"You're telling me!" The Prevalence and Predictors of Pronoun Reversals in Children with Autism Spectrum Disorders and Typical Development

Letitia R. Naigles[*],

Department of Psychology, 406 Babbidge Road, University of Connecticut, Storrs, CT 06269-1020

Michelle Cheng[1],

Department of Psychology, 406 Babbidge Road, University of Connecticut, Storrs, CT 06269-1020

Nan Xu Rattansone,

Department of Linguistics, 5th floor, Building C5A Room 508, Macquarie University, Balaclava Road, North Ryde, NSW 2109, Australia

Saime Tek,

Department of Psychology, 406 Babbidge Road, University of Connecticut, Storrs, CT 06269-1020

Neha Khetrapal,

Department of Linguistics, 5th floor, Building C5A Room 508, Macquarie University, Balaclava Road, North Ryde, NSW 2109, Australia

Deborah Fein, and

Department of Psychology, 406 Babbidge Road, University of Connecticut, Storrs, CT 06269-1020

Katherine Demuth

Department of Linguistics, 5th floor, Building C5A Room 508, Macquarie University, Balaclava Road, North Ryde, NSW 2109, Australia

Michelle Cheng: msucheng@gmail.com; Nan Xu Rattansone: nan.xu@mq.edu.au; Saime Tek: teksaime@gmail.com; Neha Khetrapal: nkhetrapal@mq.edu.au; Deborah Fein: Deborah.fein@uconn.edu; Katherine Demuth: katherine.demuth@mq.edu.au

Abstract

Social and linguistic explanations have been proposed for pronoun reversals in young typically developing (TD) children and those with autism spectrum disorders (ASD). The current study

[*]Corresponding author: 860-486-4942 (P), 860-486-2760 (F), Letitia.naigles@Uconn.edu.
1Present Address: Department of Psychology, Rutgers University, New Brunswick, NJ

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breaks new ground in investigating *both* explanations, comparing 18 TD toddlers and 15 children with ASD at similar language levels. Spontaneous speech was sampled every four months for six visits. Vocabulary and joint attention were also measured. Both groups produced pronoun reversals at low rates. The ASD group produced somewhat more reversals than the TD group, overall and at multiple visits. In the ASD group, early language and joint attention scores contributed significantly and independently to the incidence of reversal. *Both* linguistic and social factors seem implicated; moreover, reversals seem to occur when children's language and social abilities develop asynchronously. These findings can help clinicians devise both linguistic and social interventions for the relevant children.

Keywords

Language; joint attention; pronoun reversals

Researchers of typical and atypical child development have become increasingly interested in Autism Spectrum Disorders (ASD) over the past 20 years because of this disorder's intriguing constellation of impairments. Social deficits are the most obvious, and indeed a core of the diagnosis (APA, 2014), but combinations of motor, cognitive, and language impairments are also attested (Fein, 2011). One language impairment—consistently reported to be "common" in children with ASD—is the phenomenon of pronoun reversals; i.e., using 'I' for 'you' and/or 'you' for 'I' (e.g., a child saying 'You want some more milk' meaning 'I want some more milk'). This impairment is mentioned in almost every description of language and communication in children with ASD, from the earliest descriptions targeted for clinical audiences (Kanner, 1946; Fay, 1969; Rutter, 1979) to later (Roberts, 1989, 2014; McCann, Peppe, Gibbon, O'Hare & Rutherford, 2008; McGregor, Nunez, Cebula & Gomez, 2008; Paul & Wilson, 2009; Klinger, O'Kelley, & Mussey, 2009; Wetherby, 2006; Tager-Flusberg, Paul & Lord, 2005; Luyster & Lord, 2009), and has emerged recently in textbooks designed for general child development audiences (Levine & Munsch, 2014; Rothus, 2014). However, the origins—and indeed, actual prevalence—of this error in children with ASD, are still unclear.

Successful pronominal reference requires the mastery of a sophisticated grammatical paradigm, involving number ('I' vs. 'we'), person ('I' vs. 'you' vs. 'she'), and case ('I' vs. 'me'), amongst other factors. Reversal errors involve the person component, such that 'I' and 'you' become confused. These errors are attested in TD toddlers' spontaneous speech, albeit at varying rates; pronouns typically emerge around 1.5 years of age and reversals are most common before 2.5 years (Chiat, 1982; Clark, 1978; Charney, 1980; Dale & Crain-Thoreson, 1993; Evans & Demuth, 2012; Loveland & Landry, 1988; Oshima-Takane, 1992; Oshima-Takane. Goodz & Derensky, 1996), and have been hypothesized to derive at least partially, from their linguistic immaturity. That is, before children have worked out the paradigm, personal pronouns may be subject to language processing constraints, and/or used as frozen forms within specific discourse contexts (Dale & Crain-Thoreson, 1993; Lee, et al., 1994). As children develop better language skills, they are able to access the pronoun paradigm with greater facility, and the reversals cease. On this account, a higher rate of pronoun reversals in children with ASD may be attributable to their delayed onset of

language (Tager-Flusberg et al., 1990; Tek, Mesite, Fein & Naigles, 2014), and/or subtle deficits in their use of specific grammatical forms (Eigsti, Bennetto & Dadlani, 2007; Tager-Flusberg, 2006). Across multiple studies, both TD children and children with ASD have been reported to use more pronoun reversals in imitative contexts (Dale & Crain-Thoreson, 1993; Evans & Demuth, 2012; Roberts, 1989; Tager-Flusberg et al., 2005), suggesting that these pronouns were not yet linguistically productive (i.e., integrated into the grammatical system).

Appropriate use of first and second person (personal) pronouns also involves social factors such as perspective-taking, in that speakers use 'I' for self-reference and 'you' for addressee reference, and the actual referents of 'I' and 'you' change with each speaker (Chiat, 1982; Clark, 1978; Hobson, Garcia-Perez & Lee, 2010; Ricard, Girouard, & Gouin-Decarie, 1999). Because children with ASD frequently have difficulties with perspective-taking (or deixis) (Loveland, 1984), it has often been proposed that the use of pronoun reversals in this population is attributable to their social impairments. However, the pervasiveness of these social impairments in children with ASD sometimes seems at odds with actual pronoun reversal rates in this population. That is, Tager-Flusberg's (1994) analysis of the conversations of six boys with ASD revealed a pronoun reversal rate of about 13%. Tager-Flusberg reported that pronoun reversals were more frequent in these boys than in a language-matched group of children with Down syndrome, but did not present a comparison with typically developing (TD) children. A recent investigation of school-age deaf children with ASD, using ASL as their primary language, reported no reversals at all among the children who used pronouns (Shield, Meier & Tager-Flusberg, 2015). While elicited production tasks have found that school-age children with ASD produce more pronoun reversals than mental-age-matched TD children, researchers have also reported that the most common error in the ASD group was pronoun avoidance, i.e., using proper names instead. Furthermore, comprehension tasks with this age group have yielded close-to-ceiling performance in differentiating 'you' and 'me' when asked (Jordan, 1989; Lee, Hobson & Chiat, 1994). In sum, the 'common-ness' of pronoun reversals in the language of children with ASD cannot be assumed, either in absolute terms or in relation to TD children.

A recent case study of two toddlers suggests a somewhat different interpretation on how both social and linguistic factors may be operating in the incidence and characteristics of pronoun reversal (Evans & Demuth, 2012). These toddlers were precocious, beginning word production at 11 months and personal pronoun use at 13–16 months. Notably, both children reversed first and second person pronouns at much higher rates than usually reported for TD children (80–95%, cf. Dale & Crain-Thoreson, 1993), and one was diagnosed with Asperger's Syndrome at 5 years of age. The authors propose that the children's linguistic precocity and high pronoun reversal rate were connected, such that they had begun to acquire the pronominal paradigm before their social capacities grasped its deictic (perspective-taking) nature. On this account, then, more frequent pronoun reversals in children with ASD may be attributed to an asynchrony between their levels of language and social development.

What no one has yet studied is how linguistic and social factors might jointly contribute to pronoun reversal in children with ASD. The current paper, then, has three goals. First, we

assess the prevalence of pronoun reversals in a larger sample of children with ASD ($n = 15$) than has previously been studied, and compare this prevalence with that of 18 TD toddlers at similar language levels. Second, we assess the children's levels of social impairment in relation to their general language levels. An early index of these social impairments is the well-documented difficulty that children with ASD have with initiating and sustaining joint attention (JA) during dyadic interactions (Luyster, Kadlec, Carter & Tager-Flusbert, 2008; Mundy, Sigman & Kasari, 1990; Paul, Chawarska, Cicchetti & Volkmar, 2008; Rollins & Snow, 1998; Siller & Sigman, 2008). We investigate whether the proposed conditions for pronoun reversal—a developmental asynchrony between social and language development— are found in our sample, such that children with ASD who are matched with TD children on language nonetheless fall below the TD children's levels of JA. Third, we directly assess the relative contributions of children's social/perspective taking (i.e., JA) and language skills to their early vs. later incidence of pronoun reversals.

Method

Participants

The participants for this study included 18 TD children and 15 children diagnosed with ASD, which was confirmed with the Autism Diagnostic Observation Schedule (ADOS; Lord, Risi, Lambrecht, Cook, Leventhal et al., 2000). The children with ASD were recruited via service providers in the northeastern U.S.; all were verbal and were receiving at least five hours of Applied Behavioral Analysis therapy per week (ABA; Lovaas, 1987). The participants were visited every 4 months for 6 visits; at visit 1, the TD children averaged 20.5 months (SD = 1.73) and the children with ASD averaged 31.64 months (SD = 4.59). All the children were participants in a larger longitudinal study whose goal was to compare processes of language development in TD children and children with ASD, who were therefore matched on language at the onset of the study. Because of the well-known language delays of children with ASD, it was necessary to recruit younger TD children to accomplish the language matching (e.g., Tek, Jaffery, Fein & Naigles, 2008; Naigles & Fein, 2015). Some children with ASD in the larger study were not included in the current study because they did not produce pronouns at any visit.

Standardized test and demographic data for both groups are presented in Table 1. The two groups did not differ significantly on their vocabulary size nor on their raw receptive language scores at visit 1; however, p-values were not sufficiently large to justify claiming the groups were matched on language (Mervis & Klein-Tasman, 2004). Moreover, probably because the ASD group was one year older, their raw expressive language and cognitive scores were higher than those of the TD group. Group comparisons will therefore also include subsets whose scores are matched. As expected, Vineland scores generally differed by group at both visit 1 and visit 6; however, raw scores on the Mullen did not differ by group at visit 6.

Assessment Contexts

Standardized tests—The ADOS (Lord et al., 2000) was administered at visits 1 and 5 to assess ASD status. We also administered the Vineland Adaptive Behavior Scales, 2nd

Edition (Vineland II; Sparrow, Cicchetti, & Balla, 2005) at each visit to evaluate children's communication, socialization, daily living skills, and motor skills. The Mullen Scales of Early Learning (Mullen, 1994), measuring development in visual reception, fine motor skills, receptive language and expressive language, were administered at Visits 1 and 6. The CDI (Fenson et al., 1994) measured language-production abilities via parental report; the Words & Gestures version was used at visit 1.

Mother-child play session—At each visit, mother and child engaged in a 30-minute play session, half of which was semi-structured and based on the Screening Tool for Autism in Two-Year-Olds (STAT; Stone, Coonrod, & Ousley, 2000). Mothers were handed cards that prompted them to play with their child with items provided by the researcher. Thus, at least half of each session followed the same protocol and could enable the same type(s) of pronoun use (e.g., imitative, requesting, etc.). The final portion of the session was free play. The play session was recorded for later transcribing and JA coding.

Procedure

Each visit began with scheduled administration of standardized and/or psycholinguistic tests to the child (e.g., Goodwin et al., 2012; Naigles & Tovar, 2012). The mother and child then engaged in the play session, after which the Vineland was administered.

Coding

Pronoun and Speech Coding and Analysis—The play sessions were transcribed in CHAT (MacWhinney, 1995), and MLUs were calculated for each child at each visit (see Table 2). We coded the utterances with personal pronouns for the perspective of each pronoun (first, second, or third person) and the pronoun referent. Only singular pronouns were coded as these are the most frequently used in dyadic conversation, and therefore formed the bulk of the data; they are also the most commonly reversed. Following Evans and Demuth (2012), this included first person (*I, me, my, mine, myself),* second person (*you, your, yours,* and *yourself),* and third person (*he/she, him/her*, and *his/hers)*. Contracted forms were also included (e.g., *I'm, I'll, I've, you're, you've, you'll, he's/she's, he'd/she'd, he'll/she'll*).

Pronoun reversals included those using the first person instead of the second person (e.g., "I bring the milk" when the child is requesting his mother to bring the milk), or using the second person instead of the first person (e.g., "You drink the milk" when the child is describing his own action of drinking the milk). The context of the utterance was used to determine if a reversal occurred. Pronouns were coded as 'correct', 'reversed', or 'ambiguous.' A total of 4.5% of 1st and 2nd person pronouns produced by the TD group had ambiguous referents, as were 12.9% of those produced by the ASD group; these were not analyzed further. Note that ambiguity of pronominal reference is a natural artifact of discourse interactions, and that these percentages of ambiguous items are lower than that reported in Evans and Demuth (2012:174) using similar procedures for the two children in their study (17% and 22%).

The discourse context of the pronoun was also coded; the key distinction investigated here was between those reversals that were imitative (i.e., statements/observations that could reflect comments made by adults within the past five turns; see (1) below) vs. those that were not (e.g., child-initiated statements and questions; see (2) below; also Evans and Demuth (2012) for elaboration on the coding conventions).

1.   MOT: I'm gonna win.

     MOT: I win!

     CHI: I(= you) win.

2.   MOT: Oh, I know what I'm gonna do.

     MOT: I'm gonna pretend

     CHI: Those are what I(= you) want. [*Child hands the mother the instructional cards.*]

     MOT: Okay, I'll take those.

Two coders, blind to the diagnostic status of the child, performed the initial coding. Each coded both TD children and children with ASD. Two additional assistants recoded six children (three TD, three with ASD) for reliability. Pearson's rs between initial and reliability coders averaged .883(range .761 – .965; $p < .05$).

Pronoun measures included (a) the number of pronouns produced, comprising only the count of pronouns with unambiguous referents and (b) the number of reversals, which was calculated by summing those reversals with a definitive referent switch. Because the number of pronouns varied according to the amount of speech produced, we also calculated (c) the percentage of reversals, which was calculated with respect to the total number of unambiguous pronouns in a given visit.

Joint Attention Coding and Analysis—The joint attention variables were coded frame by frame from the videos of the parent-child interactions at visits 1–3, using the software program ELAN (http://www.lat-mpi.eu/tools/elan/). Both response to joint attention (RJA) and initiation of joint attention (IJA) were coded. The coding scheme for RJA and IJA was adapted from Roos, McDuffie, Weismer, and Gernsbacher (2008), which was based on the Early Social Communication Scale (ESCS) (Mundy et al, 2006). RJA behaviors included children's turning or gaze switching as a response to parents' gestures or verbal directives, which were intended to shift the child's attention to the object that the parent was attending to. IJA behaviors included the child's making eye contact with the parent while manipulating/touching an object, alternating gaze between the object and the adult, pointing to an object, holding an object and showing it to the parent, or asking about an object (e.g., "What's this?"). Eye contact had to accompany both pointing and showing behaviors to ensure that the child was initiating JA to share interest with the parent rather than independently exploring the objects (Roos et al., 2008). One researcher coded all of the data for JA; three undergraduates then recoded 10% of the data for reliability ($n = 14$ children, randomly selected across visits). The reliability coders were blind to the children's diagnosis and to the study hypotheses. The Pearson r for correlations among measures coded for

reliability ranged from .719 ($p < .01$) to .920 ($p < .001$). See Tek (2010; Tek, Fein, & Naigles, 2011) for more details. Four JA measures were calculated at each visit: the number of RJA and IJA episodes (Kasari et al., 2008; McDuffie et al., 2005) and the total durations of RJA and IJA episodes, which were calculated by summing the duration of each RJA and IJA episode within each visit.

Analysis—Personal pronoun production varied quite a bit across visits in both groups, with the mean number of pronouns ranging from 3 to 70 in the TD group and from 12 to 36 in the ASD group. Therefore, for general linguistic reasons (i.e., language growth is not expected to be linear across 4-month spans in either TD or ASD development (Bates, Dale & Thal, 1995; Tek et al., 2014), pronoun-specific reasons (i.e., pronoun reversals have been found to be more frequent in TD children under 2.5 years of age) and statistical reasons (i.e., smaller numbers of pronouns and reversals at any given visit decrease the reliability of measurement and the power to discern group differences; Cohen, 1988), we decided to bin the measures across the early (visit 1–visit 3, TD age range of 20–28 months) and later (visit 4–visit 6, TD age range of 32–40 months) visits. For consistency, the JA measures were also binned across the first three visits.

Results

The means and standard deviations for each pronoun measure are presented in Table 2 for both groups. Number of pronouns increased with age for both groups, and was subjected to a 2-way repeated measures ANOVA with group (TD, ASD) as the between-subjects variable and visit (early, late) as the within-subjects variable. A significant main effect of visit was found [F(1,30) = 74.790, $p < .001$, $\eta_p^2 = .714$] with children producing fewer pronouns at earlier visits than later visits. No main effect for group was found but a significant visit by group interaction emerged [F(1,30) = 21.270, $p < .001$, $\eta_p^2 = .415$]. This suggests that both groups produced similar numbers of pronouns in earlier visits, but TD children produced more pronouns than children with ASD at later visits.

Children in both groups produced few reversals overall (see Table 2 and Figure 1). A three-way mixed-plot ANOVA was conducted with the percent reversals measure, with group (TD vs. ASD) as the between-subjects variable, and context (imitative vs. non-imitative) and visits (early vs. late) as the within-subjects variables. A significant main effect was found for group, [$F(1,31) = 13.764$, $p=.001$, $\eta_p^2=.307$], indicating that children with ASD produced a higher percent of pronoun reversals overall than TD children. Although Figure 2 shows that the ASD group produced more reversals in imitative rather than non-imitative contexts, neither the main effect of context nor any interactions with context reached significance. No main effects or interactions with visit were found.

Because the groups as a whole were not matched on expressive language at visit 1, we also conducted the group comparisons with matched subsets. Specifically, at Visit 1 eleven children in each group could be matched on the CDI 'understands and says' with scores within 20 words ($p > .8$). Moreover, at Visits 2, 3, and 4, 12 children in each group could be matched on MLU within 0.5 units ($ps > .8$). With just these matched subgroups, effect sizes for the TD-ASD group comparisons were medium to large ($Ds = .47$ to .73) for early-visit

percent reversals, and large ($Ds > .99$) for later-visit percent reversals; the ASD group consistently produced more reversals.[1]

Another way to compare pronoun reversals examines their recurrence across individual visits. The majority of TD children produced pronoun reversals at only one visit ($n = 11$), and only five children produced pronoun reversals at two visits. In contrast, a plurality of children with ASD produced pronoun reversals at three visits (n = 7), and one child did so at four visits. The distribution of children producing reversals at one vs. multiple visits therefore varied significantly by group [$X^2(4) = 13.24$, $p = .01$]; see Figure 2.

Table 3 presents the JA measures for the two groups, also combined across the three early visits. The groups differed in the number of IJA episodes they engaged in, as well as in the total duration of the IJA and RJA episodes; as expected, the TD group consistently engaged in more and longer episodes of JA. When only the language-matched subsets were compared, large effect sizes were again found, with RJA duration, IJA episodes, and IJA duration being significantly greater in the TD subsets than their MLU- or CDI-matched ASD subsets ($Ds > .90$). Because the 'number of RJA and IJA episodes' measures included zeros from a number of the children with ASD, nonparametric tests were also performed; these yielded the same effects as the parametric tests.

Finally, we investigated the extent to which social and language factors at the early visits contributed independently to the children's propensity to produce pronoun reversals at the early and later visits, conducting a total of eight hierarchical regression analyses. Given that the children's degree of engaging in JA and their rates of pronoun reversal varied across groups, we carried out all regressions for each group separately. Moreover, given that the variance of the pronoun reversals measures varied substantially by context (Table 2), we carried out regressions separately with each pronoun reversal measure (Early Imitative, Early Non-Imitative, Late Imitative, Late Non-Imitative). For each regression, we first entered the children's Mullen VR scores to control for general cognitive level. Then we entered the children's language (CDI at visit 1) and social (IJA, RJA) scores at the early visits as predictors of (a) their percent of reversals at the early visits, and (b) their percent of reversals at the later visits. The results are shown in Table 4. For the early predictors-early reversals comparison, no significant models were obtained for the TD group; however, one significant model was obtained for the children with ASD, using the Early Imitative Reversals measure. The model in which both CDI and IJA duration scores were included was significant [$F(3,11) = 4.537$, $p = .027$], with the language scores accounting for a significant amount of the variance in pronoun reversals, and the social scores showing a strong trend in the same direction (i.e., negative). No other dependent variables yielded significant early predictors-early reversals models. For the early predictors-late reversals comparison, none of the models was significant for either group.[2]

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[1]Because these analyses involved multiple comparisons with the same data, we report effect sizes but not p-values.
[2]Additional models with MLU and or ADOS scores as predictors were not significant for either group.

Discussion

This study investigated the prevalence and predictors of children's pronoun reversals during interactions with their caregivers over a span of 2 years. There were three major findings: First, pronoun reversal proportions (out of all pronouns produced) were quite low at all visits for both TD and ASD groups. The highest mean prevalence recorded was 7.07% for the ASD group at visit 1. Second, three significant group effects emerged: The ASD group's proportion of pronoun reversals was significantly higher than the TD group's, an effect that held even when stringently language-matched subsets of the groups were compared. Moreover, children in the ASD group were more likely to produce pronoun reversals across multiple visits, whereas most TD children produced pronoun reversals at only one visit. Illustrating an asynchrony of language and social development, higher JA scores were observed in the TD than ASD group even with the language-matched subsets, suggesting delayed social compared to linguistic development in the ASD group. Third, both language and social abilities were implicated in producing pronoun reversals in the ASD group, such that children with ASD who had higher vocabulary and JA scores produced fewer pronoun reversals in imitative contexts. In what follows, we discuss these findings with respect to our major research questions.

Our first question concerned the prevalence of pronoun reversals both within and across participant groups, and our data suggest that these are not frequent at either early or later visits for either group and/or individuals. It is important to emphasize that these children were well within the MLU levels generally reported for children who reverse pronouns (Chiat, 1982; Loveland & Landry, 1988; Dale & Crain-Thoreson, 1993). In fact, the incidence of pronoun reversals reached over 25% at any given visit for only one TD child and three children with ASD. These findings are consistent the empirical literature (e.g., Chiat, 1982; Dale & Crain-Thoreson, 1993; Loveland & Landry, 1988; Shield et al., 2015; Tager-Flusberg, 1994) but inconsistent with some summaries and reviews, indicating that pronoun reversals should not be referred to as 'common' for either group of children. They are, in fact, fairly rare, even among children with ASD. However, the incidence of pronoun reversals was higher in the ASD group than the TD group, and more children with ASD produced reversals across multiple visits. Although the effect of context did not reach significance, the numerically greater proportion of reversals that were imitative in the ASD group supports the claim that many of the "I" for "you" reversals in this group were echolalic (see also Bartak & Rutter, 1974; Roberts, 1989, 2014; Tager-Flusberg et al., 2005).

These effects indicate that mastering the deictic aspects of pronominal reference is more of a challenge for children with ASD. The regressions suggest where the challenge lies: the significant predictors of the children's pronoun reversals were both language-related *and* social-related. That is, the ASD group's pronoun reversals in imitative contexts at the early visits were predicted by their CDI 'understands and says' scores at Visit 1, in that children with higher language scores produced fewer reversals. The children's total duration of engaging in IJA episodes also contributed independently, albeit at a lower level of significance, such that children who were able to sustain JA episodes that they themselves initiated *also* produced fewer reversals. Reversed pronouns may derive from linguistic immaturity because if early pronouns are represented as frozen or situation-specific forms

rather than fully integrated into the grammatical system, then the correct mapping of pronoun to reference may be missed. Moreover, children may sometimes imitate pronouns just because they have not fully acquired these forms, and so the imitations end up as reversals.

Reversed pronouns may derive from social immaturity because delayed development of a separate sense of self and social perspective-taking makes the changing referents of personal pronouns confusing: How to understand that "I" and "you" change reference according to who is the speaker and who the addressee? Perhaps the ability to initiate and maintain JA episodes directly enables or manifests children's separate sense of self (i.e., because they must deliberately look at their parent and designate, via speech, gesture, and/or eye gaze, a target of attention; Lee et al., 1994; Loveland & Landry, 1984). It is also possible that the connection between IJA and fewer pronoun reversals was more indirect, such that the ability to initiate and maintain JA episodes facilitated fewer imitations, which in turn minimized pronoun reversals. The current data are more in line with this second interpretation, because most of the reversals in the ASD group occurred in imitative contexts, consistent with Evans and Demuth's (2012) report for the child in their study later diagnosed with Asperger's syndrome. Such imitations (e.g., (1) above) are consistent with the echolalic speech frequently reported for children with ASD (Tager-Flusberg et al., 2005); one direction for future research might be to investigate whether the decline in pronoun reversals observed between early and later visits coincided with an overall decline in echolalia.

It is not immediately clear whether these predictors of pronoun reversal in the children with ASD also extend to TD children; we were unable to report any significant predictors of pronoun reversal in our TD children, probably because the overall incidence of these—and thus sample variance—was so low. In this, our TD children differed from those studied by Evans and Demuth (2012). However, the asynchronous timing of social and language development manifested by our ASD group was consistent with Evans and Demuth's proposal for what might underlie heightened rates of pronoun reversal. Recall that Evans and Demuth (2012) suggested that the precocious children in their study were using pronouns at too early a stage of development (starting at 13–16 months), before they completely understood the deictic nature of pronoun use. TD children who are developing language more slowly may therefore have a better social and linguistic understanding of the function of pronouns by the time they began to use them, and so not reverse very frequently. We suggest that the children with ASD in the current study fit this pattern as well. That is, even though they were generally delayed in language development, they were even more delayed in social development. Critically, the children with ASD engaged in fewer IJA episodes and shorter JA episodes overall than their CDI- or MLU-matched TD peers. This pattern has also been observed in young children with ASD, who produce significantly fewer deictic gestures than their language-matched TD peers (Özçalışkan, Adamson & Dimitrova, 2015) and in some school-age children with ASD, who achieve the structural language levels of their TD age-mates yet are still developmentally immature in pragmatic language use (Williams, Botting & Boucher, 2008; Tager-Flusberg, 2006). We suggest, then, that the children with ASD in the current study displayed the same language-ahead-of-social development pattern as precocious TD children, and that this asynchronous pattern contributed to their higher incidence of pronoun reversal.

These findings may have a number of practical implications. For example, our findings show that occasional occurrences of pronoun reversals might not indicate a specific pronoun impairment; instead, therapists might want to take these occurrences as signs of delayed grammatical and social development. In this case, assessing which aspects of social and grammatical development are most delayed might indicate specific targets for intervention. pronoun reversals might only need to be targeted with behavioral teaching or speech therapy in cases where they are prevalent. The relationship of joint attention to pronoun reversals certainly supports promoting these behaviors in early intervention, as joint attention is so fundamental to more complex social interaction, and since delayed or impaired joint attention is so fundamental to autism. Finally, we reported a tendency for pronoun reversals to occur more in imitative contexts; however, imitation is a fundamental prerequisite for children to take advantage of many learning opportunities, and a key skill that children need, especially children with ASD, who may show delayed imitation. Therefore, one would not want to suggest reducing opportunities for imitative learning.

Limitations of this study are both participant-related and situation-related. For example, we only included children with ASD who were verbal and produced pronouns by the sixth visit. Since these children were therefore higher functioning, the findings may not generalize to all children with ASD, or to those who began to produce pronouns later. Future studies may extend our questions to lower functioning children with ASD via comprehension tasks, as performed by Lee and Hobson (1994) and Loveland (1984). Moreover, the situations in our study also involved interactions between only mother and child, thereby restricting the child to using mainly first and second person singular pronouns. Future studies might also examine the use of plural and third person pronouns. For example, a study may observe the distinction between "we," a collective and therefore more "social" pronoun, versus "they," a pronoun that separates the child from their conversational partners, in children with ASD and TD children (e.g., Hobson, Lee & Hobson, 2010).

In conclusion, this study has revealed that pronoun reversals in children's spontaneous speech are generally of very low frequency (i.e., fewer than 10% of pronouns produced). Within this small range, children with ASD nonetheless produced reversals more frequently overall, and individually during more visits, than TD children. Regression analyses suggested that in the ASD group, pronoun reversals are strongly linked to linguistic immaturity, and somewhat less strongly—but independently—to social immaturity in the development of joint attention. Moreover, the heightened incidence of pronoun reversals in children with ASD may be also—like precocious TD children—attributable to the asynchronous development of their language and social abilities.

Acknowledgments

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Highlights

- The rate of pronoun reversal in children with ASD is under 10%.

- Children with ASD nonetheless produced more reversals than TD children.

- Higher early language and joint attention scores predicted fewer reversals.

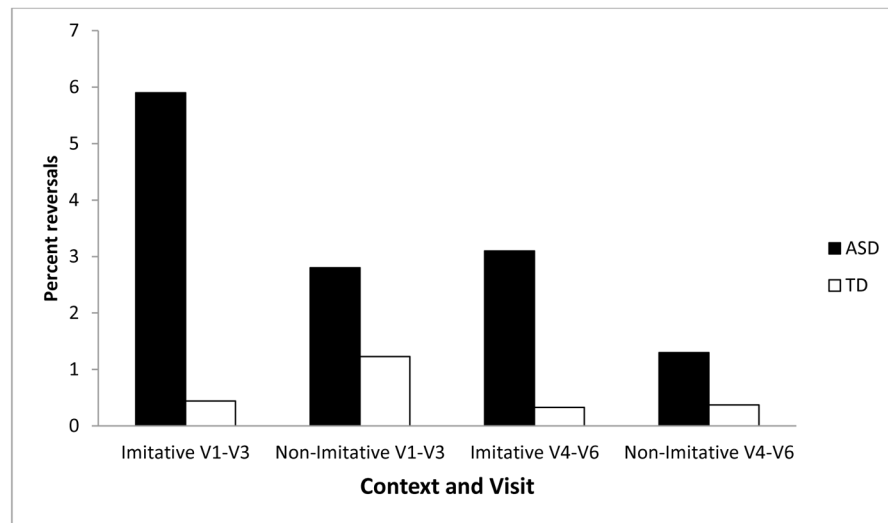- Reversals occur when language and social abilities develop asynchronously.

Figure 1.
Percentage of pronouns produced that were reversed, by context (imitative or not), group (TD, ASD), and visit (early (V1–V3) and late (V4–V6)).
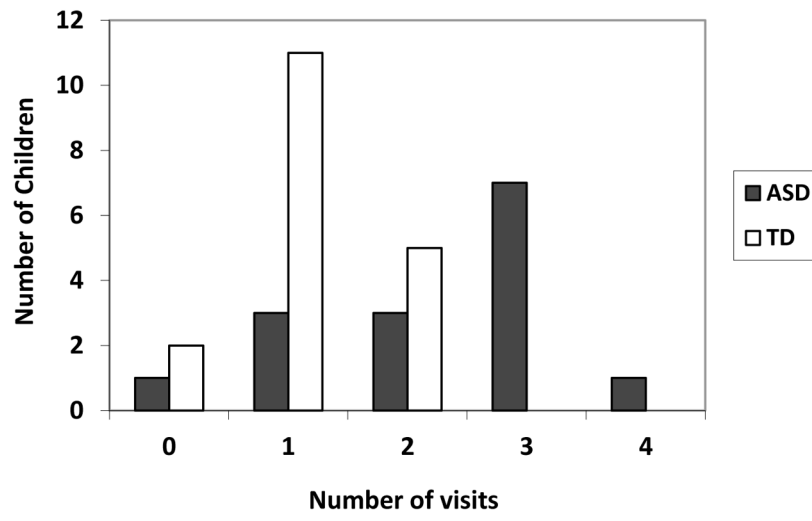
Children producing pronoun reversals

Figure 2.
Number of children who produced pronoun reversals in multiple visits

Table 1

Comparison of TD and ASD Groups, Demographics and Standardized Tests

		TD	ASD	t	p	Cohen's d
Gender		16 boys, 2 girls	15 boys			
Age V1	M (SD)	1.67 (0.1)	2.58 (0.3)			
ADOS V1	M (SD)	0.11 (0.32)	11.93 (2.60)	−17.47	<.001	−6.704
	Range[a]	0–1	7–15			
ADOS V5	M (SD)	0	11.5			
	Range	0	4–16			
V1 Mullen Raw Scores M (SD)						
	Receptive Language	25.33 (2.93)	26.26 (7.81)	ns	>.400	−0.472
	Expressive Language	19.44 (4.46)	23.26 (5.76)	2.11	.04	−1.275
	Visual Reception	26.11 (3.23)	29.93 (4.71)	2.75	.01	−1.760
V1 Vineland Standard Scores						
	Communication	103.8 (8.16)	87.67 (13.98)	3.95	.001	2.941
	Socialization	106.5 (6.98)	77.26 (7.86)	8.84	<.001	6.234
V1 CDI (Infant Version)						
	Word Production[b]	118.8 (114.4)	166.93 (108.49)	1.23	>.200	−0.626
V6 Mullen Raw Scores						
	Expressive Language	39.72 (5.48)	36.6 (8.67)	ns		0.439
	Receptive Language	39.0 (3.97)	37.06 (9.36)	ns		0.279
	Visual Reception	44.5 (2.57)	42.4 (7.15)	ns		0.406
V6 Vineland Standard Scores						
	Communication	103.5 (9.87)	96.4 (11.33)	1.92	.064	0.673
	Socialization	98.38 (6.66)	81.33 (3.33)	4.72	<.001	3.148

[a]. Autism Spectrum = 7+; Autism = 12+

[b]. Number of words produced out of a possible 396.

Table 2

Age, MLU and Pronoun measures (M, SD) by group and visit

Measure	TD group		ASD group	
	Visits 1–3	Visits 4–6	Visits 1–3	Visits 4–6
Age in months	24.65 (1.77)	36.75 (1.74)	35.90 (4.65)	47.83 (4.61)
MLU	1.40 (.25)	3.09 (.43)	1.75 (.73)	2.58 (.77)
Number of Pronouns	55.06 (47.75)	199.61 (78.63)	71.6 (79.06)	115.27 (103.42)
Number of Pronoun Reversals	0.88 (1.07)	1.16 (1.20)	1.8 (1.47)	3.13 (2.79)
Percent of Pronoun Reversals	1.67 (2.26)	0.68 (.84)	6.42 (10.06)	4.15 (4.64)
Percent of Pronoun Reversals, Imitative	0.40(1.32)	0.32 (.40)	5.90 (12.90)	3.10 (3.60)
Percent Pronoun Reversals, Non-Imitative	1.23(2.10)	0.37 (.50)	2.79 (5.60)	1.35 (2.12)

Table 3

Joint Attention Measures (Mean, SD) by Group, Early visits

	TD	ASD	*t*	*p*
RJA Episodes	15.55	13.31	1.65	>.100
	(3.66)	(4.27)		
RJA Duration[a]	1138.95	887.00	2.57	.018
	(167.06)	(347.03)		
IJA Episodes	2.65	1.38	2.668	.012
	(1.43)	(1.29)		
IJA Duration[b]	117.02	62.21	2.533	.017
	(66.62)	(55.60)		

[a]Number of seconds engaged in JA episodes in which child responded to parent's bid

[b]Number of seconds engaged in JA episodes in which parent responded to child's bid.

Table 4

Predicting Early Imitative Reversals in the ASD group

Final Model	B	$SE\ (B)$	β	R^2
Mullen VR	.006	.002	.711	
V1 CDI	−.001	.000	−.622	.369[*]
Early IJA	−.001	.001	−.487	.178[+]

[*]$p < .05$

[+]$p < .10$