Title: Maternal Mental State Language Use during Shared Storybook Reading with Children who have Down Syndrome

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Introduction: Children with Down syndrome (DS) characteristically struggle with expressive language (Abbeduto et al., 2007; McDuffie et al., 2017) and mental state language use during narrative storytelling (Channell, under review; Reilly et al., 1990). Mental state language—references to emotions, thoughts, intentions, etc.—is key to well-developed narratives; it communicates character perspectives, feelings, and goals. More broadly, mental state language is critical for perspective-taking and prosocial expression of one’s feelings during social interactions (Carpendale & Lewis, 2006; Symons, 2004). In typical development, young children’s mental state language development is facilitated by maternal talk about mental states during interactions such as shared storybook reading (Taumoepeau & Ruffman, 2008), and this relationship is mediated by children’s emotion knowledge (understanding other people’s emotional expressions and the causes and consequences of their emotions) (Ensor & Hughes, 2008). The current study applied this theory to older, school-age children with DS. A concurrent mediation model was tested by asking: Does child emotion knowledge mediate the relationship between maternal and child mental state language in DS?

Method: As a part of a larger study, 33 children with DS (6-11 years old; M = 8.66, SD = 1.70) and their mothers participated. Children completed the Leiter-3 test of nonverbal IQ (Roid et al., 2013), the Emotion Judgement Test (EJT) of nonverbal emotion knowledge (Channell et al., 2014), and an examiner-child narrative language sampling task using a wordless picture book (Abbeduto et al., 1995; Channell et al., 2018). Mother-child dyads completed a shared storybook reading task, also with a wordless picture book. Both examiner-child and mother-child narratives were recorded and later transcribed verbatim using SALT (Miller & Iglesias, 2012) transcription software. Child mental state language was coded from the examiner-child narrative transcripts for spontaneous use of mental state words (Channell, under review). Maternal mental state language was coded from the mother-child narrative transcripts for the percentage of mothers’ utterances that included any mental state references.

Results: A range of child mental state language (number of different mental state terms used = 0-14, M = 3.91, SD = 3.69) and maternal mental state language (% utterances containing mental state talk = 6.21-39.81, M = 22.57, SD = 7.85) was observed. A bootstrapping method was used to test the proposed mediational model because it is recommended for small sample sizes (Preacher & Hayes, 2008). It does not assume a normal distribution of the indirect effect and is higher powered than the traditional Sobel test (Hayes, 2018). In this study’s analyses, 5,000 iterations were used to estimate the mediated effect. The bias corrected and accelerated 95% CI did not cross zero (.01-.16) and thus was statistically significant. The point estimate for the mediator (emotion knowledge) was 0.06 (SE = .04). Follow-up analyses using Baron and Kenny’s (1986) method for testing mediation yielded consistent findings (i.e., all p-values < .10). Furthermore, these analyses suggested full mediation because the coefficient estimating the effect of maternal mental state language on child mental state language dropped significantly (from $\beta = .32$ to $\beta = .07$) and was no longer significant once child emotion knowledge was added to the model.

Discussion: Results showed preliminary evidence of concurrent mediation in which child emotion knowledge fully mediated the effect of maternal mental state language on child mental state language use in school-age children with DS. This is consistent with the literature regarding the influence of maternal language input on young typically developing children’s mental state language development. The current study showed that for children with DS, the positive impact of maternal mental state language is evident in the school-age years. Thus, mother-child shared storybook reading is an important activity for children with DS even into middle childhood. This study’s findings also connect well with what is known about the DS phenotype—relative strengths in socio-emotional skills such as emotion knowledge, and relative difficulties in expressive language and mental state language use. Thus, interventions aimed at increasing maternal talk about mental states may capitalize upon children’s strengths in emotion knowledge to enhance their mental state language development. Future work should identify the specific strategies and types of mental state language used by mothers that are most useful in promoting their children’s mental state language development. Future research should also use longitudinal design to establish causal relationships among these constructs.
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