



## Reference production in young speakers with and without autism: Effects of discourse status and processing constraints

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### ABSTRACT

We examine the referential choices (pronouns/zeros vs. names/descriptions) made during a narrative by high-functioning children and adolescents with autism and a well-matched typically developing control group. The process of choosing appropriate referring expressions has been proposed to depend on two areas of cognitive functioning: (a) judging the attention and knowledge of one's interlocutor, and (b) the use of memory and attention mechanisms to represent the discourse situation. We predicted possible group differences, since autism is often associated with deficits in (a) mentalizing and (b) memory and attention, as well as a more general tendency to have difficulty with the pragmatic aspects of language use. Results revealed that some of the participants with autism were significantly less likely to produce pronouns or zeros in some discourse contexts. However, the difference was only one of degree. Overall, all participants in our analysis exhibited fine-grained sensitivity to the discourse context. Furthermore, referential choices for all participants were modulated by factors related to the cognitive effort of language production.

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### 1. Introduction

Autism is a disorder that is characterized by deficits in both social interaction and communication, in particular the pragmatic processes of using language appropriately in context (Baltaxe, 1977; Rapin & Allen, 1988; Tager-Flusberg, 1999). One of the most frequent pragmatic decisions that speakers make is the choice between referring expressions. They may use expressions that are very explicit, like names or descriptions (*Sylvester, the cat*), or less contentful descriptions like pronouns (*he, it*) or zeros (*...and  $\emptyset$  ran; ...while  $\emptyset$  running*). We examine this production process in children and adolescents with autism, with the goal of understanding how it may differ from the same process in their typically developing peers. An understanding of specific language processes such as this one is important

for the development of a language phenotype within the autism spectrum (Tager-Flusberg & Joseph, 2003).

Autism frequently involves linguistic impairments (e.g., Baron-Cohen, 1995; Kanner, 1943; Rutherford, Baron-Cohen, & Wheelwright, 2002; Tager-Flusberg, 2001a; Tager-Flusberg, Paul, & Lord, 2005), especially in the pragmatic areas of language, that is, those processes that control the social and contextual appropriateness of language (Baltaxe, 1977; Rapin & Allen, 1988; Tager-Flusberg, 1999). While some individuals with autism never develop functional language (Tager-Flusberg, 2001a), even high-functioning autism is associated with pragmatic impairment (Bruner & Feldman, 1993; Diehl, Bennetto, & Young, 2006; Landa, Martin, Minshew, & Goldstein, 1995; Losh & Capps, 2003; Young, Diehl, Morris, Hyman, & Bennetto, 2005). As one example, Tager-Flusberg and Anderson (1991) found a lower use of contingent utterances (i.e., utterances that relate to the previous one) in their autism group, compared with a Down syndrome group, although Hale and Tager-Flusberg (2005) later found that contingent

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discourse use improved over the course of development. Children with autism also often confuse first and second person pronouns (*I, you*; Lee, Hobson, & Chiat, 1994).

We focus on reference production because we expect that it may reveal systematic differences between populations with and without autism. Reference production is a ubiquitous part of communication, and specifically requires pragmatic judgments about what is appropriate in the current context. Moreover, reference production has been claimed to be impacted by two processes that have found to be impaired in individuals with autism: (1) mentalizing, and (2) cognitive load.

### 1.1. Mentalizing

A prominent explanation of the linguistic and social deficits of autism suggests that they stem from problems representing the mental state of others, as shown by the tendency for people with autism to perform relatively poorly on theory-of-mind tasks (e.g., Baron-Cohen, Leslie, & Frith, 1985; Baron-Cohen, Wheelwright, Hill, Yogini, & Plumb, 2001; Tager-Flusberg, 2001b). The relevance of theory-of-mind, or mentalizing abilities, for linguistic processing is demonstrated by Hale and Tager-Flusberg's (2005) finding that the use of contingent discourse by individuals with autism correlated with their performance on theory-of-mind tasks. Even though older children and adults with autism can pass first-order false-belief tasks, there are a variety of advanced theory-of-mind tasks that have identified impairments in people with autism of all ages, even high-functioning individuals. Children and adults with autism tend to have difficulty with both social-cognitive tasks, like the Strange Stories task (Brent, Rios, Happé, & Charman, 2004; Happé, 1994; Kaland, Callesen, Møller-Nielsen, Mortensen, & Smith 2008), and social-perceptual theory-of-mind tasks, like the Eyes in the Mind task (e.g., Baron-Cohen et al., 2001; Kleinman, Marciano, & Ault, 2001; Rutherford et al., 2002).

Mentalizing also plays a role in standard explanations of how speakers choose referential expressions. It has been claimed that speakers only use underspecified expressions, like pronouns, when they assume that the referent is already in the focus of attention of their interlocutor, or at least when the reference is contextually unambiguous (e.g., Bard & Aylett, 2004; Brennan, 1995; Chafe, 1976; Chafe, 1994; Grosz, Joshi, & Weinstein, 1995; Gundel, Hedberg, & Zacharski, 1993; Levelt, 1989). As described by Van der Meulen, Meyer, and Levelt (2001), "Speakers keep... a more or less veridical account of their addressee's state of mind, the so-called *discourse model*," (p. 513, emphasis in original). This might mean that reference production requires detailed and explicit models of the listener's mental state, which could involve sophisticated mentalizing abilities.

The idea that reference production depends on assumptions about the listener's focus of attention comes in part from studies of how the linguistic context affects the choice between alternate possible expressions (see Arnold, 2008, for a review). For example, recently mentioned entities can be assumed to be in the focus of attention of all discourse participants, leading to a high proportion of pro-

nouns and zeros, e.g.: *Jane worked all day, Ø went to the gym, and I didn't see her until 9 pm.* (e.g., Ariel, 1990; Arnold, 1998; Givón, 1983; Gundel et al., 1993). The structural and thematic properties of the last reference to an entity are also important. Pronouns are more likely for entities previously mentioned in subject, rather than object or oblique positions; for entities in the parallel grammatical function as the current referring expression; and for entities that previously played particular semantic roles (e.g., Arnold, 1998; Arnold, 2001; Arnold, 2003; Arnold & Griffin, 2007; Brennan, 1995; Givón, 1983; Stevenson, Crawley, & Kleinman, 1994). These factors together comprise the *discourse status* of each entity. When a referent enjoys a prominent discourse status, speakers tend to use underspecified expressions like pronouns.

The idea that referential expressions are designed to be interpretable is also supported by evidence that speakers use pronouns more often when the discourse context contains only one referent that matches the features of the pronoun. For example, pronouns are more frequent in a context with one female and one male character than in an identical context with two female characters (e.g., Arnold, Eisenband, Brown-schmidt, & Trueswell, 2000; Francik, 1985). This gender effect is often explained as an ambiguity avoidance strategy (but see Arnold & Griffin, 2007).

If pronoun use does depend on assumptions about the listener's mental state, we might expect individuals with autism to have difficulty producing contextually appropriate expressions. On the other hand, the mentalizing explanation for reference production is not uncontested. There is solid evidence that pronouns tend to be used when referring to something that is prominent in the discourse (Arnold, 1998; Arnold, 2008). But since everything in the discourse is usually public to all interlocutors, it is also possible that speakers simply represent the discourse status of entities in their own mind, and ignore their addressee. A related idea is that the discourse context imposes constraints on appropriate reference use (e.g. Centering Theory's "use a pronoun for the backward looking center", Grosz et al., 1995). Therefore, individuals with autism may be able to produce appropriate referring expressions without any judgments about their addressee's focus of attention, but rather by following discourse rules or their own focus of attention.

### 1.2. Cognitive load

Recent evidence also suggests that speakers' choices are modulated by internal cognitive factors that affect their ability to represent the characters and actions in a discourse situation. Arnold and Griffin (2007) found that speakers were less likely to use pronouns in a story-telling experiment when a second character was present, drawing the speaker's attention away from the other character. This occurred even though the target character was the most salient in the discourse context, and the second character always had a different gender from the target, so even a pronoun would be unambiguous. Thus, the speaker's ability to focus attention on even the main character can influence the use of pronouns and zeros. Further support for the role of production-internal processes comes from findings

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