, 1301-1303. doi:10.1126/science.1121448
- Warneken, F., & Tomasello, M. (2007). Helping and cooperation at 14 months of age. *Infancy*, 11, 271-294. doi:10.1080/15250000701310389
- Warneken, F., & Tomasello, M. (2008). Extrinsic rewards undermine altruistic tendencies in 20-month-olds. *Developmental Psychology*, 44, 1785-1788. doi:10.1037/a0013860
- Warneken, F., & Tomasello, M. (2009). The roots of human altruism. *British Journal of Psychology*, 100, 455-471. doi:10.1348/000712608X379061
- Over, H., & Carpenter, M. (2012). Putting the social into social learning: Explaining both selectivity and fidelity in children's copying behavior. *Journal of Comparative Psychology*, 126, 182-192. doi:10.1037/a0024555
- Faulstich, A., Suomi, S. J., Visalberghi, E., & Ferrari, P. F. (2009). Capuchin monkeys display affiliation toward humans who imitate them. *Science*, 325, 880-883. doi:10.1126/science.1176269
- Uzgiris, J. C. (1981). Two functions of imitation during infancy. *International Journal of Behavioral Development*, 4, 1-12. doi:10.1177/01650254810400101
- Vaish, A., Carpenter, M., & Tomasello, M. (2009). Sympathy through affective perspective-taking and its relation to prosocial behavior in toddlers. *Developmental Psychology*, 45, 534-543. doi:10.1037/a0014322
- Vaish, A., Carpenter, M., & Tomasello, M. (2010). Young children selectively avoid helping people with harmful intentions. *Child Development*, 81, 1661-1669. doi:10.1111/j.1467-8624.2010.01500.x