**Title**: Questions Matter: Investigating the Role of Caregiver Interactions in Children with Down Syndrome

**Authors**: Tiffany Chavers Edgar1, Emily Schworer1, Catherine Rogers Gaspar1,and Audra Sterling1,2

**Introduction**: Parents and caregivers influence their child’s language development as nearly all children learn communication and language through caregiver-child interactions (Heidlage et al., 2020). One key component of these interactions is the questions asked by caregivers, which create opportunities for children to interact with their caregiver and demonstrate their communication and language skills. Therefore, caregiver-child interactions are often studied to gain a deeper understanding of children's language learning environments, particularly in children with Down syndrome (DS; e.g., Elmquist et al., 2024; Lorang et al., 2018). Prior research on caregiver-child interactions for children with DS has primarily focused on dyadic interactions (i.e., interactions between a child and one communication partner), with mothers serving as the communication partner (e.g., Hilvert et al., 2021; Lorang et al., 2018; Schneider et al., 2023), despite fathers also frequently interacting with their child. Generalizing findings on mother-child interactions to father-child interactions may be problematic, as research on children with typical development (e.g., Nandy et al., 2021) and in children with DS (de Falco et al., 2011; Elmquist et al., 2024) evidences communication differences based on parent sex. The present study addressed the following questions: 1) Are there differences in the rate and type of questions children are exposed to when comparing mother-child interactions to father–child interactions?, 2) Do the rate and type of questions children are exposed to differ between mother-child and father-child interactions within each family unit?, and 3) Are the type of questions mothers and fathers ask their children with DS associated with children’s non-verbal IQ, language ability, or chronological age?

**Method**: Participants included 15 children with DS (*M =* 39.67, *SD =* 12.11) and both of their biological parents. Each participant was administered the Mullen Scales of Early Learning (Mullen, 1995), a play-based developmental assessment. Ten-minute dyadic interactions for mother-child and father-child interactions were video-recorded during free play in the participants’ home. Dyadic interactions were behaviorally coded using Noldus Observer XT software. First, we measured the rate of questions. Questions were further coded by type (i.e., open-ended, closed-ended, rhetorical). Additionally, closed-ended questions were coded as yes/no questions, forced choice questions, or test questions. To ensure consistency in data interpretation, consensus coding was used to resolve discrepancies between raters. Hedge’s g effect sizes and 95% confidence intervals (CIs) were calculated to examine differences between question type across caregiver-interactions and within family units. Effect sizes were interpreted as small (g = 0.20), medium (g = 0.50), and large (g = 0.80; Cohen, 1988). Pearson’scorrelation coefficient was calculated to determine the association between the non-verbal IQ, language ability, and chronological age and the type of questions asked by mothers and fathers.

**Results**: When comparing mother-dyadic to father-dyadic interactions, mothers produced more total questions than fathers (Mmother = 81, SD = 20.24 Mfather = 62, SD = 28.41; g = .76, CI [.03, 1.48]). Specifically, mothers produced more open-ended questions (g = .55, CI [-.17, 1.25]) and closed-ended questions (g = .80, CI [.07, 1.52] than fathers. Mothers asked slightly more rhetorical questions than fathers (g = .17, CI [-53, .87]). Furthermore, mothers asked more yes/no questions (g = .61, CI [-.11, 1.32]), more forced choice questions (g = .46, CI [-.24, 1.17]), and more test questions (g = .47, CI [-.24, 1.18]) than fathers. Within each family unit, 10 of the 15 mothers had a higher rate of questions than the fathers. Rate of mothers’ and fathers’ open-ended and closed-ended questions were not significantly correlated with child non-verbal IQ, language ability, or chronological age. However, mother and father combined rate of closed-ended questions was significantly associated with child chronological age (*r* = -.53, *p* = .04). Additionally, mothers’ rhetorical questions were significantly correlated with child non-verbal IQ (*r* = .53, *p* = .04).

**Discussion:** Findings indicate that mothers asked significantly more questions than fathers, including more open-ended and closed-ended questions, as well as specific subtypes of closed-ended questions (i.e., yes/no, forced choice, test questions). This underscores the need to consider both maternal and paternal contributions to the language-learning environment of children with DS. Question type showed no significant correlations with children’s language ability, non-verbal IQ, or chronological age, with two exceptions: the rate of mothers’ rhetorical questions was associated with child non-verbal IQ and the combined rate of mother and father closed-ended questions was associated with child chronological age. This suggests that caregivers’ questions may be more reflective of individualistic and cultural interaction styles and less responsive to the child’s clinical characteristics. Future research should focus on how mothers’ and fathers’ question-asking behaviors support language development across the lifespan for children with DS. This would provide valuable insight into how parental question types evolve throughout children’s language and cognitive development.

**References:**

Cohen, J. (1988). Set correlation and contingency tables. *Applied Psychological Measurement, 12*(4), 425–434. [https://doi.org/10. 1177/014662168801200410](https://doi.org/10.%201177/014662168801200410)

de Falco, S., Venuti, P., Esposito, G., & Bornstein, M. H. (2011). Maternal and paternal pragmatic speech directed to young children with Down syndrome and typical development. *Infant Behavior and Development*, *34*(1), 161–169. <https://doi.org/10.1016/j.infbeh.2010.12.002>

Elmquist, M., Ford, A. L. B., Lorang, E., & Sterling, A. (2024). Opportunities to respond during dyadic caregiver–child and naturalistic family interactions among children with Down syndrome: A preliminary investigation. *American Journal of Speech-Language Pathology, 33*(4), 2041-2050. <https://doi.org/10.1044/2024_AJSLP-23-00179>

Heidlage, J. K., Cunningham, J. E., Kaiser, A. P., Trivette, C. M., Barton, E. E., Frey, J. R., & Roberts, M. Y. (2020). The effects of parent-implemented language interventions on child linguistic outcomes: A meta-analysis. *Early Childhood Research Quarterly*, *50*, 6–23. <https://doi.org/10.1016/j.ecresq.2018.12.006>

Hilvert, E., Lorang, E., & Sterling, A. (2021). Maternal use of decontextualized and contextualized talk: An in-depth investigation of early parent–child interactions in Down syndrome. *American Journal of Speech-Language Pathology*, *30*(4), 1767–1780. <https://doi.org/10.1044/2021_AJSLP-20-00190>

Lorang, E., Sterling, A., & Schroeder, B. (2018). Maternal responsiveness to gestures in children with Down syndrome. *American Journal of Speech-Language Pathology*, *27*(3), 1018–1029. <https://doi.org/10.1044/2018_AJSLP-17-0138>

Mullen, E. M. (1995). Mullen Scales for Early Learning. AGS.

Nandy, A., Nixon, E., & Quigley, J. (2021). Communicative functions of parents’ child-directed speech across dyadic and triadic contexts. *Journal of Child Language*, *48*(6), 1281–1294. <https://doi.org/10.1017/S030500092000080X>

Schneider, J. L., Roemer, E. J., Northrup, J. B., & Iverson, J. M. (2023). Dynamics of the dyad: How mothers and infants co‐construct interaction spaces during object play. *Developmental Science*, *26*(2), e13281. <https://doi.org/10.1111/desc.13281>

1 Waisman Center, University of Wisconsin-Madison

2 Department of Communication Sciences and Disorders, University of Wisconsin-Madison