Research Paper

Inferential language use by youth with Down syndrome during narration

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A B S T R A C T

We examined inferential language use by youth with Down syndrome (DS) in the context of narrative storytelling relative to younger typically developing (TD) children and same-aged peers with fragile X syndrome (FXS) matched on nonverbal cognitive ability level. Participants' narratives were coded for the use of different types of inferential language. Participants with DS used proportionately less inferential language overall relative to their counterparts with TD or FXS, although mean length of utterance accounted for group differences observed for the DS-TD group comparison only. Patterns of inferential language use varied across inferential subtypes and across participant groups, with mean length of utterance playing a significant role in group differences. These findings suggest potential syndrome specificity to the DS phenotype regarding impairments in inferential language use that can be partially explained by level of expressive syntactic ability and should be considered in future research. Clinical interventions within the DS population, therefore, should target to some extent the use of inferential language and complex sentence structure.

What this paper adds

To date, no studies have comprehensively examined inferential language skill in individuals with Down syndrome (DS). Because inferential language serves as a framework for positive social interactions and learning in academic contexts, it is important to determine whether the phenotypic characteristics of DS impact this important foundation for development. The purpose of the current study, therefore, was to investigate inferential language use by youth with DS in the context of narrative storytelling relative to youth with fragile X syndrome (FXS) and typically developing (TD) children. Comparing participants with DS to younger TD children of similar nonverbal cognitive ability level allowed us to determine whether inferential language is a strength or weakness *relative to* cognitive developmental level. Including a same-age comparison group of FXS—another cause of intellectual disability—in addition to the TD group provided some insight into the syndrome-specificity of the findings (i.e., the extent to which any differences observed can be attributed to intellectual disability in general or specific phenotypes—DS or FXS—within intellectual disability). Finally, we examined the contribution of expressive morphosyntactic ability to group differences observed in inferential language use.

1. Introduction

Down syndrome (DS) is the leading known genetic cause of intellectual disability (Presson et al., 2013). In addition to their

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cognitive delay, individuals with DS experience difficulties with nearly all facets of language (Abbeduto, Warren, & Conners, 2007; McDuffie, Thurman, Channell, & Abbeduto, 2017). Expressive language is particularly impaired, with delays observed relative to both receptive language and nonverbal cognitive ability level (Chapman, Seung, Schwartz, & Kay-Raining Bird, 1998; Miller, 1999). Syntax, or grammar, is also particularly impaired relative to other domains of language, such as vocabulary (Abbeduto et al., 2003; Finestack, Sterling, & Abbeduto, 2013; Phillips, Loveall, Channell, & Conners, 2014), with expressive morphosyntax being the most impaired (Chapman & Hesketh, 2000; Finestack & Abbeduto,2010). Far less is known about the pragmatic language abilities, or social use of language, of individuals with DS, particularly for individuals who have progressed beyond the early stages of development. The limited literature points to a complex pragmatic language profile of relative strengths and difficulties, varying by sub-domain assessed and comparison group (e.g., autism spectrum disorder and fragile X syndrome; typical development) used (Abbeduto et al., 2008; Lee et al., 2017; Martin, Losh, Estigarribia, Sideris, & Roberts, 2013; Roberts et al., 2007; Smith, Naess, & Jarrold, 2017).

Inferential language is a complex sub-domain of pragmatic language that requires an individual to use social cognition to integrate information that is not explicitly provided from the context, draw logical conclusions (i.e., generate inferences), and use language to communicate these inferences to a listener. To date, no studies have comprehensively examined inferential language abilities in individuals with DS. Because inferential language serves as a framework for positive social interactions and learning in academic contexts (Carpendale & Lewis, 2006; Symons, 2004), it is important to determine whether the phenotypic characteristics of DS impact this important foundation for development. The purpose of the current study, therefore, was to investigate inferential language use by youth with DS in the context of narrative storytelling.

2. Inferential language in narrative

Narrative storytelling (i.e., the ability to coherently relay a sequence of events to a listener) is an important aspect of expressive language needed for everyday communication and is an area in which individuals with DS also struggle, although the extent of their challenges in narration is not clear (Boudreau & Chapman, 2000; Channell, McDuffie, Bullard, & Abbeduto, 2015; Finestack, Palmer, & Abbeduto, 2012; Hesketh & Chapman, 1998; Hogan-Brown, Losh, Martin, & Mueffelmann, 2013; Miles & Chapman, 2002). Narrative storytelling is a functional skill and a means for communicating personal experiences or fictional stories to others, often serving as a forum for reflecting on past events and discussing one's own and others' perspectives (Aldrich, Tenenbaum, Brooks, Harrison, & Sines, 2011; Bamberg & Marchman, 1990; Berman, 1995; Trabasso, Stein, Rodkin, Munger, & Baughn, 1992). Thus, narrative storytelling requires the coordination of abilities across the cognitive, linguistic, and social cognitive domains. For example, an individual must recall previous events and communicate the most relevant, salient information to a listener in an orderly, coherent fashion (McCabe & Peterson, 1990). Coupled with its functional importance, this makes narrative an ideal context for providing insight into many aspects of the language phenotype associated with DS, including inferential language abilities.

Inferential language is a critical aspect of narrative storytelling because it involves conveying details about events (e.g., cause and effect) and character perspectives (e.g., intentions, actions, and reactions) in a story. In other words, inferential language provides explanations for why events happened, why characters acted in a certain way, how the characters felt, etc. Inferential language also provides other evaluative and descriptive language that naturally occurs during narrative storytelling. Inferential language enriches stories and engages the social partner, thus acting as a framework for positive social interaction. It also provides opportunities to discuss others' perspectives and express empathy (Symons, 2004), underscoring its importance to positive peer relationships and friendships (Carpendale & Lewis, 2006). In sum, inferential language is an important foundation for both narrative and social development.

In typical development, children are able to make inferences in the context of narrative by age 4 (Kendeou, Bohn-Gettler, White, & van den Broek, 2008; Tompkins, Guo, & Justice, 2013; Wenner, 2004), and in addition to its crucial role in social communicative competence, this skill is linked to receptive and expressive language abilities as well as later academic achievement (Kendeou et al., 2008; Tompkins et al., 2013). Academically, inferential language is important because the ability to draw inferences from stories is a strong predictor of later developing reading comprehension (Cain & Oakhill, 1999, 2012). Despite its functional importance and role in later skill development, inferential language use has not yet been fully examined in DS. Although inferential language is discussed above as a pragmatic language skill, its use also requires the coordination of semantic knowledge, cognition, and expressive language abilities, among others. The phenotypic pattern of expressive language and narrative storytelling difficulties along with both strengths and weaknesses in social communication in DS makes it difficult to predict inferential language ability in this population. A better understanding of the development of this skill in DS will provide insight into how interventions may support narrative and social competence in individuals with DS.

3. Inferential language in DS

What is currently known about inferential language use in DS comes from a handful studies focusing on mental state language and causal referencing in autism spectrum disorder in which DS was included as a comparison group (Baron-Cohen, Leslie, & Frith, 1986; Tager-Flusberg, 1992). Although both the Baron-Cohen and Tager-Flusberg studies included very small sample sizes, they pointed to a general trend of young children with DS making fewer references to character mental states (Baron-Cohen et al., 1986) and causality (Baron-Cohen et al., 1986; Tager-Flusberg, 1992), though this deficit depended on the communication context (i.e., spontaneous speech during free play vs. prompted narratives of simple picture sequences).

Additionally, two studies have examined a related skill—the use of evaluations—from narratives produced by individuals with DS in their narrations of wordless picture books (Hogan-Brown et al., 2013; Keller-Bell & Abbeduto, 2007). Evaluations refer to content