Symposium Title: Outcomes for Young Children with Intellectual and Developmental Disabilities: A Discussion of Behavioral Phenotypes, Differential Responses and Outcome Measures

Chair: Jena McDaniel

Discussant: Steven Warren

Overview: Developing interventions for young children with intellectual and developmental disabilities necessitates careful attention to syndrome-specific phenotypes, co-morbid characteristics, and measured outcomes. The ability to anticipate factors influencing differential responses to intervention could facilitate the development and implementation of phenotype-specific or individualized evidence-based interventions, ultimately improving outcomes. For example, behavioral phenotypes of Down syndrome provide a way to organize thinking regarding identifying syndrome-specific intervention targets, designing syndrome-specific interventions targeting related outcomes, and evaluating syndrome-specific characteristics influencing differential responses to intervention. Additionally, some characteristics that occur in children with Down syndrome also occur in other populations with disabilities and affect children's response to treatment. Finally, a long-term challenge has been measuring outcomes for children with sometimes subtle, yet clinically significant changes in communication and language. Measuring these subtle yet significant changes might improve sensitivity to change following intervention.

Our three related presentations highlight the importance of identifying and measuring key characteristics and skills when developing interventions for communication, language and adaptive skills in young children with intellectual and developmental disabilities. The first presentation evaluates the collective and unique contributions of several aspects of the Down syndrome behavioral phenotype (i.e., motor skills, visual attention, and persistence) to planning object-related actions in toddlers with Down syndrome. The second presentation examines another characteristic that has been hypothesized to be related to the Down syndrome behavioral phenotype – resistance to structure – and whether it moderates the effect of treatment intensity in young children with intellectual disabilities. The third presentation presents different scores from the Communication Complexity Scale (Brady et al., 2012) from a sample of individuals, including children with autism spectrum disorder, and how those scores can capture change over time. Combined, these presentations offer a framework for evaluating child characteristics and skills that may contribute to intervention outcomes and how to capture those responses to intervention in a meaningful way.

Paper 1 of 3

Paper Title: Contributions to Goal Directed Outcomes in Toddlers with Down Syndrome

Authors: Elizabeth Will, Deborah Fidler, Lisa Daunhauer

Introduction: Children with Down syndrome (DS) show challenges in the area of object-related planning (Fidler et al., 2014). Object-related planning, or goal-directed action on objects, encompasses problem solving around objects as well as using objects in a functional way (Fidler et al., 2014). Several characteristics associated with the DS behavioral phenotype, including motor delays, decreased attention towards objects, and task related avoidant behaviors potentially contribute to the development of competent planning behavior in toddlerhood (Fidler et al., 2005a; 2005b; Fidler, 2006). As a higher-order executive function, planning is critical to adaptive success in daily life, and it is therefore important to understand early developmental contributions to planning at very early developmental stages. The purpose of this study was to evaluate the collective and unique contributions

1 Vanderbilt University
2 University of Kansas
3 Colorado State University
of motor skills, visual attention, and persistence to two aspects of object-related planning in toddlers with DS: object-related problem solving and functional object use.

**Methods:** Participants included thirty-five toddlers with DS between 11 and 45 months old (mean chronological age=25 months; mean nonverbal mental age=17 months). The Mullen Scales of Early Learning (Mullen, 1995) were administered as a measure of nonverbal mental age and composite motor skills. Persistence was measured using the Carey Toddler Temperament Scales (Carey & McDevitt, 1995). Visual attention was measured using the duration of visual exploration of items across two 2-minute tasks: blocks and novel objects. An object retrieval battery was used as a measure of object-related problem solving. This battery included progressively more difficult object retrieval tasks that required toddlers to pull a cloth to obtain a desired object at the simplest level; opening a plexiglass box to obtain a desired toy at the moderate level; and adapting one’s reaching strategy to obtain a toy from under a plexiglass box with an opening that rotated on each trial at the most difficult level. In addition, a 2-minute toddler generativity task (Fidler et al., 2014) was used as a measure of functional object planning. This task included everyday toys (e.g., pipe cleaners, plastic rings, pom poms, etc.) that hold ambiguous play value as a collection. Functional actions on objects was operationalized as manipulating the object or a set of objects in an appropriate way given the physical affordances or properties of the object (Fidler et al., 2014). Examples of functional engagement included but were not limited to grouping like objects, hooking rings together, and using like objects in the same way. Motor skills, visual attention, and persistence were evaluated as predictors of object-related problem solving and functional object planning outcomes.

**Results:** Multiple regression analyses indicated a unique pattern of contributions to differential toddler planning outcomes across motor skills, visual attention, and persistence predictors. In the first model, motor skills, visual attention, and persistence accounted for 49% of the variance in object-related problem solving. Motor skills ($b=0.28; p<.001$) and persistence ($b=0.36; p=0.03$) significantly predicted object-related problem solving outcomes, but visual attention did not. Based on the squared semi-partial correlations, motor skills accounted for 36% of the unique variance in object-related problem solving outcomes, whereas persistence accounted for 8%. In the second model, motor skills, visual attention, and persistence accounted for 42% of the variance in functional object use outcomes. Motor skills ($b=0.33; p=.006$) and visual attention ($b=0.03; p=0.002$) significantly predicted functional use of objects. Persistence ($b=-0.83; p=.012$) also significantly predicted functional use of objects, but such that increased persistence was associated with an approximate 1-unit *decrease* in functional object use. Visual attention accounted for 20% of unique variance in functional object use outcomes, whereas motor skills accounted for 15%, and persistence accounted for 12%.

**Discussion:** Findings indicate differential contributions to planning outcomes for toddlers with Down syndrome. Regardless of planning type, results demonstrate that motor skills play a key role in the development of early planning for toddlers with Down syndrome. In addition, results indicate that visual attention is critical to planning functional actions on objects, but not to object-related problem solving. Findings suggest that aspects of persistence may be adaptive in some regard, yet maladaptive in others. Increased persistence results in increased success on object-related problem solving; yet greater persistence also suggests decreased functional use of objects on the generativity task. These differential findings suggest that persistence may be adaptive in the continued pursuit of solving a problem to achieve a goal, but persistence may also cause a lack of generation of novel ideas or strategies around objects. Collectively, these findings have early implications for potentially shaping persistence behaviors towards adaptive outcomes related to object-related planning in Down syndrome.

**References/Citations:**


**Paper Title:** Resistance to Structure Moderates the Effect of Treatment Intensity in Young Children with Intellectual Disabilities

**Authors:** Jena McDaniel¹, Paul Yoder¹, Steven Warren², Marc Fey²

**Introduction:** Using child characteristics to inform treatment intensity decisions may improve the efficiency and effectiveness of speech-language therapy at multiple levels. One such child characteristic might be “resistance to structure,” which is a child’s generalized tendency to protest in response to directives or physical constraints (e.g., car seat). In a previous report, children with Down syndrome (DS) randomly assigned to a high-intensity (five, 1-hour sessions per week) Milieu Communication Teaching (MCT) group demonstrated greater gains on spoken vocabulary than those assigned to a low-intensity (one, 1-hour session per week) MCT group (Yoder, Woynaroski, Fey, & Warren, 2014). Surprisingly, children with non-DS intellectual disabilities (ID) did not show this differential effect. DS-specific differences in the intensity effect may be due to temperament differences between DS and non-DS ID groups. Resistance to structure is particularly relevant for children with DS because they may tend to avoid cognitively demanding tasks (Daunhauer & Fidler, 2011). Because intentional communication develops prior to spoken vocabulary, intensity effects on intentional communication may be more detectable than those on spoken vocabulary.

**RQ1:** Do children with DS have significantly greater resistance to structure than children with non-DS ID?

**RQ2:** Does resistance to structure prior to intervention moderate the effect of MCT treatment intensity on rate of intentional communication at the 6-month follow-up?

**Methods:** Participants included fifty-six, 18 to 27-month-old children with ID (IQ < 70) from the Fey, Yoder, Warren, and Bredin-Oja (2013) study. Twenty-five received low-intensity MCT. Thirty-one received high-intensity MCT. Participants used ≤20 words per caregiver report. Diagnoses included DS (30), no formal diagnosis (15), premature birth (3), Seizure Disorder (1) and rare genetic syndromes (7). An aggregate of communication acts during three contexts at five time periods spanning 15 months quantified rate of intentional communication. The Adapted Infant Behavior Questionnaire (AIBQ) quantified resistance to structure via parent responses to 12 questions about their child’s tendency to protest directives or physical constraints. Higher scores indicate less resistance. The predicted interaction between resistance to structure and treatment intensity on intentional communication was evaluated via a moderator analysis using mixed level modeling.

**Results:** There were nonsignificant differences in resistance to structure between DS (M = 3.08; SD = 0.81) and non-DS ID (M = 3.00; SD = 0.75) diagnostic groups (t(54) = 0.400, p = .690). Although both intensity groups and children of all levels of resistance to structure showed growth on intentional communication, the “resistance to structure x intensity group” product term predicting intentional communication 6 months after treatment ended was significant (p = .02). Specifically, children who scored >3.23 on the AIBQ at pre-intervention benefited more from high-intensity than low-intensity MCT (Hedge’s g = .40). Children who scored <3.23 on the resistance to structure questionnaire did not.
Discussion: The findings cannot be used to explain why children with DS benefited from higher intensity MCT and children with non-DS ID did not. Nonetheless, results indicate that young children with ID who exhibited less resistance to structure demonstrated higher rates of intentional communication 6 months after treatment ended following high-intensity than low-intensity MCT. Findings support resistance to structure being a potentially important child variable on which to select treatment intensity for children with ID. A confirmatory analysis is required.

References/Citations:

Paper Title: Beyond Rates of Communication

Authors: Nancy Brady², Kandace Fleming², Rebecca Swinburne Romine², Alison Holbrook⁴, Connie Kasari ⁴

Introduction: Progress in language interventions is frequently measured with scores from standardized language tests or with performance measures such as vocabulary or mean length of utterance. For some individuals with severe intellectual disabilities (ID), however, these measures may not be sensitive enough to detect subtle but important changes. Changes in pre-linguistic communication are often reflected in rates of communication (e.g., Fey et al., 2006). Few measures are available that reflect changes in the quality, as well as the quantity of pre-linguistic communication. Brady and colleagues have been developing and testing a scale called the Communication Complexity Scale (CCS) designed to reflect qualitative changes in the forms and functions of pre-linguistic communication by individuals with severe ID (Brady et al., 2012). The current study focuses on different scores that can be derived from the CCS and consideration of how these scores compare to existing scores and changes over time.

Methods: 195 individuals between the ages of 3-60 years were concurrently assessed with the CCS and two other measures of early communication: the Communication Matrix (Rowland & Fried-Oken, 2010) and the Communication Subscales from the Vineland Adaptive Behavior Scales II (Sparrow, Cicchetti, & Balla, 2005). Both the Communication Matrix and Vineland rely on parent/caregiver report. The Communication Matrix focuses on early communication and has been used with individuals with a variety of intellectual disabilities. 110 children with autism spectrum disorder (ASD) were assessed with the CCS and the Early Social Communication Scales (ESCS; Mundy, Hogan, & Doehring, 1996) pre and post intervention. Three different types of CCS scores were investigated. The “Optimal” score refers to the average of the top 3 scores from each of 12 activities. The “Typical” score refers to the average of the 6 middle scores. The third type of score is the “mode” or most common score.

Results and Discussion:
Research questions and results for each question:
Question 1: What is the relation between each of three CCS scores and scores from the Communication Matrix and Vineland Adaptive Behavior Scales II?
In comparison to the other CCS scores, correlations are slightly higher between the “Optimal” scores from the Matrix and the Vineland subscales.

Question 2: How does each of the three CCS scores change over time for children with ASD undergoing an intervention?

Significant changes were detected for all three CCS scores and the rate of joint attention for children after 6 months of intervention. Only changes in rates of behavior regulation were significant for children in shorter interventions.

Question 3: How do the changes in CCS scores compare to changes in ESCS rates of joint attention before and after intervention?

Rates of change as measured with rates of joint attention and rates of behavior regulation were significantly related to changes measured with all 3 CCS scores, but correlations with rates were higher for “Typical” and “Modal” scores than for “Optimal” scores.

References/Citations: