Caregiver-Reported Pronominal Errors Made by Children with and without Autism Spectrum Disorder

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1. Introduction

Autism spectrum disorder (ASD) is defined by social-communication impairments affecting daily functioning, along with other behaviors, i.e., restricted, fixed interests, repetitive behaviors, and/or sensory-processing issues (American Psychiatric Association 2013). The current diagnostic criteria do not include impaired language, but certain aspects of language are notably difficult for this population. One of these aspects is pronoun use.

1.1. Pronouns in ASD

Pronominal errors in ASD were described as early as 1943 by Kanner, who noted confusion between first- and second-person pronominal forms. For example, one child asked his mother to take off his shoe by saying "Pull off your shoe" instead of "Pull off my shoe," and another was described by her father as having referred to herself as *you*, while referring to her parents as *I* (Kanner 1943).

This incorrect use of second-person pronouns to refer to oneself and first-person pronouns to refer to others has been labeled a pronoun "reversal error", and it has been argued to be a special characteristic of ASD (Bartak, Rutter & Cox 1975; Fay 1979; Lee & Hobson 1994; Tager-Flusberg, Paul & Lord 2005; Seung 2007). However, typically-developing (TD) children also make reversal errors (Chiat, 1982; Naigles et al., 2016). Thus, reversal errors are not unique to ASD, but they may be more frequent (Naigles et al. 2016) and/or developmentally persistent (Overweg, Hartman & Hendriks 2018) in this population. The idea that reversal errors are common in ASD is reflected in clinical practice; speech-language pathologists who work with this population often target pronoun reversals (e.g., Barbera, 2018).

Some reversal errors in ASD may be attributable to echolalia, or the rote repetition of language previously heard, but some children with ASD create novel

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utterances containing reversed pronouns (Evans & Demuth 2012), suggesting that reversals are not always echoed. Moreover, children also make reversal errors in comprehension (Clancy et al. 2019). This suggests that pronoun reversals reflect fundamental difficulties in understanding that first- and second-person pronouns depend on a referent's role in conversation. And although much of the research on pronoun use in ASD has focused on first- and second-person pronouns, studies on narrative production also point to problems with third-person pronouns (see Baixauli, Colomer, Roselló, and Miranda, 2016, for review), including reduced usage (Arnold, Bennetto & Diehl 2009; Hobson, Lee & Hobson 2010; Novogrodsky 2013) and/or ambiguous use, where the pronoun's referent is unclear to the listener (Novogrodsky 2013; Novogrodsky & Edelson 2016; Malkin, Abbot-Smith & Williams 2018).

Researchers seeking to explain these pervasive differences in pronoun use have implicated broader deficits including impaired theory of mind and perspective-taking (Baron-Cohen, Leslie & Frith 1985; Tager-Flusberg 1999), reduced joint attention (Kelty-Stephen, Fein & Naigles 2020), atypical self-other awareness and differentiation (Hobson & Meyer 2005; Lyons & Fitzgerald 2013; Shield, Meier & Tager-Flusberg 2015), or even difficulties in working memory and other skills required for keeping track of referents in discourse (Kuijper, Hartman & Hendriks 2015). It is possible that there are different explanations for different types of pronoun errors: for example, children with ASD struggle to use first-/second-person pronouns appropriately because of difficulties with perspective-taking and third-person pronouns because of pragmatic impairments. But it is also possible that these observations about pronoun use fit into a broader language pattern among children with ASD.

1.2. Caregiver report

The current study uses a different method from prior studies for studying children's pronoun use: an online report completed by caregivers. Caregiver report is a recommended practice for measuring early language development in ASD (Tager-Flusberg et al. 2009; Nevill et al. 2019) and correlates with other language measures for children with and without ASD, especially when measuring language production (as compared to comprehension) (Charman 2004; Luyster et al. 2008; Ebert 2017). Caregiver report offers many advantages in the study of pronoun use. First, it allows for an examination of children's use (and non-use) of the more than 20 personal pronouns in English, when it would be difficult to design an experimental paradigm to capture the child's production of all of them. Second, it allows for a large sample (in this paper, we report results from 280 children). Finally, it provides a picture of how the child produces these pronouns at home rather than in a laboratory setting). While this latter feature is also true of a corpus study, it can be difficult for researchers to identify whether children are using a particular pronoun in the correct context (for example, identifying a reversal error) because the form of the pronoun is often correct, and a deep understanding of the context and the child's intent are important for noting

errors. Caregivers, however, who have access both to context and to the child's full repertoire, may be more likely to notice errors in usage.

1.3. Current study

In the current study, we examined how young children with ASD use all the personal pronouns in English—how many of these pronouns they use and how many they use correctly—and to compare these findings to TD children of the same language level. We hypothesized, due to language and social communication difficulties, that children with ASD would be significantly less accurate than TD peers in pronoun use overall.

2. Methods

2.1. Participants

Caregivers of children with and without ASD were recruited through a variety of means, including social media, word-of-mouth, and parenting groups. Some caregivers of children with ASD were recruited with the assistance of the Interactive Autism Network (IAN) Research Database at the Kennedy Krieger Institute, Baltimore. To qualify for participation, individuals had to identify as a primary caregiver of a child under the age of six, for whom English is the primary language spoken at home, and who uses at least five spoken words.

Children were included in the TD group when their caregiver indicated that they had never been diagnosed with ASD, nor with any other psychiatric, language or intellectual disability. When caregivers reported their child had been diagnosed with ASD (and provided the child's age when they received the diagnosis), that child was included in the ASD group. Of the children in the ASD group, 15% had at some point been diagnosed ADHD/ADD, thirty-two percent with a language impairment, and 13% with intellectual disability.[1]

In total, 153 caregivers of children with ASD and 127 caregivers of TD children participated (see Table 1 for demographic information). Children in the ASD group were significantly older (ASD $M = 52$ months; TD $M = 34$ months, $p < 0.001$). There was a higher proportion of males in the ASD group, and this difference approached significance ($\chi^2 = 3.002$, $p = 0.083$); this is unsurprising given that more males than females are diagnosed with ASD (Center for Disease Control and Prevention 2016). There was a significant difference between groups in caregivers' highest level of education, with higher levels of parent education in the TD group ($\chi^2 = 10.134$, $p = 0.017$).

Caregivers reported on their child's overall expressive language level by classifying their child's primary utterance type as either single words, phrases, or full sentences. They also provided example utterances of their child's speech, which we categorized ourselves; our categorizations accorded with those provided

[1] Because these latter two factors likely affect rates of pronoun use and accuracy, we report secondary analyses that excluded children with either diagnosis.

by the caregivers. Proportions of children at these different language levels differed significantly between groups ($\chi^2 = 10.319$, $p = 0.006$). See Table 1.

Table 1. Demographic information for participants included to test hypothesis 1. Data are shown as mean ± standard deviation or as *n*s and percentages and are compared by *t*-test or Chi-Square.

Characteristics		ASD (*n* =153)	TD (*n* =127)	*p*
Age, months		52.261 ± 11.676	35.685 ± 13.371	<0.001
Female/male, *n*		32/121	38/89	0.083
Language level, *n* (%)	Single-word	40 (26%)	25 (20%)	0.006
	Phrases	67 (44%)	40 (31%)	
	Sentences	46 (30%)	62 (49%)	
Caregiver's highest level of education, *n* (%)	No post-secondary education (Some high school or high school diploma)	17 (11%)	10 (8%)	0.017
	Some college up to two-year degree (Associate or Vocational)	38 (25%)	37 (29%)	
	Bachelor's Degree	60 (39%)	31 (24%)	
	Graduate degree (Master's, Ph.D, J.D., M.D.)	38 (25%)	49 (39%)	

2.2. Procedures

Procedures were approved by the Institutional Review Boards of Emerson College and New York University. All participants provided informed consent electronically. After consenting, they completed Part I of the study, focusing on demographics, child and family characteristics, and information about daily routine.

Once Part I was complete, they were given instructions to prepare for Part II. They were given a list of pronouns and pronominal determiners and were asked to observe their child's use of those words during the following 24-48 hours. This feature of our report—the period during which caregivers were asked to directly observe an aspect of their child's behavior—makes our report a hybrid between a caregiver diary (a classic tool in language acquisition research, e.g., Clark, 1993; Dromi, 1987; Tomasello, 1992) and a caregiver questionnaire (e.g., the MacArthur-Bates Communication Development Inventory). The instructions explained that caregivers would be required to answer questions about their child's use of these words in the second report (Part II).

Within 24 to 48 hours after submitting Part I, caregivers received an email linking to Part II, where they rated mastery of twenty-three pronouns and/or pronominal determiners (*I, me, my, mine, you, your, yours, we, us, our, ours, he, him, his, she, her, hers, it, its, they, them, their, theirs*[2]) according to whether the child: (1) uses the pronoun correctly; (2) uses the pronoun incorrectly; (3) sometimes uses the pronoun correctly/sometimes incorrectly; (4) used the pronoun incorrectly in the past; or (5) does not use the pronoun. At the end of the rating portion, caregivers were asked to provide example errors for any pronouns that the child was not yet using correctly[3].

2.3. Analysis

We recategorized caregivers' five-scale rating for each pronoun into two binary scales (0 vs. 1). One scale is USE, where 0 indicates the child does not use a pronoun and 1 means the child does use it, whether correctly or not. The other scale is ACCURACY, where 0 indicates that the child uses the pronoun incorrectly and 1 indicates that the child uses the pronoun correctly.

If the caregiver indicated that their child did not use a given pronoun (a score of 5 on the 5-point scale), the child would receive a 0 for both USE and ACCURACY. Otherwise, the child would receive a 1 for the first scale, and their rating for the second scale would depend on which use classification the caregiver selected (1-4). The only children who received 1s as ACCURACY score were those whose caregivers explicitly indicated that their child uses the pronoun correctly (a score of 1 on the five-point scale). Zeros were assigned to children whose caregivers said they always used the pronouns incorrectly or sometimes used the pronoun incorrectly. If the caregiver said that the child used a pronoun incorrectly in the past, we removed the pronoun from comparisons, since it is impossible to know whether the child is consistently using the pronoun correctly now.

The dependent variable for accuracy comparisons was the sum of ACCURACY scores divided by the sum of USE scores. Thus, each child's accuracy was represented as a number from 0 to 1, representing the proportion of pronouns used appropriately of those used at all. We used an ANOVA to measure the effect of diagnostic group (ASD vs. TD), age, and language ability (single-word- vs. phrase- vs. sentence-level speech) on pronoun accuracy.

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[2] Due to methodological error, four pronouns/determiners were left out for more than half of the children: *I*, *ours, them,* and *their*. We ran accuracy analyses with and without these pronouns, and results were the same. To simplify comparisons, results in this paper report exclude these pronouns, so that the set of pronouns examined is the same across all children.

[3] We presented a between-groups analysis of these example errors at BUCLD 45 (Zane, Arunachalam & Luyster 2020). For space reasons, we do not include these comparisons here, but we have submitted a manuscript reporting on example-error patterns to another journal.

3. Results
3.1. Use

An ANOVA revealed main effects of language level ($p < 0.001$) and age ($p < 0.001$) on USE scores. There was no significant main effect of group ($p = 0.137$). There was a significant group-by-language interaction ($p = 0.008$), reflecting the fact that children with ASD use a larger set of pronouns at phrase-level speech than TD children (ASD 10; TD 7); while TD children use a larger set of pronouns at sentence-level (ASD 16; TD 18). See Figure 1.

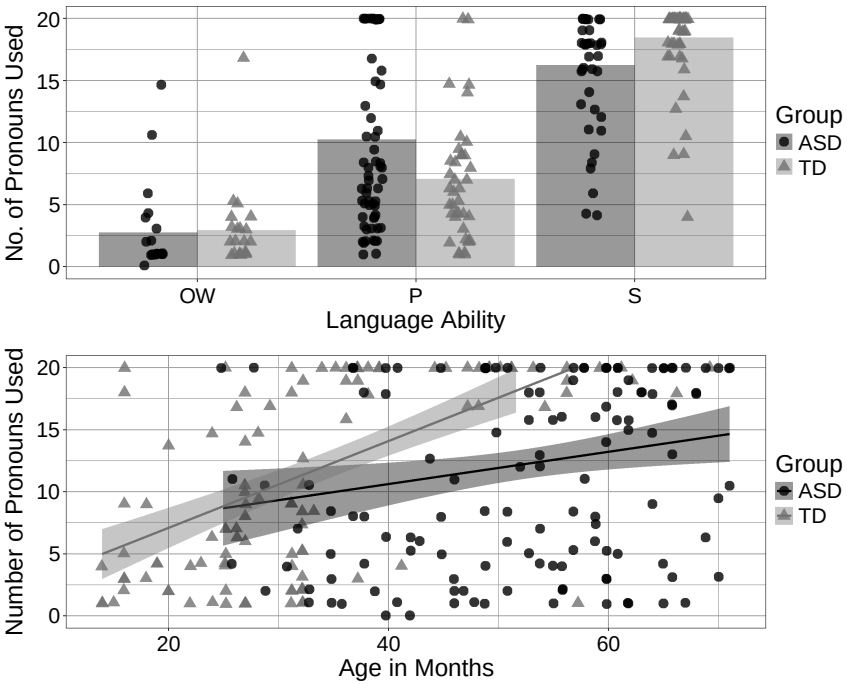

Figure 1. TOP: Number of pronouns used for each group by expressive language level; BOTTOM: Number of pronouns used for each group by age, with shaded bands reflecting standard error.

As a post-hoc comparison, we calculated the percentage of children using each pronoun in each group at the three different language levels. These values are presented in Table 2.

Table 2. Percentage of children using each pronoun by participant group and expressive language level

	Single-word		Phrase		Sentence	
Pronoun	ASD	TD	ASD	TD	ASD	TD
I	26.67%	17.65%	85.00%	80.00%	96.55%	96.15%
Me	30.43%	40.91%	61.19%	55.00%	91.30%	98.39%
Mine	26.09%	36.36%	73.13%	72.50%	95.65%	96.77%
My	30.43%	18.18%	76.12%	60.00%	95.65%	96.77%
You	30.43%	22.73%	71.64%	62.50%	93.48%	98.39%
Yours	8.70%	0.00%	46.27%	17.50%	73.91%	90.32%
Your	13.04%	4.55%	47.76%	27.50%	84.78%	93.55%
He	73.91%	100.00%	76.12%	100.00%	95.65%	100.00%
Him	8.70%	0.00%	37.31%	17.50%	78.26%	91.94%
His	8.70%	4.55%	38.81%	17.50%	84.78%	93.55%
She	13.04%	4.55%	46.27%	25.00%	89.13%	95.16%
Her	8.70%	4.55%	38.81%	15.00%	84.78%	93.55%
Hers	8.70%	0.00%	32.84%	15.00%	78.26%	90.32%
It	26.09%	9.09%	71.64%	52.50%	95.65%	100.00%
Its	17.39%	4.55%	46.27%	35.00%	78.26%	85.48%
We	17.39%	4.55%	46.27%	32.50%	73.91%	95.16%
Us	17.39%	4.55%	32.84%	10.00%	58.70%	82.26%
Our	17.39%	4.55%	37.31%	10.00%	56.52%	82.26%
They	17.39%	4.55%	41.79%	12.50%	71.74%	91.94%
Theirs	13.04%	4.55%	31.34%	15.00%	52.17%	75.81%

General patterns of use are similar between groups, where certain pronouns are used by relatively more children at each expressive language stage (e.g. *he* is used by a majority of children in both groups, even at single-word-level speech). However, there are certain pronouns that more than 20% of children with ASD are still not using by sentence-level speech, including: *yours*, *him*, *hers*, *its*, *we*, *us, our, they* and *theirs*. Aside from *theirs*, all of these pronouns are used by at least 80% of children in the sentence-level TD group.

3.2. Accuracy

An ANOVA revealed a significant main effect of group on ACCURACY; children with ASD use a smaller proportion of the pronouns they use accurately ($F = 9.984$, $p = 0.002$). There was also a significant main effect of language level: Regardless of diagnostic group, children speaking in sentences use a larger proportion of their pronouns accurately than children at phrase- or single-word-level, and children with phrases use more pronouns accurately than children using single words ($F = 19.668$, $p < 0.001$). There was a significant main effect of age, with older children using more pronouns accurately than younger children do in both groups ($F = 5.105$, $p = 0.020$). There was also a significant interaction between group and language ability ($F = 4.096$, $p = 0.018$).

A Tukey HSD test revealed that this interaction was driven by differences in pronoun accuracy for sentence-level children. Children in the ASD group at sentence level use 38% of their pronouns correctly, while children in the TD group use 62% correctly ($t = -3.741$, $p = 0.003$). Differences between the other two language-level subgroups were not significant. See Figure 2.

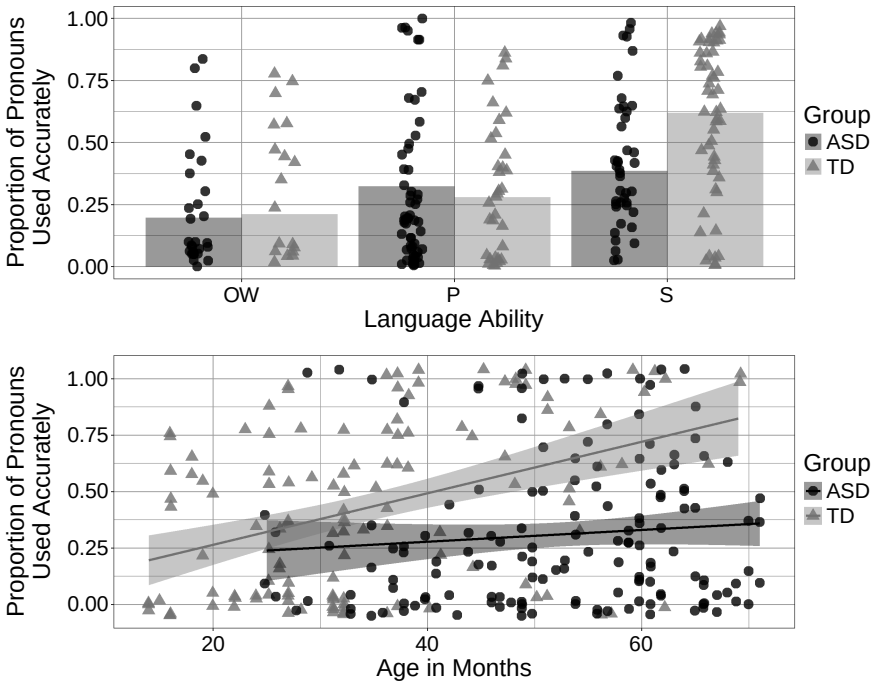

Figure 2. TOP: Proportion of pronouns used correctly for each group by expressive language level; BOTTOM: Proportion of pronouns used correctly for each group by age, with shaded bands reflecting standard error.

4. Discussion

The results of this caregiver report study support the hypothesis that children with ASD are less accurate at using pronouns than TD children at the same expressive language level, even though they use as many pronouns as—or even more than—TD children do. Accuracy comparisons show that children with ASD use fewer pronouns correctly than TD peers of similar ages and/or similar expressive language skills. Previous research suggests that children with ASD use pronouns less often than their TD peers (e.g., Arnold et al., 2009; Kelty-Stephen et al., 2020), so it is possible that children in our ASD group make more errors because they have been afforded fewer opportunities to practice appropriate use. That is, TD children use pronouns more often at earlier ages and learn through experience when their uses are successful or unsuccessful.

However, we believe this account is incomplete. First of all, our comparisons provide evidence that children with ASD use a similar (if not larger) set of pronouns than their TD peers do at similar language levels, especially at earlier expressive language levels. Although caregivers do not report on the *frequency* of pronominal use, our results ensure that children with ASD in our study are not avoiding pronouns altogether. Further, it is important to remember that we asked caregivers to attend to their child's pronoun use for 24-48 hours before completing the second portion of the report. Thus, it is likely that caregivers who indicated that their child uses a given pronoun had heard that child use it within the last day or so. A second reason to doubt that pronominal avoidance leads to differences in accuracy are the inconsistent research findings on pronoun frequency in ASD. While there is evidence that children with ASD use fewer pronouns and prefer to refer to themselves or others by name (Lee & Hobson 1994; Arnold et al. 2009; Hobson et al. 2010; Wicklund 2012; Kelty-Stephen et al. 2020), there is some research that finds no difference in frequency of pronoun use between children with and without ASD (Naigles et al. 2016). Research on pronominal *errors*, on the other hand, seems more consistent: Young children with ASD produce more pronoun reversals than TD peers (Cheng 2012; Naigles et al. 2016), and older children and adults with ASD produce more instances of ambiguous third-person pronouns (Colle et al. 2008; Novogrodsky 2013; Suh et al. 2014; Novogrodsky & Edelson 2016). Therefore, pronoun-use behavior in ASD may not be accurately characterized by atypical *quantity* of use but in atypical *quality* of use.

Given their social impairments and difficulties linking local detail to global context, it is not surprising that children with ASD would have special difficulty acquiring pronouns. Children with ASD show fundamental differences in social engagement and attention (Yirmiya et al. 1989; Klin et al. 2009; Hobson et al. 2010; American Psychiatric Association 2013; Constantino et al. 2017) and specifically in joint attention (Kasari, Freeman & Paparella 2006; Leekam & Ramsden 2006; Gillespie-Lynch 2013; Adamson et al. 2017). A recent article shows that frequency of pronoun use among children with ASD correlates with time spent responding to joint attention (Kelty-Stephen et al. 2020), suggesting that social attention and perspective-taking relate directly to pronoun use among

children with ASD. We take this further and suggest that not only pronoun use, but *appropriate* pronoun use, depends on social attention and perspective-taking skills. If so, this could explain why children with ASD in the current study use significantly fewer pronouns accurately at all ages and language levels tested compared to TD counterparts.

It is possible that results simply reveal delayed acquisition of pronouns among children with ASD, but it is important to stress that this delay is not inconsequential. The ASD participants were almost two years older, on average, than the TD participants yet were still significantly less accurate. This may foretell lasting problems with pronominal reference (and other aspects of semantics/pragmatics). Early expressive language delays have been shown to predict later language problems in children with and without autism (Preston et al. 2010; Kenworthy et al. 2012). Further, significant interactions between expressive language ability and pronoun accuracy suggest that pronoun development is relatively delayed compared to overall language ability in our group of children with ASD, particularly for later stages of development, i.e., children who are speaking in full sentences.

This brings us to our final point. We would like to end the discussion by emphasizing relative strengths in pronoun use among our set of children with ASD. When comparing the set of pronouns used across groups, children with ASD were reported as using a significantly larger set of pronouns as compared to TD peers. Thus, children with ASD do not seem to be avoiding pronouns altogether. One explanation for this counterintuitive finding—where children with ASD are using a *larger* set of pronouns than TD peers at earlier expressive language stages—is that some children with ASD seem to get stalled at early stages of expressive language ability. Research shows that about 60-70% of children with ASD are still using phrase-level speech by the age of eight (Anderson et al. 2007; Kim et al. 2014), which accords with the fact that our ASD children were significantly older than TD children but at similar stages of language use. Thus, children with ASD may have been using a more advanced lexicon (i.e., using pronouns) despite limited expressive syntactic abilities.

There are limitations to this study, the most significant of which is the use of caregiver report (rather than direct assessment) to gather omnibus information about diagnosis and language level, as well as details about pronoun use and errors. While there are many benefits to using a report (e.g., the ability to administer it to a large sample, the ability to collect data when in-person laboratory testing is prohibited for health and safety reasons, and the ability to get a picture of the child's language used at home), it is inferior to direct assessment. Although parents in both groups reported feeling reasonably confident in their reporting [on a scale of 1-10, TD group=7.5; ASD group=7.9 (two-tailed *t*-test $p = 0.10$)], it is possible that some caregivers struggled to observe or report their child's pronoun use and accuracy. A related limitation is that we did not ask about the frequency of use or frequency of errors between groups.

There could also be a possible bias amongst caregivers of children with ASD to: a) pay more attention to pronouns; and b) depress accuracy estimations.

Pronouns are frequently a target for speech therapy intervention for children with ASD; therefore, caregivers of these children may have been primed to focus on their child's pronoun use. There is some evidence that runs counter to that, showing that caregivers of children with ASD actually *under*-report their child's use of pronouns (Jyotishi, Fein & Naigles 2017). Still, it is possible that caregivers of children with ASD might be especially aware of and attentive to pronoun *errors*, and report more of them than caregivers of TD children. This may well have affected our accuracy comparisons—inflated reports of misuse among children with ASD.

Thus, we interpret our results as a foundation for more focused research using direct methods and as providing important potential implications for clinical practice in speech-language pathology. Many pronoun interventions designed for children with ASD address reversal errors (e.g., Morgenstern, Causin, & Weinlein, 2019). While reversal errors may contribute to problems with first- and second-person pronouns in ASD, accuracy comparisons show increased inaccuracy for *all* pronouns. This adds to recent evidence that reversal errors may be overemphasized in the literature on ASD (Naigles et al. 2016) and therefore overemphasized clinically. We suggest that reversals are simply a symptom of a larger problem with pronouns and recommend that interventions expand their targets to all personal pronouns.

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