

Imitation Enhances Social Behavior of Children With Autism Spectrum Disorder: A Review

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This article is a brief review of the literature on the enhancing effects of adult imitating the social behavior of children with autism spectrum disorder (ASD). The studies reviewed show that children with ASD respond more to imitative than to contingently responsive adults. After repeated imitation sessions, the children showed more distal social behaviors (looking, vocalizing), proximal social behaviors (moving close to and touching adult) and more joint attention behaviors as well as less repetitive/stereotypic behaviors during the imitation condition. To determine if any other behaviors of adults encouraged approach behavior by these children, the adults' behaviors were coded. The children approached both more imitative and more playful adults. Interactions between children with autism and their parents suggested that when compared with the imitative adult the parents of children with ASD showed less imitative behavior. The children, in turn, were more imitative with the imitative adult. In another study, parents of children with ASD spent more time demonstrating and directing the children's play and were less imitative. In at least 1 study, however, the children with autism showed more distal and proximal social behaviors with their mothers when their mothers were asked to imitate all the children's behaviors. The literature suggests, then, that children with ASD showed more social and imitative behavior when they were imitated, highlighting the importance of imitation as an effective therapy for these children.

Keywords: autism spectrum disorder, adult imitation

Adult Imitation Enhances the Social Behavior of Children with Autism Spectrum Disorder

Several studies have documented the positive effects of adults imitating children and play situations including nonautistic children (Field, 1977; Lubin & Field, 1981) and children with ASD (Dawson & Adams, 1984; Dawson & Galpert, 1990). Typically, imitation by an adult has enhanced social responsiveness in the children. Other studies on imitation by children with ASD showed that imitative interactions (1) improved interactions with objects (Tiegerman

& Primavera, 1981), (2) decreased self-stimulating behaviors (Harris, Handleman, & Fong, 1987), (3) increased gaze behavior (Tiegerman & Primavera, 1984), and (4) enhanced language development (Dawson & Adams, 1984; Nadel, 2006). Still others suggest that children with ASD (ranging in age from 2 to 11 years) have shown increased eye contact, positive affect, and social responsiveness and decreased perseverative behaviors when an unfamiliar adult imitated them (Dawson & Adams, 1984; Escalona, Field, Nadel, & Lundy, 2002; Field, Field, Sanders, & Nadel, 2001; Heimann, Laberg, & Nordeen, 2006; Nadel et al., 2000; Rogers & Williams, 2006). Some have suggested that imitation was beneficial because it is a "recognized exchange or connection between two persons and thereby creates a feeling of shared understanding between the individuals" (Nadel & Peze, 1993, p. 23). Adults have been noted to become more sensitive to their child's cues when they are being imitative (Field, 1977).

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Imitation in the Still-Face Paradigm

Imitation effects on children with ASD have often been studied in social play situations such as the adapted version of the still-face paradigm by Nadel and her colleagues (Nadel et al., 2000). In the Nadel et al. adaptation, children with autism interacted with an unfamiliar adult for four phases, each lasting 3 min. In the first phase, the child walked into a room that was furnished with a sofa, a table, two chairs and two sets of identical toys. An unfamiliar adult sat motionless on the sofa with the still-face for three minutes. In the second phase, the stranger imitated everything the child did, including the child's aberrant behaviors, and toy play behaviors, using toys that were identical to those the child use. The third phase consisted of a second still-face that was the same as the still-face of the first phase, and the fourth phase was a spontaneous interaction.

Although Nadel et al. (2000) had some concern about the negative effects or at least the potential confusion created by the still-faced behavior in contrast to the more social behavior during the imitative segment, they showed that out of the six social behaviors coded (looking at adult, positive facial expressions, negative facial expressions, positive social gestures, close proximity, and touching), as many as five of the six social behaviors occurred more often during the second still-face after the imitative segment compared with the first still-face. These included looking at the adult, negative facial expressions, positive social gestures, close proximity and touching. During that segment, the children displayed significantly more expectant behaviors such as looking at or touching the strangers. According to Nadel et al. (2000), children with ASD develop social expectancies during the imitation condition. The increases in proximity-seeking and touching behaviors were viewed as positive changes because they seem to indicate attempts on the part of the children to initiate interactions. It is not clear why the imitative behavior on the part of the adult was effective, although young preschool normal children have also been noted to be particularly responsive to imitations of their own behaviors (Lubin & Field, 1981).

Imitation Compared With Contingently Responsive Interactions

The Nadel et al. (2000) study was limited in that the results could relate to the imitation per se or simply the interaction being contingently responsive. Thus Field and her colleagues compared the effects of the adult being imitative versus being simply contingently responsive in their interaction behavior (Escalona, Field, Nadel, and Lundy (2002). In this study, 20 children (M age = 5 years) were recruited from a school for children with ASD. The children were randomly assigned to an imitation ($n = 10$) or contingently responsive ($n = 10$) interaction group based on a stratification table for gender, developmental and chronological age. The sessions consisted of the same four phases described for the Nadel et al. (2000) study.

The results suggested that during the third phase (the second still-face condition), the children in the imitation group spent less time in gross motor activity and more time close to the adult and touching the adult, as if attempting to initiate interaction. The children also showed significantly more negative facial expressions toward the adult during the second still-face phase, perhaps suggesting that they may be expressing their disappointment that the adult was no longer imitating them. These results highlighted the effectiveness of imitation versus simply contingently responsive behavior.

The children showed social expectancies in both the Nadel et al. (2000) and the Escalona et al. (2002) studies by reducing their distance from the adult and touching the adult more frequently. Their motor activity and vocal stereotypies also decreased, as indicated by no decrease in silence. Because silence was defined as no audible sound, this could also include no preverbal verbal vocalizations. This makes this finding difficult to interpret inasmuch as increased preverbal vocalizations would be desirable, especially if they occurred at the same time the children were increasing their attention to the adult. In the conclusion of the Escalona et al. (2002) study, we suggested that coding the adults, behaviors might indicate ways in which the adult differed during the contingently responsive and imitation conditions. A comparison could be made between those children who initiated contact by touching the adult after imitation (the approaching children) and the other

approximately half of the children who did not. The anecdotally reported frequency of social touch a version in children with ASD (Baranek, 1999) highlights the importance of finding interventions such as imitation to enhance the proximity and touch initiations noted in the children with ASD. That imitation was more effective than the contingently responsive condition in reducing gross motor activity and increasing the children's social contact behavior (touching) highlights the special nature of imitation. It is not only being immediately responsive, as in being contingently responsive, that is important, but it is also responding with the same behavior that is effective. The data from these studies as well as those from other studies (Dawson & Adams, 1984; Nadel & Peze, 1993) suggest that imitation by adults may be an effective intervention with young nonverbal children with ASD.

Children With ASD Display More Social Behaviors After Repeated Imitation Sessions

In the next study, we explored the effects of repeated sessions of imitation (Field, Field, Sanders, & Nadel, 2001). Twenty children (M age = 5 years) were recruited from a school for children with ASD to attend three sessions during which an adult either imitated all of the children's behavior or simply played with the child. By the second session, the children in the imitation group were showing distal social behaviors toward the adult a greater proportion of time, including (1) looking, (2) vocalizing, (3) smiling, and (4) engaging in reciprocal play (see Table 1). During the third session, the children in the imitation group spent a greater proportion of time showing proximal social behaviors toward the adult, including (1) being close to the adult, (2) sitting next to the adult, and (3) touching me adult.

These results suggest that both distal and proximal social behaviors may be increased in children with ASD by repeated sessions of the adult imitating the child's behaviors. Solitary behaviors including inactivity and playing alone had decreased by the second session and playing with objects had increased. Distal social behaviors of looking at the adult, smiling and vocalizing toward the adult occurred more often, and reciprocal play and recognizing imita-

Table 1
Mean Percentage of Time That Behaviors Occurred During Spontaneous Play Following Repeated Imitation Sessions (Contingently Responsive Play Sessions in Parentheses)

Behavior	Session		
	1	2	3
Stereotypies	1.6 (2.1)	1.5 (1.9)	.9 (1.7)
Inactivity	19.3 _d (21.2)	1.7 (20.7)	5.7 _c (19.0)
Playing alone	65.7 _a (67.1)	54.1 (61.2)	50.9 _a (60.3)
Accepting object	.0 (.7)	3.0 (1.2)	.0 (.9)
Playing with object	60.3 _d (54.9)	90.6 (62.3)	80.8 _b (71.5)
Looking at adult	4.5 _d (3.9)	20.0 (7.8)	15.7 _c (9.3)
Mirror play	1.0 (2.1)	6.5 (4.2)	10.7 _a (5.8)
Smiling/laughing	.1 _d (.01) _a	8.9 (3.2)	4.3 (2.7)
Vocalizing	5.0 _b (6.7)	11.0 (7.2)	7.3 (5.8)
Proximal to adult	.7 (.5)	.7 (.9)	3.3 _b (1.7)
Sitting next to adult	.1 (.4)	1.0 (.5)	7.1 _b (.8)
Touching adult	.0 (.0)	.0 (.0)	6.2 _d (1.2)
Imitation recognition	.0 (.0)	6.8 (.0)	7.0 _d (.0)
Reciprocal play	.0 _d (.2)	6.7 (3.1)	7.1 _d (3.2)

Note. Subscripts in column 1 reflect significant differences between Sessions 1 and 2. Subscripts in column 3 reflect significant differences between Sessions 1 and 3. (Adapted from Field et al., 2001.)

a $p < .05$. *b* $p < .01$. *c* $p < .005$. *d* $p < .001$.

tion had also increased by the second session. By the third session, the time that proximal social behaviors occurred had increased including mirror play, being close to the adult, sitting next to the adult and touching the adult. A noted limitation of this study is that we did not include a group to control for mere exposure to the adult.

Imitation and Joint Attention

To study the relationships between imitation and joint attention, the videotapes from the Field et al. (2001) study were recoded (Ezell et al., 2012). As already described, during the intervention segment one group of children with ASD was imitated by the unfamiliar adult, and in the other group, a different unfamiliar adult interacted in a nonimitative but contingently responsive way. For this group, the adult was instructed not to imitate the child. Joint attention behaviors were observed in accord with the definition offered by Carpenter, Pennington, and Rogers (2002). These researchers referred to joint attention as a cluster of behaviors such as referential looking, gaze following, imitation

and gestures such as showing, reaching and pointing. The young children with ASD (4–6 years of age) who were imitated were expected to show joint attention behaviors a greater percent of the interaction time as compared with the children in the group that simply received contingently responsive behavior. These behaviors were coded for the intervention phase and the spontaneous interaction phase in the first and third sessions. The imitation group showed greater referential looking, gaze following and imitative behavior. Imitating the child's behaviors was significantly related to the increase in percent time that the child engaged in three of the four joint attention behaviors including referential looking, gaze following and imitation (see Table 2). Adult imitation was not, however, significantly related to the percentage of time the child spent gesturing.

Imitation and Less Repetitive/Stereotypic Behavior

Researchers have frequently studied the effects of adult imitation on the positive behaviors of children with ASD, such as their social and joint attention behaviors as noted in the preceding text. In contrast, the effects of adult imitation on negative behaviors such as the repetitive/stereotypic behavior of children with ASD have received less attention. In a recent study, we recoded videotapes from our archival database (Field et al., 2001) to address the effects of imitation on the children's stereotypic/repetitive behavior and their behavior directed toward the adult and the toys (Field et al., 2014). During the second still-face following the imitation pe-

riod versus the first still-face period, the children spent more time touching the adult and touching and playing with the toys. During the imitation versus the spontaneous play segment, the children showed less stereotypic/repetitive behavior, including less time bringing the toys to the face and making autistic-like sounds. These data suggest that imitation by the adult led to less stereotypic/repetitive behavior by the children with ASD and more engaging behavior including both touching the adult and touching and playing with the toys.

That imitation by the adult can lead to less stereotypic/repetitive behavior is perhaps counter-intuitive. But the lesser incidence of these behaviors during the imitation condition suggests that the adult is imitating more sophisticated behaviors of the child, as in scaffolding or supporting the higher developmental level behaviors of the child (Vygotsky, 1934/1986; Wood, Bruner, & Ross, 1976). It would be interesting to explore the different developmental level behaviors that were being imitated to assess imitation in the context of scaffolding theory. If seen as a form of scaffolding, parents and teachers might more readily use imitation as a way of supporting/reinforcing the child's higher developmental level behaviors.

Children With Autism Approach More Imitative and Playful Adults

Imitation by an adult requires total attentiveness and responsiveness to the child for the child's behaviors to be matched. In mother-infant interactions featuring imitation (Field, 1977) the adult-infant time together became more playful and reciprocal, especially with the preterm infants who are less skilled. In the better interactions of children with ASD (i.e., those where the children approach, are close to and touch the adult more), the adult may be more playful. To explore this question, the videotapes from the Escalona et al. (2002) study were recoded for the children's approach behaviors and for other adult behaviors that might be associated with the children's approach behaviors (Nadel et al., 2007). The children were then assigned to high- and low-approach groups based on a median split of their proximity-seeking behavior with adults (looking at, approaching, and touching adults). The adults of the high-approach group showed more looking

Table 2
Comparison Between Groups on the Mean Percentage of Time That Joint Behaviors Occurred During the Intervention and Spontaneous Interaction Phases of the First and Third Sessions

	Joint attention behavior			
	Referential looking	Gaze following	Imitation	Gesture
Adult imitates	30.25	67.25	24.00	23.65
Adult does not imitate	10.68	39.63	2.55	19.40

Note. The groups significantly differed on all behaviors except gestures. (Adapted from Ezell et al., 2012.)

at the child, smiling at the child, inviting the child to play, imitating the child in play and being playful (see Table 3).

The results suggested that the high—approach interactions were characterized by more interesting behavior in the adults, including more frequent smiling, sound effects, imitative behavior and playfulness. The greater incidence of adult imitative behavior during those high-approach interactions, however, may have been a carryover effect from the imitative phase of the session inasmuch as more of the high-approach interactions occurred following the imitation sessions. More frequent approach behaviors by the child during the spontaneous interactions may relate to the imitative and more playful behavior during those interactions. These data are consistent with the suggestion by Nadel et al. (2000) that children with ASD show social expectancies around socially expressive adults, which then manifest themselves in more approach behaviors such as looking at or touching the adult. More playful adults may help the child with ASD relate to that adult and form more social expectancies. More playful adults may also be more interesting playmates and more flexible, allowing the children with ASD more freedom to initiate. The child being allowed to initiate seems to be effective in eliciting social contact. A second confound of the study, in addition to the chance finding that more approach behaviors occurred following the imitation sessions, is that more of the high-approach interactions featured an adult who was more experienced playing with children with autism.

Table 3
Mean Percentage of Time Adult Behaviors Occurred in High-Approach and Low-Approach Interactions

Adult behavior	High approach	Low approach
Looking at child	52.5	63.9
Smiling at child	11.1	4.0
Moving toward child	29.7	21.8
Relaxed body tone	72.0	20.0
Adult making sounds	3.5	.0
Inviting child to play	47.6	28.5
Imitating child in play	3.8	.7
Being playful	72.0	20.4

Note. The groups differed significantly on all behaviors except looking at and moving toward child. (Adapted from Nadel et al., 2008.)

This adult may have learned through interactions with these children that imitation and playfulness are effective behaviors.

Parents May Need Training to Be Imitative

Parents of children with ASD have been noted to initiate more play schemes and command more play acts than parents of typical children (Freeman & Kasari, 2013). In pilot data by our group, we noted the parents of children with ASD spent more time demonstrating and directing play acts during their play sessions (Field, 2016). However, although parents of children with ASD appear to be playful, they are significantly less imitative than adults who imitate everything a child does.

For example, in one of our studies we assessed how much imitative behavior parents showed during play interactions with their children with ASD as compared with a researcher who was deliberately imitative of the children and to determine if the more imitative researcher affected the child's social and imitative behavior. Children with ASD (M age = 6 years) were videotaped first interacting with a parent and then with an unfamiliar researcher who imitated the child's behaviors. The researcher showed more imitative and playful behaviors than the parents. In turn, the children showed more imitative behavior when playing with the imitative researcher than with their parents (see Table 4). The low levels of imitation the children demonstrated (from 7% to 8% time with the parents to 17% time with the researcher) are consistent with the literature suggesting impaired imitation among children with ASD (Malvy, Rouby, Receveur, & Sauvage, 1997; Rogers, Hepburn, Stackhouse, & Wehner, 2003). Imitation deficits are risk factors for later development given that imitation is related to mental age (Roeyers, Van Oost, & Bothuyne, 1998).

The reciprocal play and game-like turn-taking during the bouts of imitation could be elicited specifically by the imitative behavior of the adult. Comparisons between sessions that are imitative and those using contingently responsive behavior have suggested that imitative behavior of the adult may be more effective in eliciting imitative behavior of the child (Escalona et al., 2002). The effects of the researcher's more frequent imitative behavior on the imitative behavior of the child, however, were confounded by the researcher also showing

Table 4
Mean Percentage of Time That Interaction Behaviors Occurred in Mothers, Researchers, and Children With Autism Spectrum Disorder

Behavior	Mother	Researcher
Imitating child	2.60	39.33
Playful with child	50.33	59.67
Smiling at adult	6.20	9.27
Touching adult	15.93	5.13
Imitating adult	7.20	17.33
Recognizing being imitated by adult	1.47	2.13

Note. The groups significantly differed on all behaviors except child smiling at adult and child recognizing being imitated by adult. (Adapted from Field et al., 2010.)

more frequent playful behavior. Playful behavior by adults has also been notably effective in eliciting social behavior in children with autism (Nadel et al., 2007). The relatively high levels of playful behavior in the parents (33% to 50% time) and the simultaneously low levels of imitative behavior by the children during play with their parents suggest that the adults' playful behavior is less instrumental than the adults imitative behavior in eliciting the children's imitative behavior. These data highlight the effectiveness of adult imitative behavior and suggest that therapists/teachers might model imitative behavior for parents. Since imitation is a process by which most young children learn new skills, the social and cognitive skills of children with ASD might also be enhanced by imitation modeling of this kind.

Several behavioral techniques have been investigated for increasing the social behavior of children with ASD including discrete trial training, use of stereotypic behaviors to increase play skills, pivotal response training, differential reinforcement of appropriate behavior, in vivo modeling and play scripts, video modeling and reciprocal imitation training (Stahmer, Ingersoll, & Carter, 2003). In a study teaching reciprocal imitation skills to young children with autism using the naturalistic behavioral approach, the children increased their imitation skills and generalized the skills to novel environments (Ingersoll & Schreibman, 2006). In addition, the children increased other social-communicative behaviors, including language, pretend play and joint attention. However, this program was intensive (3 hrs per week), basically teaching the child imitation.

Parents have been taught many of these techniques with consistent results. A small sample study shows, for example, that the parents can be trained to teach their children imitation (Ingersoll & Gergans, 2007). In a larger sample, children whose mothers imitated them were more social (both distally and proximally) with their mothers than with an experimenter (Slaughter & Ong, 2014).

Limitations and Future Directions

The limitations of this body of research include research design problems and questions of generalizability of the effects to other situations as well as the feasibility of teaching them. The primary research design problems include the highly variable severity of children with ASD, identifying developmental-age matched comparison groups of typical children and selecting appropriate treatments to be compared with imitation therapy. Most of the studies reviewed above compared imitation with spontaneous play situations and sampled only children with ASD. The highly variable severity of ASD has contributed to difficulties matching experimental and control groups, for example, in the comparisons between imitation and the contingently responsive groups (Field et al., 2001). Rarely are children with ASD compared with typical children on the effects of adult imitation. This not only relates to the difficulty finding developmental-age matched children but also to the potentially negative effects of imitation on typical children. Even at the preschool stage some typical children have negative reactions to being imitated.

Another problem is the confounding behaviors of the imitative adult. As has been noted, the imitative adult in these studies differed not only in being more imitative but also being more playful (Nadel et al., 2008) and being less demonstrative and less directive at least when compared with the parents of the children with ASD (Field, 2016). It is likely that the imitative adult differs from the typical parents of children with ASD in other ways that have not been explored. There may be still other behaviors of the adult therapists that have been facilitating imitative and social behaviors of the children with ASD.

Although there were positive effects of repeated sessions of adult imitation, with distal social behaviors of the children increasing by the second session and proximal social behaviors increasing by the third session in the Field et al. (2001) study, it is not clear whether the social behaviors have generalized to the children's interactions in their daily lives with parents, teachers or peers. The adult's imitation of the child is seemingly key to this process, and parents and peers, for example, may not know that. Teachers and parents seem to be using other teaching techniques that are more demonstrative, directive potentially reinforcing. Further, they may prefer to model appropriate object and social actions than to imitate the autistic-like behaviors of the children. They may be concerned that they are reinforcing these behaviors. Although imitation by the adults has been noted to reduce repetitive/stereotypic behaviors such as autistic-like sounds (Field et al., 2014), its reinforcing effects on other autistic-like behaviors have not been assessed.

Summary

These data highlight the enhancing effects of adult imitating the social behavior of children with ASD. At least one study has shown that children with ASD respond more to imitative than contingently responsive adults. After repeated imitation sessions, the children showed more distal social behaviors (looking, vocalizing) and proximal social behaviors (moving close to him touching adult). In other studies, children with ASD showed more joint attention behavior and less repetitive and less stereotypic behaviors. In an analysis of the imitative adult behavior, children approach both more imitative and more playful adults. When parents were compared to an imitative adult, children with ASD were more imitative with the imitative adult than with their parents. However, when parents were asked to be imitative, their children showed more social behavior. This literature suggests, then, that the children with autism show more social and imitative behavior when they are imitated, highlighting the importance of adult imitation as an effective therapy for these children.

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