Syposium Title: Naturalistic Developmental Behavioral Interventions (NDBIs): Expanding Intervention Programs and Developing Assessment Tools for Children with Diverse Neurodevelopmental Disabilities

Chair: Grace W. Gengoux, Ph.D.¹

Discussant: Amanda C. Gulsrud, Ph.D.²

Overview: Naturalistic Developmental Behavioral Interventions (NDBIs; Schreibman et al., 2015) are a class of early interventions for children with neurodevelopmental disabilities (NDs) that target a variety of developmental skills (e.g., joint attention, language, social communication), and have robust research supporting their efficacy with children with Autism Spectrum Disorder (ASD). Despite the growing prominence of NDBIs with children with ASD, very few studies have examined the use of NDBIs with children with non-autism NDs and this remains a prominent gap in treatment research (Butler et al., 1999). Furthermore, there is a need for valid, sensitive, and standardized assessment tools (Grzadzinski et al., 2016), especially for tracking intervention fidelity and treatment progress. To address these gaps in NDBI intervention and assessment research, this symposium includes a presentation on the unique developmental profiles of children with Down syndrome as compared to children with ASD, a presentation on the expansion of a well-known NDBI to children with non-autism NDs (e.g., Down syndrome, Kleinfelter syndrome), and presentations on the effectiveness of two novel assessment tools in measuring treatment-related change and NDBI-specific treatment fidelity. The first presentation will specifically report on early language ability, nonverbal communication, and play profiles in children with Down syndrome as compared to a matched sample of children with ASD to better inform intervention targets for each population. The second presentation will review data supporting the effectiveness of Pivotal Response Treatment (PRT) in improving language and social communication outcomes among children with a diverse range of non-autism NDs. The third presentation will demonstrate the utility of an emerging assessment tool, the Brief Observation of Social Communication Change (BOSCC), to measure treatment response among children with ASD receiving PRT. Finally, the fourth presentation will present a new global rating system for measuring fidelity of NDBI implementation and preliminary data showing concurrent and discriminant validity of the measure. Collectively, these presentations highlight the importance of expanding NDBIs to other populations of children with NDs beyond ASD, and critical tools to evaluate intervention efficacy and therapist fidelity to ensure the continued growth and development of children with diverse NDs.

Paper 1 of 4

Paper Title: Early Developmental Profiles in Children with Down Syndrome and Children with ASD: Implications for Intervention

Authors: Lauren Baczewski², Alison Holbrook³, Justin Williams³, Lindsay Hauptman³, Cassin Gonzales², Amanda Gulsrud², Connie Kasari²

Introduction: Research has shown that the earlier children with neurodevelopmental disorders receive targeted treatment for foundational skills (e.g. joint attention), the better (Green et al., 2010; Curatolo et al., 2015). Despite the availability of several early behavioral interventions that focus on language and play, these interventions are often not tailored to the unique characteristics of the population that they are serving (e.g., Dawson et al., 2010). In response to this need, treatment approaches have been created to specifically target the core social deficits associated with autism (Kasari, 2006). However, treatments that address the specific needs of young children with DS are lacking (Fidler, Philofsky, Hepburn, & Rogers, 2005). In order to select appropriate and relevant intervention targets, it is necessary to examine the skills and characteristics of the sample one intends to support. Therefore, this study examines early language ability, nonverbal communication, and play profiles in children with DS and ASD. Additionally, we examined group differences in order to inform intervention targets specific to each population.

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Methods: A total of 34 children with DS were matched to a sample of 63 children with ASD (mean chronological age = 42.2 months, mean visual receptive age equivalence = 24.4 months). Sequential matching was performed using a one-to-one nearest neighbor strategy without replacement. The resulting 68 matched children had no significant differences with respect to chronological age (p=0.45) or visual receptive age equivalence (p=0.64). All participants completed the Mullen Scales of Early Learning (MSEL), Early Social Communication Scales (ESCS), and Structured Play assessment (SPA) to assess language, nonverbal communication, and play skills, respectively. ESCS videos were coded for initiations of nonverbal communication including joint attention (JA) and behavioral requests (BR). SPA videos were coded for play level. Group comparisons on the measures above were conducted using independent sample t-tests.

Results: Children with DS displayed a greater number of developmentally-advanced play types in comparison to peers with ASD. Specifically, DS children displayed a greater variety of play types in the presymbolic (p=0.02), and symbolic play levels (p=0.02) than children with ASD. In terms of social communication, DS children used significantly more nonverbal JA initiations than those with ASD (p<0.05). There were no significant group differences between nonverbal BR, functional or lower level play, receptive language or expressive language. Within group, children with DS commonly exhibited more JA gestures than BR, whereas children with ASD nearly always displayed more BR gestures than JA.

Discussion: Results are consistent with extant literature on syndrome-specific profiles of early social-communication and play in DS and ASD. These results provide further evidence for the need for individualized behavioral interventions for specific populations; there is no “one size fits all” intervention. The challenges that children with DS and ASD face may be improved by established interventions targeting language and play (Schreibman et al., 2015). However, profiles of children with ASD suggest that intervention should specifically target initiations of joint attention and developmental play level, while profiles of DS children suggest that they may benefit from a focus on requesting skills.

References/Citations:

Introduction: Children with neurodevelopmental disabilities (NDs) are an increasing population that includes a variety of unique disorders and diverse cognitive abilities. While many children with NDs exhibit deficits in language and social communication, the majority of early interventions targeting these behaviors have been studied only in children with Autism Spectrum Disorder (ASD). In particular, the expansion of naturalistic developmental behavior interventions (NDBIs) to children with non-autism neurodevelopmental disabilities (e.g. Down syndrome, genetic disorders) remains a significant gap in treatment research for these populations. Pivotal Response Treatment (PRT) is a prominent NDBI that targets language and social communication skills in children, and has a strong evidence base for use with children with ASD (Koegel, O’Dell, & Koegel, 1987; Koegel, Camarata, Ben-Tall, & Smith, 1998). Implementing PRT with children with other NDs and cognitive delays/intellectual disability may address communication challenges, improve child outcomes, and expand benefits of PRT to unique populations.

Methods: Participants included 16 children (2-6 years old) diagnosed with a non-autism ND (e.g. Down syndrome, global developmental delay) and showing cognitive delay on the Mullen Early Learning Scales (MSEL; Early Learning Composite). Parents of participants received one hour of PRT parent training weekly for 12 weeks focused on increasing their child’s functional communication skills. The primary outcome measure was frequency of functional child utterances during a structured laboratory observation (SLO; Hardan et al., 2015) collected at baseline and post-treatment (Week 12). Secondary outcome measures included the Preschool Language Scales, 4th edition (PLS-4), the Vineland Adaptive Behavior Scales, Second Edition (Vineland-II) Communication subscale, the MacArthur-Bates Communicative Development Inventories Words and Gestures version (CDI W&G), and ratings of child severity and treatment improvement (Clinical Global Impressions - Improvement; CGI-I) as rated by an expert clinician not involved in the child’s care.

Results: Paired sample t-tests revealed significant improvement from baseline to Week 12 in total child utterances (t= -3.4, p<.01) and imitative utterances (t= -3.6, p<.01) on the SLO. Similarly, analyses of standardized language assessments revealed significant improvements in child expressive raw scores on the PLS-4 (t= -4.5, p<.01), and Expressive v-scale scores (t= -3.9, p<.01) and Communication standard scores (t= -3.01, p<.05) on the Vineland-II. In addition, analyses of the CDI W&G indicated significant improvement in phrases understood (t= -2.7, p<.05), words understood (t= -2.7, p<.05), and words produced (t= -3.6, p<.01). The majority of children were also rated as “much improved” on the CGI-I by the independent rater following treatment.

Discussion: Results from this pilot study suggest that Pivotal Response Treatment (PRT) shows promise for improving functional communication skills in children with neurodevelopmental disabilities (NDs) and cognitive delays but without autism. Additionally, these results may be an important addition to the literature on the effectiveness of NDBIs with non-autism ND populations, particularly for PRT parent training research. This study also supports parent training as an effective and efficient method to improve children’s functional communication. However, in light of the uncontrolled nature of this pilot investigation, further research is warranted. Implications for expanding the application of PRT to new populations and parent training programs will be discussed.

References/Citations:
**Authors:** Melanie Fox, Jennifer Phillips, Chelsea Acker, Christina M. Ardel, Antonio Y. Hardan, Grace W. Gengoux

**Introduction:** With autism diagnoses on the rise, there is an increasing demand for effective, early, and intensive behavioral interventions targeting core symptoms of Autism Spectrum Disorder (ASD). Core deficits in social communication manifest early on and have a pervasive effect on development. Therefore, there has been a growing focus on establishing parent-focused treatments for these deficits. However, there are limited appropriate and standardized outcome measures to capture changes in social communication behaviors following intervention, hindering the ability to evaluate the effectiveness of and justify the dissemination of these treatments (Anagnostou et al., 2015; Fletcher-Watson & McConachie, 2015). Researchers have begun to focus on developing sensitive measures of social communication, one of which is the Brief Observation of Social Communication Change (BOSCC). Initial studies of the BOSCC for coding parent-child interactions suggested its utility as a treatment outcome measure (Grzadzinski et al., 2016). The present study will employ the newly-developed BOSCC coding measure to evaluate change in social communication skills during standardized laboratory observation (SLO) of parent-child interaction following a naturalistic, behavioral intervention for ASD, Pivotal Response Treatment (PRT).

**Methods:** Forty-eight children with ASD and significant language delay aged 2 to 5 years were randomized to PRT (N=24) or delayed treatment group (DTG; N=24). Participants in the PRT condition received weekly parent training and clinician delivered in-home treatment over a 24-week period. It was hypothesized that participants receiving PRT would demonstrate a greater decrease in BOSCC scores over time (indicating improvement in social communication behaviors) as compared to the control group. Further, improvement on the BOSCC in comparison to the Mullen Scales of Early Learning, Vineland-2, ADOS-2 severity score, and frequency of utterances from behavioral coding of SLO videos will be examined.

**Results:** One participant in the PRT group withdrew when the family moved out of state; four participants in the Delayed Treatment Group (DTG) elected to make significant changes in concomitant therapies during the trial and were excluded; therefore the final sample included 23 participants in the PRT group and 20 in the DTG. Analysis of BOSCC scores over time using a mixed model procedure revealed that treatment condition significantly moderated the association with time for BOSCC scores, \( b = -3.79, p < .05 \). More specifically, the treatment group had lower BOSCC scores than the control group at week 12, \( b = -3.85, p < .01 \), and at week 24, \( b = -7.16, p < .01 \), but not at baseline, \( b = -0.54, p = .67 \) (Figure 1). In comparison, treatment condition did not significantly moderate the association of time with Vineland-2, Mullen, or ADOS-2 scores, \( ps > .07 \). There was a positive association between time and utterances for the treatment group \( b = 22.18, p < .01 \), but not for the control group, \( b = 0.65, p = .92 \).

**Discussion:** The present study is one of the first efforts to employ the BOSCC as a treatment outcome measure. Our findings support the utility of the BOSCC in capturing subtle changes in social communication behaviors as a result of treatment. Further, our study highlights the ability of PRT parent training to produce meaningful improvements in social communication behaviors in young, minimally-verbal children with ASD.

**References/Citations:**


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4 PGSP-Stanford PsyD Consortium
Paper Title: Identifying and Measuring Common Elements of Naturalistic Developmental Behavioral Interventions: Development of the NDBI-Fi

Authors: Kyle M. Frost⁵, Brooke Ingersoll⁶

Introduction: There is a growing evidence base for the efficacy of Naturalistic Developmental Behavioral Interventions (NDBIs) for young children with autism spectrum disorder and other developmental disabilities (Schreibman et al., 2015). Many of these treatment models have been developed for or adapted to caregiver-mediated models, in line with best-practice recommendations (National Research Council, 2001; Zwaigenbaum et al., 2015). Although these interventions have different theoretical bases and emphases, researchers acknowledge that different NDBI treatment models share common elements (Schreibman et al., 2015). Currently, there is no clearly-defined set of common intervention components, nor a standardized measure for assessing intervention adherence by caregivers which can be used across NDBI models. This study addressed this gap by developing an observational rating scheme, the NDBI-Fi, that can be used to characterize intervention fidelity for the common components of NDBI.

Method: An iterative approach was used to establish content validity, using qualitative and quantitative data from intervention developers and experts. A taxonomy of twenty strategies was defined based on the initial review of intervention fidelity forms, and subsequently refined. Based on survey ratings, a content validity ratio was calculated, and established cutoffs for achieving statistically significant agreement was used to determine which items were common elements and thus would be retained in the NDBI-Fi (Lawshe, 1975; Veneziano & Hooper, 1997). The final measure consisted of 8 items.

Results: Post timepoint data on 60 caregiver-child interactions from three NDBI trials lend support for the utility of this measure. NDBI-Fi was reliable across raters (intraclass correlation=.79). Caregivers who received training scored higher than caregivers who did not, $t(58)=3.81$, $p<.001$, $d=1.10$, and a subset of pre-post video pairs indicated that caregivers improved on this measure with training in an NDBI $t(23)=5.93$, $p<.001$, $d=1.53$. NDBI-Fi also showed convergent validity with intervention fidelity, $r=.54$, $p<.001$, and discriminant validity from child developmental level $r=.19$, $p=.11$ and chronological age, $r=.16$, $p=.18$.

Discussion: The NDBI-Fi appears to capture common NDBI treatment techniques in a way that is both reliable and valid. This measure may advance early intervention research by allowing for better characterization of treatment and control groups, cross-study evaluation of techniques and fidelity, as well as larger collaborative research studies necessary for evaluating the active ingredients of interventions. Importantly, results revealed variability in caregiver use of strategies for caregivers with and without training. This suggests that fidelity at pre-training, as well as change in fidelity, should be carefully examined in relation to child outcomes in intervention trials, and also has implications for a stepped-care model of intervention delivery.

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