"Hand leading" and "hand taking" gestures in autism and typically developing children

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Abstract

Children with autism use hand taking and hand leading gestures to interact with others. This is traditionally considered to be an example of atypical behaviour illustrating the lack of intersubjective understanding in autism. However the assumption that these gestures are atypical is based upon scarce empirical evidence. In this paper I present detailed observations in children with autism and typically developing children, suggesting that hand-leading gestures may be an adaptive form of interaction in typically developing children neglected by mainstream developmental psychology. I conclude that, although there may be features differentiating how these gestures are used in autism and typical children, systematic research on them is needed to clarify their nature and significance for both typical and atypical development.

Keywords: gestures, hand-leading, joint attention, communication

Introduction

A clinical observation commonly reported in children with autism is their use of peculiar forms of interaction consisting of taking other people by the hand to places they wish them to move to or taking other people's hand to objects they want them to manipulate. This has become a paradigmatic example of unusual behaviour illustrating the lack of social understanding in children with autism who would appear to be treating people, or their hands, as a tool (Frith, 2003, p. 106). In this paper I argue that this assumption may be wrong. It is based on a few clinical or anecdotal descriptions, but very few attempts have been made to characterise these forms of interaction systematically or indeed explore their possible presence in typically developing children.

1. Hand leading and hand taking in autism

Although just mentioned in passing by Kanner in his 1943 seminal paper, hand leading and hand taking have become well-known examples of autistic behaviour that appear to illustrate DSM 4's criterion of "qualitative impairment in social interaction" as manifested by the impairment in the use of gestures to regulate social interaction. Indeed, one of the examples quoted in DSM 4 to illustrate this impairment is "involving others in activities only as tools or 'mechanical' aids." The more recent DSM-V emphasises the concurrent lack of attempts to look at the other, but it still highlights "hand-pulling" as an example of unusual social interaction typical (albeit not diagnostic) of early autism, as if there is something especially significant in this particular instantiation of interaction without joint attention. Similarly, the revised version of ADI (ADI-R) includes the item "Use of another's body to communicate" as a behaviour typically associated with autism (Lord, Rutter, & Le Couteur, 1994), and in the third edition of a well-known Handbook of Autism, Chawarska and Volkmar (2005) list "use of other's body as tool" as one of the typical symptoms differentiating toddlers with autism from typically developing toddlers.

Although it is not always clear if hand taking and leading are seen as atypical on their own or only if they are performed without eye gaze, many authors discuss the nature of the actions themselves as an atypical feature. For example, Travis and Sigman (2001) present lack of eye contact and "manipulation of the partner's body" as two separate atypical features of the way in which children with autism make requests (p. 286). Siegel (1996) emphasises that children with autism use hand leading instead of pointing gestures, listing this as an additional feature to lack of eye contact and describing it as "something normally developing children seldom do" (p. 46). Paul stresses that, in addition to being less likely to engage others with gaze, children with autism tend to "use unusual gestures such as pushing an adult's hand towards a desired object" (Paul, 2007, p. 133), and that these gestures "appear to use the other as a tool" (Paul, 2008, p.86).

In sum, even when concurrent lack of attention to the other is mentioned, hand leading gestures continue to be an example of choice to illustrate the social impairment in autism, as if they capture some additional element of the condition typically summarised as the impression of "using the other as a tool".

However, there are very few systematic empirical studies of the hand taking and hand leading gestures to support the impression that it is an especially atypical form of interaction (a symptom that others are treated as tools), or that this form of communication is rare or non-existent in typically developing children.

One of the first reports of hand leading in autism (Hutt and Ounsted, 1966) indeed suggested that all elements of social contact displayed by children with autism, including their attempts at moving the adult's limbs to make them do things, were in themselves normal except for the lack of eye contact with the other. The study presents, however, no data from typical children to back this assertion. Curcio (1978) reported that the children with autism who used these gestures always performed them without eye contact and suggested that they were primitive requesting strategies similar to those found by Piaget (1937) in typical infants at 8-12 months of age. Such contact gestures would reflect a lack of understanding that other agents are autonomous and need no mechanical activation.

Phillips et al. (1995), using an object request task, reported that 5-year-old children with autism used conventional distal gestures (e.g., pointing) significantly less than control groups (2 year-old typical children and 5 year-old children with learning difficulties). However, children with autism showed no higher propensity to use contact gestures (including 'climb on adult,' 'push/drag adult with full force,' or 'throw adult's hand in the target direction'). All groups used some contact gestures as part of their requests. The significant difference was that children with autism were less likely to use intersubjective cues like eye contact paired with *any* gestures.

None of these studies provides any detailed information about the topography, kinematics and mechanics of hand leading or hand taking gestures, but all suggest that some contact gestures may exist in typical children.

2. Hand taking gestures in typically developing children?

The only published account of hand taking gestures in typical development refers to infants under 12 months. Piaget (1937) reported that around the age of 8-12 months his infants frequently manipulated his hands to make him do things with objects. For example, after tickling his 11 month-old daughter's tummy, she grabbed his hand and took it back to her tummy. Other instances include taking his hand to the spectacles after he tapped them, pushing his fingers to make him repeat a sound, or taking his hand to a mechanical toy to make him reactivate it. No information is given about whether these actions were or not accompanied by eye contact. Piaget interpreted these behaviours as indicating a lack of understanding that agents are autonomous and therefore need not be physically activated or triggered. When this is understood after 12 months of age, hand taking behaviours disappear and are replaced by actions like offering objects to others or pointing.

To the best of my knowledge there are no other systematic reports of hand taking actions in typically developing children, except some occasional confirmation of Piaget's observations in the 8-12 month-old age range (Sugarman-Bell, 1978). There seems to be therefore an assumption that in typical development, hand-taking is a primitive, transitory behaviour that disappears as conventional forms of gesturing with genuine communicative intentionality emerge (Sugarman-Bell, 1978). In recent reviews of preverbal communication in typical development (e.g., Lock and Zukoff-Goldring, 2010), contact gestures do not figure at all, and the development of

communication in the second year of life is characterised as consisting of the emergence of progressively more symbolic gestures that complement pointing.

However, casual naturalistic observations suggest that hand-leading and taking may be relatively common in typical infants and toddlers persisting as forms of communication alongside pointing and vocalisations beyond the first year of life (Gómez, 2007). In the next section I report in detail some examples of hand-taking and hand-leading gestures in children with autism and typical children, in an attempt to show that these gestures may indeed be part of the typical communicative repertoire of infants and toddlers, and therefore more systematic studies on their nature and development are needed to understand their significance in autism.

3. Observations of hand taking and hand leading gestures in autism and typical development

3.1. Children with autism spectrum condition

The following detailed observations (coded A for 'Autism') come from videotaped examples of children in tasks where their ability to request desired objects was being assessed in the special schools they were attending. All of them had been diagnosed with autism with varying degrees of severity and varying degrees of associated learning difficulties by an experienced clinician using criteria from DSM III-R and their own expertise. Observations took place in the early 1990s in Spanish schools.

OBSERVATION A1. (12 years old boy; no language, severe associated learning difficulties).
A favourite object (a mirror) is placed on a shelf out of reach of the child. He repeatedly pushes with his hands the body of a caretaker, who initially was standing a few meters away, and pulls different body parts towards the location of the mirror, all of this punctuated with productions of a manual sign that he has been trained to use to make requests. There is no eye contact. There are several instances of hand leading: in the first, he pulls the adult by the wrist towards the target location. Once there, with the other hand he moves a stool under the target, pulls again the person from the wrist and with the other hand pushes the caretaker by the arm in the direction of the stool; he then pushes with both hands the back of the caretaker trying to make her step on the stool, which she does. Finally he looks up towards the goal and waits for the caretaker to hand him the object. No eye contact or vocalisation during the interaction.

This observation shows hand leading combined with pushes and other manipulations of the other person's body trying to make the caretaker move in the direction of the target, with no eye contact, but in combination with trained requesting gestures. Remarkably, the child strategically places a physical means (the stool) that the caretaker would need to reach the target.

OBSERVATION A2. (Girl, 9 years old; no language; mild learning difficulties).
The adult places a radio (a favourite object) on a shelf behind him. The girl vocalises in displeasure with an occasional brief look at the eyes of the adult, who asks: "Is there anything you want?" The girl goes away and looks at other things. The adult turns the radio on and off again. This attracts back the girl's attention. She looks from about 2 m away at his face while vocalising, then approaches looking at his face, looks at his hand on the table, grabs it and throws it in the direction of the radio with no eye contact. The adult turns on the radio. The girl listens to the music smiling and looking at the ceiling, and in one occasion looks at the adult in the eye when he says: "It's nice, isn't it?" Then the adult turns the music off. The girl glances at his hand, takes it with her hand while looking back at the radio, and swiftly throws it in the direction of the object, staring at this and smiling, but not looking at the adult, who turns the radio on.

After two additional repetitions of the same sequence (radio turned off; hand thrown in the direction of the radio), the adult switches off the radio again and turns his back to the girl, with his hands now out of direct reach. She looks at the adult's back and at the radio without doing anything for more than 30 seconds. Finally, she extends her hand towards the adult's left arm, and pulls. The adult turns and both make eye contact: she grabs his hand and with a gentle movement throws it to the radio while smiling with her attention concentrated on the object. She then listens to the music while looking away at the ceiling all the time.

In this observation, a girl with autism shows a particular variant of hand taking —throwing the other's hand towards the target that she wants manipulated— sometimes with and other times without eye contact. She also manages to call the attention of the adult who had his back turned.

OBSERVATION A3. (Boy, 7 years old, isolated words, mild learning difficulties).

An adult person (P) shows the boy a piece of chocolate and places it on a shelf. The boy produces a good phonetic approximation of "chocolate" while looking at P's face. P hands him the chocolate. In the next trial, P pretends to be distracted and doesn't answer after the vocalisation. The boy waits looking at the hand and body area of the 'distracted' person. After 6 seconds, he gently takes P's hand by the wrist and softly moves it towards the chocolate letting it go with a soft push while looking at the hand and the chocolate. When P grasps the chocolate, he grabs P's arm again, pulls it down with his left hand, and takes the chocolate with his right hand. No eye contact during the whole sequence.

Later, more chocolate is placed on the shelf with P looking distracted elsewhere. The boy approaches, and says "chlate" and at the same time takes P's hand, and throws it towards the chocolate with his left hand, which he immediately moves under P's elbow to push it upwards as if to make sure it reaches the target. He keeps his hand on the elbow and as soon as he sees the hand grabbing the chocolate, he pulls down P's arm and takes the chocolate. There was no eye contact. The boy leaves to eat the chocolate a couple of meters away, but a few seconds later he turns and looks P in the eye, approaches, and while looking at P's face, he tries to grab P's arm, just touching it. P responds anyway giving him the last piece of chocolate.

Here the child first tried to obtain the reward using a word uttered with eye contact, but when the adult pretended to be distracted, he switched to the less easily ignored contact gestures (including taking, throwing and pulling the other's hand, sometimes with a lot of 'mechanical detail' apparently to ensure that the hand reaches its destination). These actions were produced without eye contact, except for the last one. This shows a combination of taught requesting procedures (words) and spontaneous use of contact gestures.

3.2) Typically developing children

The following are personal observations (coded "T" for typical) from three typically developing children extracted from a data base of videotapes of spontaneous behaviour in naturalistic household situations.

OBSERVATION T1. (9 month-old male infant with his mother).

The mother is teasing his son, sitting on her lap, with a cookie. She shows him the cookie. He reaches and pulls his mum's hand by a finger and tries to grab the cookie with the same hand, but his mother withdraws the cookie. The boy then grabs his mother's wrist with his left hand, pulls and then tries to get the cookie with his right hand while still holding his mother's. He fails, but in a second attempt, grabbing again two fingers of his mother's hand with his left hand and then reaching with his right, he succeeds in getting the cookie. All the time, his visual attention was concentrated on the cookie/mother hand

compound. Not a single look was directed at his mother's eyes, despite her continuously talking to him with teasing utterances like "this is mine!." After getting the cookie, he starts eating it with no attention to his mother's face.

OBSERVATION T2. (10 month old male infant; same child as in Obs.T1).

The boy's mother is holding him in her right arm, while with her free hand she demonstrates how to switch on and off the room lights by pressing the switch on the wall. He looks intently in the direction of the switch. After four demonstrations, the mother withdraws her hand and places it on the child's tummy to tickle him. The child, looking at the switch, finds his mother's hand with his left hand and pushes it halfway to the switch, letting it go with a final push. The mother's hand stops a couple of inches from the switch. The boy gives a very light additional push to the hand, always looking at the switch, and the mother complies and switches on and off the lights.

The mother then withdraws the hand again and moves it towards the child's tummy, but he intercepts it and pushes it back to the switch until the mother complies (the child's attention always on the hand or the switch). This is repeated several times. On one occasion the mother resists the pushes and her hand stays a few inches away from the switch: the child gives several pushes to the hand, and eventually takes it all the way to the switch, so that the mother's hand hits the switch and accidentally turns the lights off. The child leans forward and starts touching the switch himself with his hand. He then finds again his mother's hand and pushes it again, with a succession of slight pushes, and his visual attention focused on the switch. He pushes it again all the way to the switch, and then as nothing happens (mother just leaves hand on switch without acting), he gives slight shoves to the mother's hand with his fingers. He tries again himself. There is not a single look at his mother's eyes.

These observations with an infant under one year of age are similar to those reported by Piaget (1937). They show hand taking and pushing to gain possession of an object (cookie), where the hand/wrist is treated as an intermediary linked to the target object in a similar way to how the child in A3 gained possession of the piece of chocolate; or to provoke an action upon an object (cfr. Observation A2 with the radio), without a single instance of intersubjective eye contact or looks at the face of the mother. The infant (who grew up typically) was capable of engaging in face to face interactions with abundant eye contact and affective exchanges at the time of the above observations.

OBSERVATION T3. (Female toddler; 18 months, with her father in a room).

The girl, who has been walking around the room on her own, grabs the index finger of her father who is seated on a bench. After a few seconds looking elsewhere, she starts pulling strongly, but the father resists and stays seated. The girl turns and looks very briefly into her father's eye, she then looks at something in the distance without pulling, but keeping hold of his index finger. She suddenly points with her index finger in the direction she was looking while letting go of her father's hand. She keeps pointing for a few seconds, seems to get distracted, but finally stops pointing, takes two steps towards her father, and grabs again her father's hand with her left hand (without looking either at eye or hand). She then starts pulling her father in the direction she had been pointing at, and while keeping her grip and pull on her father's hand, she extends her own hand towards her coat that lies on a couch, grabs it and starts moving it towards her father without making any eye contact. The father takes the coat and puts it on her, but then sits down again on the bench. The girl walks towards the door of the room, but the father doesn't follow. She returns looking shyly around, extends her left hand towards her father's arm, gropes a little and finally grabs her father's small finger and starts pulling him in the direction of the exit door initially without looking at him. The father resists, but after his daughter briefly looks him into his eye while pulling, he complies.

This observation shows an apparent request to leave the room made by pulling the adult's hand with very limited intersubjective signals (e.g., eye contact). It is noteworthy that the father is initially pulled all the way to the coat instead of taking the coat to him, but only after the child's earlier attempt at pulling and then pointing failed to make her father move.

OBSERVATION T4. (Toddler boy; 21 months, with his father in the garden).
The child is in the garden playing with a ball. His father stands a few meters away. The child picks up the ball, and holding it in his hands walks briskly towards his father, uttering the word "papa," but without making eye contact with him. He approaches and extends his right hand towards his father's hand grabbing it with from the little finger area. He immediately starts pulling him to a different part of the garden, while occasionally producing soft vocalisations. About 4 meters into the walk, he lets go of his father's hand with a slight push/throw forward in the direction they were moving. However, he changes direction himself, 90 degrees to the left, and continues playing with his ball without further attention to his father. There was no eye contact at any time during the interaction.

OBSERVATION T5. (Toddler boy; 21 months; same as in Obs. T4).
Still in the garden, the father says: "Do you want to go to the Wendy House?". The child looks at his father's eyes, nods, approaches him and takes his hand as in example T4. He leads his father for about 12 meters towards the Wendy house without looking at him again. As they arrive, the child's attention is picked by some rotten apples on the ground, and with his left finger he points to them while still holding his father's hand with the right, and says: "caca, caca" (meaning 'dirt'). He eventually looks at his father's eyes, while he is commenting on his remark. He stays watching the rotten apples while his father speaks, all the time holding the father's hand by his small finger. He finally resumes his way towards the Wendy house pulling his father, but suddenly lets go of the hand, turns around whining and looks at his father who asks "what?" He extends his arms up looking at his eyes and the father takes him in his arms.

OBSERVATION T6. Toddler boy, (21 months; same as in Obs. T5).
The child is on the platform of the elevated Wendy house, in front of the door, apparently complaining about his tummy. The father checks his tummy, while talking to him, and says: 'there is nothing there.' The child looks several times at his eyes. He looks at an object he has in his own hands and looks back at his father's eyes, then turns back to the Wendy house entrance door, and extends his hand to it as if to open the door; however, he aborts the action and turns to his father, makes eye contact with him, mutters something unintelligible, and extends his right hand towards the father as if going to take his hand as before; however, he stops midway, and instead points with the same hand at his fathers hand, alternating gaze between it and his father's eyes. The father offers his hand, and the child extends his own as if to take it, very briefly grabs it, but immediately lets go of it and points to the ladder leading to the Wendy house platform (his hand somehow tracing the spatial displacement his father would need to make), while looking at his father's eyes and muttering something. The father complies and goes to the ladder.

The last three observations were made on the same day with the same child, a 21 month old toddler. They are taken from a 45 min videotape of continuous interactions between a father and his son. Hand-leading gestures occurred 15 times, alongside many other gestures and vocalizations, such as pointing or palm-up requests, and even some words. Abundant eye contact and gaze alternation behaviours occurred during most of the interactions.

The observations show that this toddler smoothly integrated hand-leading actions, and at least one instance of hand throwing, into the sophisticated acts of nonverbal (and beginnings of verbal) communication of a typically developing 21 month old child. These hand leading

gestures seem to be mainly used to request long displacements. The hand-leading actions themselves were seldom accompanied by eye contact. Observation T4 is noteworthy because it shows an instance of hand throwing, not at an object (as in Obs. T2), but apparently to signal a direction of movement. The interaction in this observation lacks any clear contextual joint attention cues (other than the utterance of the word 'papa' at the beginning). Obs. T6 provides a possible example of an aborted hand-leading action transformed into a pointing that indicates or "depicts" the desired movement. In other observations from the same child (not reported here), he produced similar patterns, in which an act of hand grasping, instead of being followed by hand leading towards a place, was followed by pointing in the desired direction. These observations may indicate an increasing reliance on distal, maybe even symbolic, gestures to request displacements, but building upon the expressive possibilities offered by contact gestures.

Conclusions

The main aim of this paper was to show the need to systematically study the hand leading and hand taking gestures that are frequently used as paradigmatic examples of autistic behaviour despite the lack of empirical evidence about their nature and origins in typical and atypical development. To this end I have presented some detailed observations of instances of hand taking and hand leading in both autism and typical development. These suggest that some of the assumptions made in the literature may need to be revised.

First, hand leading and hand taking gestures are not exclusive to children with autism. Typical children of a variety of ages also use them, which suggests that by themselves they are not atypical or abnormal ways of interacting with people. They are not restricted to typical children in the 8-12 month age range, but seem to be used from the end of the first year of life to the end of the second year, and maybe beyond. We know next to nothing about these forms of interaction in typical development, because they have been almost completely neglected by developmental psychologists, who have concentrated on pointing and other conventional means of communication.

The observations presented here also suggest that the concurrent presence or absence of joint attention cues such as eye contact is not a clear-cut difference between contact gestures in autism and typical development. Typical infants at the end of the first year of life perform contact gestures with no eye contact whatsoever, pushing or taking the hands of others to an object in an "instrumental" way comparable to some descriptions of hand taking without joint attention in autism. Moreover, even in their second year of life, typical children may produce their hand leading gestures without any accompanying joint attention cues, despite the fact that in the wider context of the interactions they use such cues with other gestures and communicative expressions. In addition, some children with autism may show some joint attention cues like eye contact with their contact gestures.

Of course, the few personal observations presented here are no substitute for systematic, larger scale studies with properly matched age groups, but they offer some suggestions of potential issues and possibilities to be explored in such future studies. For example, a thorough and systematic description of the topography, kinematics, and mechanics of contact gestures is needed. The term "hand leading" is frequently used in the literature to refer to any action involving taking the hand of the other. However, the observations presented here raise the possibility that hand taking and hand leading are different, and that other categories, like hand-

throwing, may need to be introduced. There might be a whole family of different gestures performed with the other's hand or other body parts: leading, taking, touching, throwing, pushing, holding, etc. In addition, children with other developmental conditions should be studied as well. For example, Siegel (1996) mentions that deaf children and language-handicapped children also engage in hand leading, and Núñez (2014) reportes hand-taking gestures in deaf-blind children.

Another important issue is to determine the developmental relations between different forms and functions of hand using gestures. For example, the above observations raise the possibility that in typical development hand *taking* and hand *throwing* towards objects are more prevalent in the 8-12 months period, and linked to object requests, while hand *leading* towards places may be more frequent in toddlers and used for displacement requests. This needs to be investigated with extensive and systematic studies, as well as whether hand taking and leading have different or common developmental origins. For example, is there continuity between the earlier highly instrumental gestures displayed by typical children at 8-12 months and the later, more schematised hand leading actions, or do they emerge differently?

Most discussions of contact gestures focus on their combination (or lack thereof) with joint attention cues. However, the above observations suggest another potentially important dimension in the analysis of hand leading and taking: the topography, kinematics and degree of schematisation of the action. Observations like T6 raise the possibility that in typical development there is a progressive schematisation of contact gestures, with transitions from hand leading and touching to pointing in the direction of a desired movement, and maybe the emergence of symbolic pointing depicting movement trajectories. The impression of using the other as a tool that the hand leading gestures of children with autism so often cause might be due, not only to the habitual lack of eye contact with the recipient, but maybe also to a lesser degree of schematisation of the actions.

Understanding better the nature and development of contact gestures like hand leading and hand taking may also have implications for intervention in autism. Independently of how atypical such contact gestures may be, they are an effective way of showing the desires and intentions of the child and seeking help to fulfill them (e.g., Wetherby & Prutting,1984). As such they can and have been used by practitioners as a basis to try to build more sophisticated forms of communication. Some of the above observations suggest that something like this may naturally happen in typical children, where more conventional gestures like pointing to indicate a direction of movement may build upon hand leading actions in the course of normal development. Knowing more about the nature and developmental processes underlying these gestures both in typical and atypical development may help improve the effectiveness of intervention strategies.

The main conclusion of this paper is, therefore, a call for systematic studies of the hand leading and hand taking gestures. I hope to have argued successfully that there is much to be learned about typical and atypical social interaction by studying them, rather than dismissing them as a manifestation of the lack of social insight in children with autism or as a secondary feature to their joint attention problems.

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