**Title**: Evaluating Associations of Parental Fidelity to NDBI Strategies on Child Vocalisations and Dyadic Engagement

**Authors**: Hannah S Beavis1, Pernilla Meyer1, Laura J Chubb1, Andrea Castillo2, Seunghee Lee2, Amy Esler2, Adele Dimian2, Jason J Wolff1  & Jessica J Simacek2

1 Department of Educational Psychology, University of Minnesota  
2 Institute on Community Integration, University of Minnesota

**Introduction**: Challenges in social communication is a core feature of autism spectrum disorder (ASD), with some autistic children producing fewer or atypical vocalisations that in turn may negatively impact caregiver responsiveness and learning opportunities for language and social development (Yankowitz et al., 2019). To date, little is known about how individual strategies used in Naturalistic Developmental Behavioural Interventions (NDBI) may contribute to child outcomes (Shreibman et al., 2015). The Measure of NDBI Implementation-Caregiver Change (MONSI-CC; Vibert et al., 2020) is designed to capture changes in how caregivers use specific NDBI strategies over time. Previous research has focused on overall caregiver fidelity to intervention, and little is known about how individual strategies (within an NDBI such as the Early Start Denver Model [ESDM]; Rogers & Dawson, 2010) relate to specific child outcomes. The purpose of this study was to investigate how the use of specific intervention strategies impacted child rate of vocalisations and the quality of dyadic child-caregiver engagement.

**Method**: Participants consisted of a subset of 18 caregiver-child dyads (child aged 18-69 months, *M* = 42.2; 17 English speaking, 1 Spanish speaking) enrolled in an ongoing randomized controlled trial (RCT). The RCT tested the use of supplemental NDBI via telehealth for children ages 1 to 5 years old who were waitlisted for either ASD evaluation or community-based treatment on child and caregiver outcomes. At study entry and following intervention, recorded observations of child and caregiver play were collected using a structured play video sample that lasted for at least 12 minutes modelled after the Brief Observation of Social Communication Change (BOSCC) administration guidelines (Grzadzinski et al., 2016). Participants were mailed materials for the structured play sessions and all study procedures were conducted remotely over secure telehealth. Coders scored the MONSI-CC for each video. Vocalisations were measured as total count of functional utterances and intentional vocalisations using the same 12-minute video recordings.

**Results**: Results suggest that all domains in the MONSI-CC contribute to the total rate of child vocalizations and the quality of dyadic engagement between caregiver and child. Total *child vocalisations* were statistically significantly associated with several items on the MONSII CC, specifically *environmental setup* (*r*s = 0.59, p <.01), *child guided interactions* (*rs* = 0.48, p <.05), *active teaching and learning* (*r*s = 0.56, p <.05), and *natural reinforcement and scaffolding* (*r*s = 0.55, p <.05). *Dyadic engagement* was statistically significantly associated with *environmental setup* (*r*s = 0.66, p <.01), *child guided interactions* (*r*s = 0.51, p <.05), *active teaching and learning* (*r*s = 0.60, p <.01), and *natural reinforcement and scaffolding* (rs = 0.68, p <.01). Neither child variable was significantly associated with *opportunities for engagement*. The domain *natural reinforcement and scaffolding* was selected for secondary analysis at an item-level to understand which strategies contribute the most to the associations. This domain was chosen given previous research indicating positive relations between reinforcement, engagement, and vocalizations (e.g., Neimy et al., 2020; Vernon et al., 2012). Results indicated there were significant positive associations between *total vocalisations* and *imitating social communication* (*r*s = .67, p = .003), and *reinforcing desired behaviour* (*r*s = .51, p = .031), but not for *reinforcing goal-directed behaviour* (*r*s = .38, p = .125). *Dyadic engagement* was significantly positively correlated with all three items in the domain (imitating social communication, *r*s = .73, p = <.001, *reinforcing desired behaviour*, *r*s = .66, p = .003, and *reinforcing goal-directed behaviour*, *r*s = .55, p = .018). Lastly, the domain *opportunities for engagement* were further analysed to understand the comparatively weak associations with child variables. The results indicated that there was a significant positive relation between the strategy *using turn-taking*, *blocking*, *and* *expectant waiting* with *total vocalisations* (*r*s = .51, p = .031) and *dyadic engagement* (*r*s = .65, p = .004). However, there was a non-significant relation between the strategy *providing choices* and both *total vocalizations* (*r*s = .13, p = .621) and *dyadic engagement* (*r*s = .25, p = .313).

**Discussion:** This study investigated the effects of caregiver use of specific NDBI strategies on dyadic engagement and child vocalizations. Results showed that most domains in the MONSI-CC contributed to the rate of total child vocalizations and the quality of dyadic engagement between caregiver and child. Results were comparable to previous research investigating the impact of parent fidelity to individual strategies on child learning response, expressive language and dyadic engagement (Zitter et al., 2020; Waddington et al., 2020). Overall, reinforcement and imitation of social communication were found to be associated with higher rates of child vocalisation and quality of dyadic engagement and should be considered in the future as possible priority goals when programming for child vocalisations and quality of dyadic engagement.

**References:**

Grzadzinski, R., Carr, T., Colombi, C., McGuire, K., Dufek, S., Pickles, A., & Lord, C. (2016). Measuring Changes in Social Communication Behaviors: Preliminary Development of the Brief Observation of Social Communication Change (BOSCC). *Journal of Autism and Developmental Disorders*, *46*(7), 2464–2479. <https://doi.org/10.1007/s10803-016-2782-9>

Neimy, H., Pelaez, M., Monlux, K., Carrow, J., Tarbox, J., & Weiss, M. J. (2020). Increasing Vocalizations and Echoics in Infants at Risk of Autism Spectrum Disorder. *Behavior Analysis in Practice*, *13*(2), 467–472. <https://doi.org/10.1007/s40617-020-00413-2>

Rogers, S. J., & Dawson, G. (2010). *Early Start Denver Model for young children with autism: promoting language, learning, and engagement*. Guilford Press.

Schreibman, L., Dawson, G., Stahmer, A. C., Landa, R., Rogers, S. J., McGee, G. G., Kasari, C., Ingersoll, B., Kaiser, A. P., Bruinsma, Y., McNerney, E., Wetherby, A., & Halladay, A. (2015). Naturalistic Developmental Behavioral Interventions: Empirically Validated Treatments for Autism Spectrum Disorder. *Journal of Autism and Developmental Disorders*, *45*(8), 2411–2428. <https://doi.org/10.1007/s10803-015-2407-8>

Vernon, T.W., Koegel, R.L., Dauterman, H. *et al.* (2012). An Early Social Engagement Intervention for Young Children with Autism and their Parents. *J Autism Dev Disord* 42, 2702–2717 <https://doi.org/10.1007/s10803-012-1535-7>

Vibert, B. A., Dufek, S., Klein, C. B., Choi, Y. B., Winter, J., Lord, C., & Kim, S. H. (2020). Quantifying Caregiver Change Across Early Autism Interventions Using the Measure of NDBI Strategy Implementation: Caregiver Change (MONSI-CC). *Journal of Autism and Developmental Disorders*, *50*(4), 1364–1379. <https://doi.org/10.1007/s10803-019-04342-0>

Waddington, H., van der Meer, L., Sigafoos, J., & Whitehouse, A. (2020). Examining parent use of specific intervention techniques during a 12-week training program based on the Early Start Denver Model. *Autism : The International Journal of Research and Practice*, *24*(2), 484–498. <https://doi.org/10.1177/1362361319876495>

Yankowitz, L. D., Schultz, R. T., & Parish-Morris, J. (2019). Pre- and Paralinguistic Vocal Production in ASD: Birth Through School Age. *Current Psychiatry Reports*, *21*(12), 126–126. <https://doi.org/10.1007/s11920-019-1113-1>

Zitter, A., Rinn, H., Szapuova, Z., Avila-Pons, V. M., Coulter, K. L., Stahmer, A. C., Robins, D. L., & Vivanti, G. (2023). Does Treatment Fidelity of the Early Start Denver Model Impact Skill Acquisition in Young Children with Autism? *Journal of Autism and Developmental Disorders*, *53*(4), 1618–1628. <https://doi.org/10.1007/s10803-021-05371-4>