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Personal Pronoun Avoidance in Deaf Children with Autism

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Personal pronouns, especially first- and second-person forms (e.g., *I/me/my/mine* and *you/your/yours* in English) have long been known to cause difficulty for hearing children with autism spectrum disorder (ASD). Children with ASD sometimes reverse pronouns, referring to themselves as *you* or to others as *me* (e.g., Kanner, 1943; Evans & Demuth, 2012). In addition to producing reversals, children with ASD sometimes use proper names in contexts where pronouns are typically used. Jordan (1989) found that eight of 11 autistic children (ages 6;8-16;5) used their own name for self-reference instead of the pronoun *me* in a picture-identification task, while only four of 22 language-matched control children did so. Jordan speculated that the use of proper names could reflect input from adults, who may intuit that spoken language pronouns are confusing to children. Similarly, Lee, Hobson, and Chiat (1994) reported that on a similar task nine of 12 lower-ability ASD participants (ages 8;4-19;6) referred to themselves by name only, whereas just three of 12 non-ASD lower-ability participants did so. They concluded that pronoun avoidance could reflect abnormalities in how such children experience the self, with a less-secure anchoring in a sense of "me-ness" than TD children.

In short, theories abound about why children with ASD sometimes avoid pronouns. All studies to-date have focused on pronouns in spoken languages. In recent decades, a rapidly growing body of work has examined the acquisition of signed languages of the deaf (Newport & Meier, 1985; Chen Pichler, 2012), but there is very little work on the linguistic development of signing children with ASD. A study of the use of sign language pronouns by TD and ASD deaf children, therefore, could shed new light on the phenomena of pronoun avoidance and pronoun reversals in children with ASD. Crucially, there are interesting differences between signed and spoken pronouns.

1. Pronouns in American Sign Language (ASL)

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Personal pronouns in ASL are indexical points to self or other (Figure 1; Klima & Bellugi, 1979). They clearly pick out their intended referents,[1] unlike spoken language pronouns whose phonological forms give no hint as to their referents.

Figure 1. The ASL signs I/ME[2] (left) and YOU (right).

Could the transparency of reference exhibited by ASL pronouns aid learners in understanding their use? Much research has examined the role of iconicity – i.e. the motivated, non-arbitrary relationship between form and meaning – in sign learning. Though findings have been mixed (e.g., Meier, 1982; Meier, Mauk, Cheek, & Moreland, 2008; Orlansky & Bonvillian, 1984, for negative findings), there is evidence that the iconicity of some signs can be beneficial to both first- and second-language learners. L1 learners tend to acquire more iconic signs earlier in life (Vinson, Cormier, Denmark, Schembri, & Vigliocco, 2008) and are faster at matching signs and pictures when those pictures resemble iconic qualities of the sign (Thompson, Vinson, & Vigliocco, 2009). L2 learners remember iconic signs better than non-iconic signs (Beykirch, Holcomb, & Harrington, 1990). Similarly, hearing children with ASD seem better able to learn iconic signs than non-iconic signs (Konstantareas, Oxman, & Webster, 1978). It is thus possible that the resemblance of some signs to their referents may facilitate the learning of symbols. Though ASL pronouns are *indexical* rather than *iconic* – that is, they *point to* their referent rather than *looking like* their referent – it is possible that children learning sign could use this transparency to their advantage.

Nearly all research to date on sign learning by ASD children has focused on hearing children with severe forms of ASD. There have been few studies of deaf

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[1] Exceptions are the ASL signs WE and OUR (Meier, 1990).

[2] As is conventional, we denote ASL signs with their English translations in SMALL CAPS.

children with ASD, particularly those exposed to ASL from birth by their deaf parents. Deaf children with ASD who are exposed natively to a signed language provide an important test case for understanding how language modality and first language acquisition interact in children with ASD. By studying how native-signing children with ASD handle sign pronouns, we can gain greater insight into the nature and causes of pronominal deficits in hearing children with ASD.

In order to explore how native-signing children with and without ASD use sign pronouns, we used an experimental paradigm to elicit first- and second-person pronouns.[3] At least two prior studies (Lee, et al., 1994; Jordan, 1989) used similar picture identification tasks with hearing children with ASD. We sought to replicate a portion of these studies with deaf children using sign.

2. Method

2.1. Participants

Two groups of participants were tested: 1) Signing children with ASD, and 2) Typically developing deaf children. All children were raised in households in which ASL is the primary language; all participants had deaf parents, except one child whose grandparents were deaf. All of the children with ASD were also deaf, except for one hearing child of two deaf parents. Only children born to signing parents were tested because we can be assured that such children were exposed to a rich linguistic environment beginning when they were neonates.

2.1.1. ASD group

ASD diagnosis in deaf children is complicated by the fact that current gold-standard instruments were not designed with these children in mind. The Autism Diagnostic Observation Schedule, Second Edition (ADOS-2; Lord et al., 2012) was used to verify diagnosis in these children. The ADOS-2 was given by two administrators who had attained research reliability on the instrument and were also proficient in ASL. Due to the unusual nature of the research population, several modifications in administration and scoring were made. Certain items were not scored due to their inappropriateness for deaf children (e.g., Intonation of Vocalizations/Verbalizations). Thus, the scores of the children in our sample likely underestimate autism severity, since the maximum possible score is lower than that used in standard practice with hearing children.

Parents were asked to complete the Social Communication Questionnaire (SCQ; Rutter, Bailey, & Lord, 2003), a widely-used screening tool with high

[3] The linguistic status of personal pronouns in ASL and other signed languages has been a matter of continuing controversy (Cormier, Schembri, & Woll, 2013; McBurney, 2002; Meier, 1991). However, ASL unequivocally has points to self and points to addressee; for purpose of this paper we label these points as first- and second-person pronouns.

specificity and sensitivity in discriminating between children with and without ASD. The mean score of the ASD group on the SCQ was 14.0 (*SD* = 6.7; range 4-31), slightly below the standard cut-off criterion score of 15. However, some studies (Allen, Silova, Williams, & Hutchins, 2007; Eaves, Wingert, Ho, & Mickelson, 2006) have suggested that a cut-off score of 11 may be more clinically useful (Norris & Lecavalier, 2010).

Children were included in this study if they: (a) scored above the cut-off for ASD or autism on the ADOS-2; *or* (b) did not score above the cut-off for ASD or autism on the ADOS-2, but were judged to fit a clinical picture of ASD by a clinical psychologist fluent in ASL and trained in ASD who reviewed their SCQ, ADOS-2, data collection session, and educational or medical records, if available.

Children were recruited via a video in ASL posted on social media (YouTube and Facebook), and research visits were conducted at the child's home or school. Fifteen children with ASD (11 male, 4 female) are reported here. None of the children had received a cochlear implant or used amplification (hearing aids). Nine additional children (6 male, 3 female) were recruited but were not included in the study. Five of these children did not have any expressive language and thus could not complete any of the tasks, three children completed all the tasks but their diagnosis was not confirmed by the ADOS-2 or by the clinician's judgment, and one child was not included because both parents used Signed English[4] and spoken English rather than ASL with their child, and the child responded to the tasks in English. A summary of characteristics of the children with ASD included in the study can be seen in Table 1.

2.1.2. TD group

Eighteen typically-developing deaf children (8 male, 10 female) participated. TD children were recruited through schools for the deaf, and the study was conducted in those schools. All children had at least one deaf parent and had been exposed to ASL from birth; none of the children had received a cochlear implant or used amplification. The children were screened using the SCQ. All scored under cut-off; the group mean was 2.39 (*SD* = 2.35; range = 0-7), which was significantly lower than that of the ASD group (Mann-Whitney U, $p < .001$).

2.1.3. Matching

The two groups were matched for chronological and mental age. The TD group was slightly younger on average (M_{age} = 9;4, *SD* = 1;9, range 6;7-12;9)

[4] Signed English is a system of manual signs that follows English grammar and thus is not considered an independent language.

than the ASD group (M_{age} = 9;8, *SD* = 2;6, range 5;1-14;4); however, this difference was not significant (Mann-Whitney U, *p*=.58, *ns*).

Table 1. Summary of Characteristics of Participants with ASD

Subject	Age	Sex	Hearing status	Parental hearing status	ADOS-2 score	SCQ score	TONI-4 score
ASD-M1	5;1	M	Deaf	Deaf	11	15	88
ASD-M2*	5;3	M	Deaf	Deaf	1	10	100
ASD-F1	7;1	F	Deaf	Deaf	18	8	98
ASD-M3	8;5	M	Deaf	Hearing (CODAs)	14	19	100
ASD-M4	9;5	M	Deaf	Deaf	18	31	80
ASD-M5*	9;0	M	Deaf	Deaf	4	9	92
ASD-M6	9;6	M	Deaf	Deaf	11	4	86
ASD-M7	9;8	M	Deaf	Deaf	16	15	117
ASD-M8	10;2	M	Hearing (CODA)	Deaf	15	14	69
ASD-M9	10;10	M	Deaf	Deaf	8	9	102
ASD-M10	11;0	M	Deaf	Deaf	8	9	100
ASD-F2	11;1	F	Deaf	Deaf	14	18	104
ASD-F3	11;8	F	Deaf	Deaf	15	12	87
ASD-M11	12;7	M	Deaf	Deaf	13	4	96
ASD-F4	14;4	F	Deaf	Deaf	16	10	100

Note. Cut-off for hearing children on the SCQ > 11; cut-off for ASD classification on the ADOS-2 ≥ 8 (Modules 1 and 2), ≥ 7 (Module 3).
***** These children were included in the study despite scoring under cut-off on the ADOS-2 because a clinical psychologist judged these children to fit a clinical picture of ASD.

The Test of Nonverbal Intelligence, Fourth Edition (TONI-4; Brown, Sherbenou, & Johnsen, 2010) was used to estimate general intellectual ability. This test has been validated for use with deaf children and children with ASD, and requires little or no verbal instruction. The TD group scored slightly higher (*M* = 101.6; *SD* = 10.3, range = 86-127) than the ASD group (*M* = 94.6, *SD* = 11.4, range = 69-117); however, this difference was not significant (Mann-Whitney U, *p* =.23, *ns*).

Children were also tested for sign language comprehension level using the ASL Receptive Skills Test (ASL-RST; Enns, Zimmer, Boudreault, Rabu, & Broszeit, 2013). The TD children's mean standard language score was significantly higher (*M* = 108.7, *SD* = 6.3; range 91-116) than the ASD children (*M* = 86, *SD* = 11.3; range 70-104), *p* < .001. This is unsurprising since by

definition ASD entails deficits in language and communication. Thus, the two groups were not matched for language.

2.2. Procedures

The procedures were adapted from the picture identification task described in Lee, et al. (1994), but were modified to be conducted in ASL.

For the first-person task, the experimenter sat across from the child, and took a picture of the child using an iPad. The experimenter then showed the picture to the child and asked in ASL "Who is this?" This question consists of two signs, the sign WHO and an indexical point at the picture. Thus, the question itself contains a sign that resembles the sign pronouns ME and YOU, but directed at the iPad rather than at any person.

The second-person task followed the first-person task. The experimenter showed the child a picture of the experimenter on the iPad and again asked in ASL "Who is this?"

3. Results

Each child's responses to the two tasks are shown in Table 2; the results are summarized in Figure 2. One child with ASD did not respond to either task (ASD-F1); thus, this child was excluded for the purposes of analysis. On the first-person task, 15 of 18 TD children and 5 of 14 ASD children produced the ASL pronoun ME (i.e., they pointed to themselves). There was a significant difference between the TD and ASD groups (Fisher's Exact Test, $p < .01$). The three TD children and nine ASD children who did not produce the pronoun ME each produced their name sign[5] or fingerspelled their English name.

On the second-person task, all 18 TD children and 7 of 14 ASD children produced the ASL pronoun YOU (i.e., they pointed to the experimenter). There was a significant difference between the TD and ASD groups (Fisher's Exact Test, $p = .001$). One TD child and two ASD children produced the experimenter's name sign along with the pronoun. Three children with ASD produced the experimenter's name sign or fingerspelled name only. Three ASD children produced the ASL sign MAN and one ASD child produced the ASL sign DOCTOR.

[5] A sign that functions as a unique name for a person, often invented by Deaf parents.

Table 2. ASD and TD Participants' Responses to Pronoun Elicitation

ASD subjects	Age	1st	2nd	TD subjects	Age	1st	2nd
ASD-M1	5;1	NS	NS, P	TD-F1	6;7	NS, P	P
ASD-M2	5;3	NS	MAN	TD-F2	7;7	P	P
ASD-F1	7;1	*None*	*None*	TD-F3	7;7	NS	P
ASD-M3	8;5	P	P	TD-F4	7;7	P	P
ASD-M4	9;0	P	P	TD-F5	7;7	NS, FS	P
ASD-M5	9;5	FS	MAN	TD-M1	7;9	P	P
ASD-M6	9;6	P	P	TD-F6	8;7	P	P
ASD-M7	9;8	FS	MAN	TD-M2	8;7	P	P
ASD-M8	10;2	NS	NS	TD-M3	8;10	P	P
ASD-M9	10;10	P, NS	P, FS	TD-F7	9;7	NS	P, FS
ASD-M10	11;0	FS	FS	TD-M4	9;7	P	P
ASD-F2	11;1	P	P	TD-M5	9;11	P, FS	P
ASD-F3	11;8	NS	DOCTOR	TD-M6	9;11	P	P
ASD-M11	12;7	NS, FS	P	TD-F8	10;3	NS, P	P
ASD-F4	14;4	NS, FS	FS	TD-F9	11;2	P	P
				TD-F10	11;6	P	P
				TD-M7	12;2	P	P
				TD-M8	12;9	P	P

Legend. NS = name sign. FS = fingerspelling. P = pronoun.

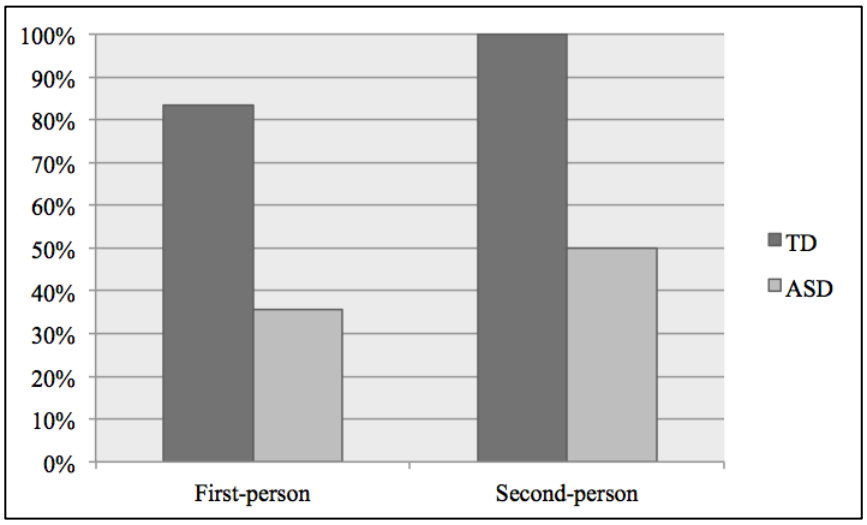

Figure 2. Percentage of TD children and children with ASD who produced pronouns on each task.

We analyzed the relationship between performance on this task and overall receptive language level, mental age, and chronological age. Children were assigned a composite score in which one point was given for production of the first-person pronoun and one point was given for production of the second-person pronoun. A Pearson Product-Moment correlation found that pronoun production was positively correlated with ASL comprehension; $r(30) = .67$, $p < .001$ (Figure 3). Pronoun production was also correlated with non-verbal intelligence; $r(30) = .35$, $p < .05$, but not with age; $r(30) = -0.1$, *ns*.

Children who produced the first person pronoun (N = 20) scored higher on the ASL Receptive Skills Test ($M = 105.3$, $SD = 9.5$) than the 12 children who only produced names ($M = 89.3$, $SD = 14.3$). A one-way ANOVA using performance on the task as a group factor and ASL-RST standard score as the dependent measure found that this difference was significant, $F(1, 30) = 14.53$, $p < .001$.

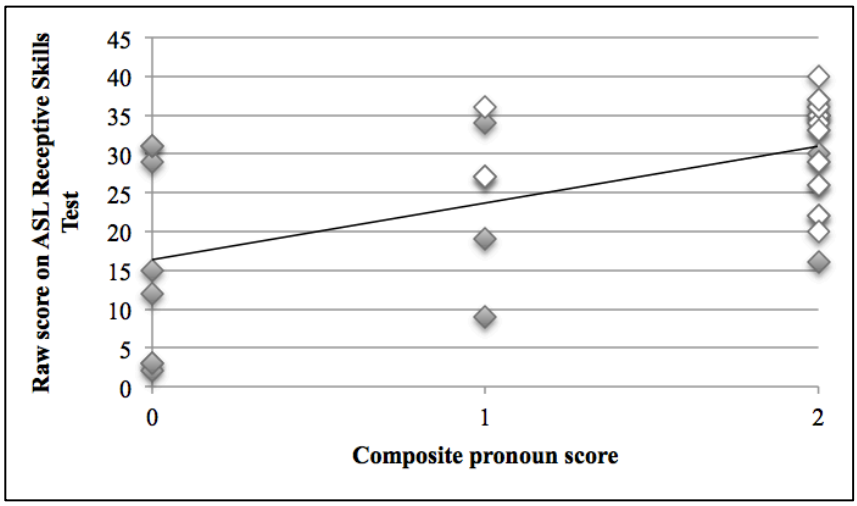

Figure 3. Pronoun production was strongly correlated with raw scores on the ASL Receptive Skills Test, r(30) = .67, p < .01. Grey diamonds indicate participants with ASD; white diamonds indicate TD participants.

4. Discussion

Deaf children with ASD differed significantly from TD deaf children in their performance on the first- and second person pronoun elicitation task. Children with ASD were less likely than TD children to produce a sign pronoun, and instead tended to refer to themselves and the experimenter by sign name. These results are nearly identical to those of prior studies with hearing ASD children on similar tasks (Jordan, 1989; Lee, et al, 1994). Indeed, the percentages of ASD children and control subjects who referred to self by name rather than a pronoun when shown a picture of themselves is surprisingly similar in all three studies (Figure 4). It thus appears that this pattern of behavior is consistent in both deaf and hearing children with ASD (and also occurs in a small percentage of non-ASD children). This is surprising in light of the fact that sign language pronouns are transparent indexical points to self and to other. It is even more striking when one considers that the experimenter's question ("*Who is this?*") contains an indexical point to the picture, thus modeling the very form that the answer should contain.

Both groups produced more pronouns on the second person task than on the first person task; however, this difference was not significant (Fisher's Exact Test, $p = .55$, *ns*). A plausible explanation is that children were less likely to know or remember the experimenter's name, and thus using the pronoun may have been the most available strategy for answering this question. It is also worth noting that on this task, four children with ASD responded with nouns (three with the sign MAN and one with the sign DOCTOR). It is unclear from these responses if the children recognized that the person in the picture was indeed the

experimenter seated in front of them. By contrast, it is clear that all children understood the first-person question and recognized themselves in the picture, responding with a correct answer, be it a pronoun or a sign name.

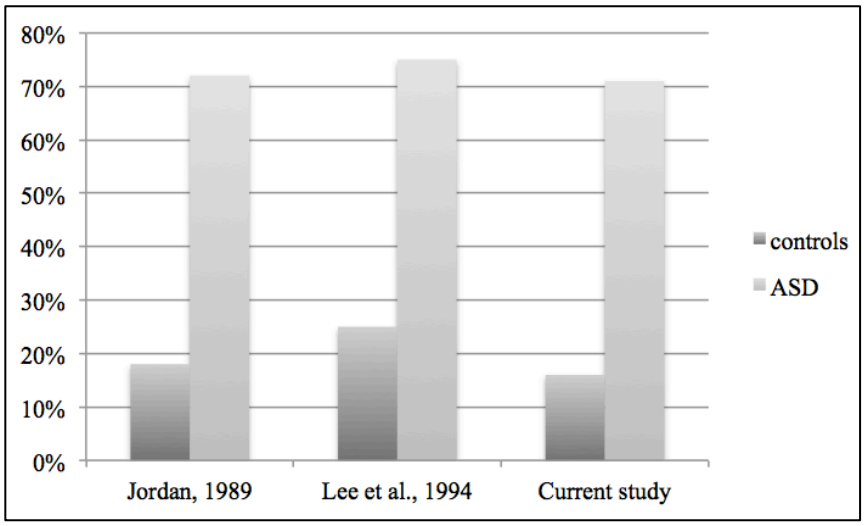

Figure 4. Percentage of controls and participants with ASD in three different studies who answered with their own name, rather than a pronoun, when asked to identify a picture of themselves.

Lee et al. (1994) suggested that the use of names rather than pronouns in identifying pictures may reflect an abnormal self-concept:

> autistic subjects' use of names and not pronouns for photographs might have reflected a relatively detached, almost third-person attitude to these depictions of themselves and the experimenter. In contrast, nonautistic subjects seemed to identify with the photographs of themselves, and to see and care about the photographed person as *me*: The images were infused with the subjects' and experimenter's *sense* of identity as well as formal identity. Autistic subjects seemed not to become engaged nor to confer "subjectivity" in this way (p. 174).

This interpretation resonates with our experience. When shown a picture of themselves, the TD children in our study often reacted to the question "Who is this?" with a smile or laugh and an emphatic point at his/her own body. The children with ASD had no such emotional reaction.

The formation of a representation of oneself – a sense of *me-ness* – is an essential part of normal development. It typically emerges between 15 and 24 months (Lewis & Brooks-Gunn, 1979; Lewis & Ramsay, 2004) and is necessary for the development of social behaviors such as empathy (Bischof-Kohler, 1994),

theory of mind (Lee, et al., 1994), and imitation (Asendorpf, 2002). Research has found that self-representation ability is underdeveloped in some children with ASD (Carmody & Lewis, 2012), as indicated by mirror recognition, other-directed pretense, and personal pronoun use.

5. Limitations and Future Directions

There are several possible alternative explanations for the phenomenon observed. The first is that the use of sign names has been modeled to children with ASD by parents or teachers. It is possible that such input could be responsible for the results, since parents sometimes use names instead of pronouns in their utterances to young children (Smiley, Chang, & Allhoff, 2011). However, sign names are not typically used in direct address in sign discourse; the ASL equivalent of a vocative phrase such as "Sally, do your homework" would almost certainly omit the name, substituting a pronoun or an attention-getter such as the sign HEY instead (Hoza, 2011). It is therefore likely that deaf children have fewer opportunities to see their sign name than hearing children have to hear their spoken name. Still, a study of the sign language input of Deaf parents with their ASD children would help clarify this point.

Similarly, it is unclear to what extent the artificiality of the task may have contributed to the results observed. Future work should examine the spontaneous use of pronouns and sign names by deaf children with ASD in a more naturalistic setting in order to gain a better sense of the frequency with which such children use pronominal forms or name signs.

Another possibility is that the results reflected a general pointing deficit rather than a specific linguistic deficit related to pronouns. Hearing children with ASD point less than TD children, especially to comment or share rather than to request (Baron-Cohen, 1989). A study analyzing the general pointing behavior of deaf children with ASD could help clarify whether the results obtained reflect a specific deficit in personal pronouns or a more general pointing deficit.

6. Conclusion

We have reported the results of a study on an under-examined research population, deaf children with ASD who have been exposed to a sign language from birth by their deaf parents. Research with these children provides an opportunity to study how language deficits in ASD manifest in the visual-gestural modality. Pronouns in sign are qualitatively different from speech in that they transparently pick out their referents. Despite such transparency, deaf children with ASD performed identically to what has been reported in past studies that used a similar task with hearing children. That is, the deaf children tended to produce sign names instead of sign pronouns. This finding helps us understand that it cannot be the arbitrary nature of spoken language pronouns that impedes their use by hearing children with ASD. Rather, a deficit in understanding the self and its relation to others is a plausible explanation.

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