**Symposium Title:** Communication Interventions for Children with Down Syndrome

**Chair:** Nancy Brady

**Discussant:** Steve Warren

*University of Kansas*

**Overview:** This symposium will summarize previous research and provide examples of current research efforts aimed at improving communication outcomes for children with DS. The first paper by Bredin-Oja and colleagues sets the stage for the symposium by summarizing research from two approaches—milieu intervention and AAC. Both approaches have been researched with children with Down syndrome but neither has shown compelling evidence in randomized clinical trials. The authors suggest that a large-scale effort supported by a consortium of agencies is needed to fully evaluate these approaches, and that the effectiveness may be optimized when combined. In paper 2, Romski and colleagues present results from children with DS who participated in a clinical trial focusing on parent-implemented interventions that included AAC. This RCT demonstrated significant effects and is exemplary of the type of research called for in the first paper. In paper 3, Wilkinson and colleagues delve deeper into the visual aspects of AAC to examine how visual screen configuration can impact communication by children with DS. In paper 4, Holbrook and colleagues present baseline data from an RCT, aimed at demonstrating the importance of identifying meaningful outcome measures.

**Paper 1 of 4**

**Paper title:** Review of Communication and Language Interventions for Children with Down Syndrome

**Authors:** Shelley Bredin-Oja¹, Steve Warren¹, Laura J. Hahn² and Nancy Brady²

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**Introduction:** The authors recently completed a selective review focused on the current state of communication intervention research for children with Down syndrome (DS). The results will be summarized, setting the stage for the three other papers in this symposium that each provide examples of the types of research needed in support of evidence-based interventions for children with DS.

**Methods and Results:** We recently reviewed research on language interventions for children with DS, with a focus on the early childhood period. Most of the available published research that included children with DS encompassed two approaches; milieu teaching strategies and related interventions that incorporated parent training and language learning in natural, everyday activities, and interventions that included Augmentative and Alternative Communication (AAC). Numerous studies including single case research designs and randomized control trials have been completed using the milieu approach which can be characterized as intervention that incorporates language learning opportunities into everyday environments. Five general themes were identified in milieu studies: 1) parent responsivity impacts communication growth 2) parents can be taught to be highly responsive, 3) gains in overall communication were demonstrated but development of spoken words was slower than expected, 4) children with DS may need to be taught specific words more directly and may struggle to generalize word learning, and 5) young children with DS may need even more intensive levels of intervention to make significant gains in speech and language development than was provided in these studies. The results of these studies have not shown large positive effects in terms of changes on standardized language tests, primarily because of lack of gains in spoken communication. The second approach, use of AAC strategies has been investigated less thoroughly. AAC includes use of sign language and speech generating devices. Results from small N studies provide evidence that AAC supports vocabulary development and expressive communication gains but there remains a need for randomized control studies to demonstrate large-scale effects on expressive
language, including speech. Several of the small N studies showed benefits to speech even though it was not directly targeted in the AAC interventions.

**Discussion:** A promising future direction appears to be combining milieu teaching techniques with AAC approaches, conducted with RCTs that would allow evaluation of this combined approach on a large scale. The authors call for a consortium of agencies joining forces to create and launch an initiative aimed at determining the true potential of enhanced communication interventions aimed at accelerating the language development of children with DS. The remaining papers in this symposium provide examples of research addressing this continuing need of improved language interventions for children with DS.

**References/Citations:**

**Paper 2 of 4**

**Paper Title:** Parent-Implemented Augmented Language Intervention and Young Children with Down syndrome: An Exploratory Report

**Authors:** MaryAnn Romski\(^1\), Rose A. Sevcik\(^2\), Andrea Barton-Hulsey\(^2\), Evelyn Fisher\(^1\), Marika King\(^1\), Phebe Albert\(^1\), Gal Kaldes\(^1\) & Casy Walters\(^2\)

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**Introduction:** Young children with Down syndrome (DS) present with speech and language impairments very early in childhood with the delayed onset of babbling followed by a gap between receptive and expressive language development with expressive language skills significantly more delayed (Miller, 1999; Fiddler, 2005). Historically, early language intervention for children with DS has included the use of manual signs (Bird, Gaskell, Babineau, & Macdonald, 2000) though recently there has been an interest in the use of Speech Generating Devices (SGDs; Warren, Bredin-Oja, Hahn, & Brady, in press). In this paper, we examine the language and communication performance of young children with DS who participated in parent-implemented communication interventions that included SGDs. Specifically, we compared the functional vocabulary usage and communication interaction skills of children with DS who received augmented language interventions that included an SGD with those children with DS who received spoken language intervention.

**Method:** Twenty-nine children diagnosed with DS who participated in one of two longitudinal randomized control studies of parent-implemented communication interventions in a larger sample of children with severe developmental delays and communication and language impairment (N = 113) are included in this study. The subset of children with DS included 20 males and 9 females, ages 24 to 29 months (M = 28.67, SD = 3.65). All children had an Expressive Language score on the Mullen Scales of Early Learning (MSEL; Mullen, 1995) of less than 12 months and no more than 10 spoken words. Other inclusion criteria were a primary language of English and enough gross motor skills to manipulate an SGD. The children all participated in a 24 session parent-implemented language intervention that focused on speech, augmented input or augmented output. For purposes of this study, the children who participated in the augmented input and output groups were combined into one augmented language group. Using the Systematic Analysis of Language Transcripts (SALT), we measured functional vocabulary usage (combined total of spoken and augmented words) and communication interaction skills.
Results: A non-parametric Mann-Whitney U test determined significant differences between children in the AC and SC groups in the number of functional vocabulary targets used, proportion of functional vocabulary used and total vocabulary targets provided during intervention at sessions 18 and 24. Overall, the children with DS who received AC intervention were better communicators at the end of the intervention than the children who received SC intervention. The AC interventions provided them with a way to communicate while the children in the SC intervention were still learning to produce spoken words and did not have a conventional way to communicate.

Discussion: Young children with DS can benefit from a parent-implemented augmented communication intervention that uses an SGD. At the end of the intervention, they had a larger functional vocabulary with which to communicate and were more intelligible than the children who received a spoken language intervention. Research directions and clinical implications with be discussed.

References/Citations:


Paper 3 of 4

Paper Title: Visual-Perceptual Characteristics of Augmentative and Alternative Communication Displays Influence Allocation of Visual Attention As Well As Functional Communication Outcomes in Adolescents and Young Adults with Down Syndrome

Authors: Krista M. Wilkinson, Rachel Bennett, Caroline Fehr

The Pennsylvania State University

Introduction: Individuals with Down syndrome (DS) often have substantial difficulty being understood by communication partners, particularly unfamiliar partners (cf., Kent & Vorperian, 2013; Kumin, 1994). For this reason, individuals with DS can benefit from addition of visual communication supports, that is, from augmentative and alternative communication (AAC) interventions (Brady, 2008). Previous studies in our laboratory have demonstrated that the arrangement of the symbols on these AAC displays can influence the speed and accuracy of search for target symbols (e.g., Wilkinson & McIlvane, 2013; Wilkinson, O’Neill, & McIlvane, 2014). Specifically, aligning the design of these AAC displays with principles derived from visual cognitive science promotes both speed and accuracy of finding symbols. However, those outcomes were examined exclusively in non-social laboratory-based visual search tasks. Not yet studied have been whether these changes to the display design affect functional communication outcomes during social interactions. This paper will report on the features of design that influence responding in the visual search task as well as in authentic social interactions.

Methods: In the visual search paradigm, participants included 12 adolescents or young adults with DS and 12 typically developing (TD) children matched on vocabulary level. Four different display layouts were created, all of which contained the same 16 symbols. The visual search task presented participants with a spoken word and photograph sample, and the participant’s task was to find the matching line drawing from the field of 16. Visual attention during search was measured via automated eye tracking technologies that measured the latency to fixate on the target, latency to execute the response to the target (by mouse click), and number of fixations to distracters. On the basis of results from this visual search task, displays were designed that
were either optimal or non-optimal in their arrangement, which were then used during several sessions of storybook reading with a trained communication partner. During these storybook reading sessions, mobile eye tracking technologies acquired information about visual attention allocation and videotapes enabled coding of communication behavior. At the time of submission, three participants with DS have undergone the sessions, with at least 7 more planned in the next few months.

**Results:** In the visual search paradigm a large statistically significant effect was found for symbol arrangement, in both the individuals with DS and the children with TD. Displays that made use of space to distinguish symbols of different word-class categories (subjects, verbs, objects, descriptors) resulted in significantly faster search and significantly fewer fixations to distracters during search. In the storybook interaction sessions coded thus far, the amount of visual attention allocated to the meaningful parts of the interaction (the communication partner and the storybook) is reduced by half when non-optimal AAC displays are used as compared to with optimal ones; instead, visual attention is either allocated almost exclusively to the symbols themselves (which are needed to support communication, but are not the focus of communication) or to other things in the environment. Communication output when ideal displays are used include a greater variety of functions and more social functions (agreeing, providing information) rather than instrumental functions (answering test questions).

**Discussion:** The research reported here is demonstrating the substantial effects of making small changes to AAC displays. There is no instruction given to the participants, yet significant changes are observed in both visual attention as well as social interaction. These findings suggest that the effectiveness of AAC interventions for individuals with DS can be improved by careful attention to the visual-perceptual characteristics of the AAC displays themselves.

**References/Citations:**


**Paper 4 of 4**

**Paper title:** Validity of Language Measures in Children with Down Syndrome

**Authors:** Alison Holbrook, Christina Kang Toolan, Connie Kasari

University of California, Los Angeles

**Introduction:** The optimal method for assessing language in young children remains a topic of debate; this is particularly true when assessing young children with limited language and/or developmental disabilities. Language impairment is common in children with Down syndrome (DS), with particular delays in expressive language (EL) development beyond those predicted by cognitive impairment.
There are three common methods used to assess language: standardized direct assessment, caregiver report, and observational language measures. Studies on language ability in DS tend to rely on only one of the three methods. However, very few studies have investigated the validity across these methods of assessment in a DS sample. As language outcomes in the DS population are variable, it is important to ensure researchers and clinicians accurately measure language ability. Therefore, this study aims to: 1) establish that different methods of assessment measure the same language constructs, and 2) relate EL scores to observed language ability.

Methods: This study used baseline data from an intervention RCT. Participants were young children with DS (n=39, Mage=41.9 months) with limited language (<20 spontaneous words at baseline).

Direct assessments: Direct standardized assessments were administered in school or clinic settings by a trained clinician. Age equivalents from the RL and EL subscales from the Mullen Scales of Early Learning (MSEL) and Preschool Learning Scales-5 (PLS-5) were used.

Caregiver report: The MacArthur-Bates Communicative Development Inventories: Words and Gestures form (MCDI) was sent home for caregivers to complete. Caregivers reported on the number of words understood (RL) and number of words produced (EL).

Observational assessments: Observational assessments took place in home, school, or clinic settings. The Early Social Communication Scales (ESCS) is a structured behavioral assessment. Total language count was coded from videotaped assessments. A naturalistic language sample (LS) was transcribed and analyzed for number of different words, spontaneous utterances, and elicited utterances.

We conducted a multi-trait multi-method (MTMM) matrix with RL and EL scores from the MSEL, PLS-5, and MCDI.

Results: Results from the MTMM matrix indicate strong validity between the MSEL and PLS-5, but not the MCDI. Language from the ESCS was highly correlated with EL from the MSEL and PLS-5, while moderately correlated with the MCDI. Correlations between LS outcomes with the MSEL, PLS-5, and MCDI were weak to moderate.

Discussion: The direct standardized language measures appear to be valid assessments of RL and EL in DS children with limited language. Conversely, the MCDI demonstrated low validity.

EL scores on these measures were correlated with observational measures, indicating strong validity with the direct measures and a weaker relationship with the MCDI. Correlations between observational measures and direct assessments indicate the ESCS may be a more appropriate observational outcome measure for EL in this population, compared to variables from the LS. Previous studies on language in DS have often relied on the MCDI as an outcome measure. However, these results indicate that the MCDI should be interpreted with caution, as it is more weakly associated with other measures and methods of language assessment.

The PLS-5 may be a strong alternative option as a language outcome measure. PLS-5 administration allows for caregiver report on certain items. The blend of caregiver report with direct assessment procedures may increase the validity and correlations of this measure over caregiver report alone.

References/Citations: