Symposium Title: Social and Communicative Functioning in Down Syndrome: A Developmental Perspective

Chairs: Marie Moore Channell1 & Laura J. Hahn1

Discussant: Anna Esbensen2

Overview: Over the last few decades, research has made major advancements toward understanding strengths and difficulties associated with the Down syndrome (DS) phenotype, particularly in the domains of cognition, language, and behavior. Despite this, we still have a limited understanding of how the DS phenotype is expressed within and across developmental domains in individuals with DS over different developmental periods. The purpose of this symposium is to bring together current work being conducted on individuals with DS across different ages and developmental periods, with the common theme of addressing both strengths and challenges in social and communicative functioning. The first presentation examines early patterns of communicative development longitudinally in a sample of infants and toddlers with DS. The second presentation describes the development of mental state language use (i.e., talk about other’s internal states or perspectives) during narrative storytelling and associated cognitive, linguistic, and social-emotional abilities in school-age children with DS. The third presentation explores the presence of peer victimization and prosocial behavior in older children and adolescents with DS. The fourth presentation addresses independent living outcomes and associated individual and family factors in young adults with DS who have recently transitioned out of high school. Each presentation will highlight the clinical relevance of its findings. Together, these presentations represent snapshots of abilities associated with social communication and interaction and daily functioning in individuals with DS across distinct periods of development, from infancy through young adulthood.

Paper 1 of 4

Paper Title: Trajectories of Early Communication in Infants and Toddlers with Down Syndrome

Authors: Laura J. Hahn1

Introduction: Despite the importance of early communication and its relevance for intervention in Down syndrome (DS), the limited investigations of these skills in infants and toddlers with DS makes it difficult to discern the feasibility, timing, and specific abilities to target for language intervention. Understanding the early communication profile in DS can help to determine the roots of the expressive language deficits and social communication strengths observed in later development (Fidler et al., 2007; Luyster et al., 2011) as well as identify areas for early language interventions in this population. The purpose of the present study was to describe the trajectory of early communication in DS in the domains of social communication (gestures, eye gaze, emotion), spoken language (sounds, words), and understanding language.

Method: Participants were 18 infants with DS who were followed longitudinally. At Time 1 children were between 7-24 months old (M = 13.33, SD = 5.09), and at Time 2 children were between 15-28 months (M = 22.83, SD = 4.17). At Time 1 children had a mean mental age of 8.94 months (4.25-19.50 months) based on the Mullen Scales of Early Learning (Mullen, 1995). Their mothers completed the Communication and Symbolic Communication Scales-Caregiver Questionnaire (CSBS-DP; Wetherby & Prizant, 2002). This is a 41-item questionnaire that examines communicative competence across three domains: Social, Speech, and Symbolic. Each broad domain is comprised of communication subdomains (e.g., ‘Understanding’ and ‘Object Use’ in the Symbolic domain). Also, a Total Communication Composite score is calculated.

Results: Growth models were estimated to explore the individual trajectories of early communication using raw scores instead of standard scores because CSBS standard scores decreased from Time 1 to Time 2. Results indicated a pattern of increasing raw scores over time for the Total Communication Composite and within each domain (Social, Speech, and Symbolic). Specifically, significant fixed effects for linear growth were observed for Total Communication (intercept 56.55, p < .0001), Social domain (intercept 29.03, p < .0001), Speech domain (intercept 10.23, p < .0001), and Symbolic domain (intercept 17.21, p < .0001).

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Communication scores increased at an average of 2.94 points per month of age, Social domain scores increased .88 points per month of age, Speech domain scores increased .65 points per month of age, and Symbolic domain scores increased an average of 1.42 points per months of age. Significant fixed effects for linear growth were also observed for all subdomains: Emotion & Eye Gaze (intercept 13.40, p < .0001), Communication (intercept 9.46, p < .0001), Gestures (intercept 6.62, p < .0001), Sounds (intercept 7.71, p < .0001), Words (intercept 3.01, p = .0002), Understanding (intercept 9.69, p < .0001), and Object Use (intercept 8.46, p < .0001). While Communication, Gestures, Sounds, and Object Use demonstrated significant increases per month of age (.54, .35, .35, .64 respectively), a significant effect of age was not observed for Emotion & Eye Gaze, Words, and Understanding.

Discussion: Results indicate that infants and toddlers with DS are increasing their communication skills over the first 2 years of life. Although standard scores do not capture this growth, raw scores do. In other words, because young children with DS are developing at a slowed rate relative to their age-matched peers, their standard scores show a decrease over time. Thus, the use of raw scores provides information about clinically relevant change in language skills. While, children’s language skills are delayed, they are continuing to gain skills, suggesting that these skills can be targeted in intervention. Within the CSBS domains, the greatest increase was observed in the Symbolic domain, which includes the subdomains of Understanding and Object Use, while the Speech domain (subdomains of Sounds and Words) showed the smallest increases over time, demonstrating similar early strengths in receptive language and early difficulties in expressive language. This provides initial evidence that the language phenotype associated with DS is emerging in the first 2 years of life and highlights the importance of early language interventions for this population. Promoting language learning in infants and toddlers with DS has a long-term developmental impact for later communicative functioning.

Key References/Citations:


Paper 2 of 4

Paper Title: Trajectories of Mental State Language Use in School-Age Children with Down Syndrome

Authors: Marie Moore Channell

Introduction: Individuals with DS characteristically struggle with expressive language, even relative to their nonverbal cognitive delays (McDuffie et al., 2017), which impacts their ability to communicate and interact with others across the lifespan. Narrative storytelling is an everyday functional communication context used to relay important stories or events to others. Mental state language (i.e., talk about one’s own or others’ internal states—emotions, thoughts, intentions, etc.) is a key component of narratives that enables us to talk about others’ perspectives, enriching our narratives and providing a pro-social avenue for expressing our thoughts and empathizing with others. Lack of mental state language, however, constrains one’s opportunities to discuss, empathize, and connect with others, impacting peer relations and social competence. Some initial evidence suggests delayed mental state language use in DS (Ashby et al., 2017; Beeghly & Cicchetti, 1997), although the extent and nature of this delay is unclear. This study sought to (1) examine the emergence of mental state language use in the context of narrative storytelling in school-age children with DS, and (2) explore characteristics associated with its use (age, nonverbal cognition, expressive language, emotion knowledge) using a cross-sectional developmental trajectory design.

Methods: Participants were 36 children with DS, ages 6-11 years (M = 8.53, SD = 1.64; 67% female), who completed a narrative task in which they were asked to tell a story from a wordless picture book (modeled after Abbeduto et al., 1995; Channell et al., 2018). Children’s narratives were audio recorded for later transcription with Systematic Analysis of Language Transcripts (SALT; Miller & Iglesias, 2012). Utterances were segmented into C-units (independent clause and its modifiers). Transcripts were coded for the presence of mental state language use (see LaBounty et al., 2008), with inter-coder agreement averaging over 80%. Two
metrics of mental state language use were computed: density—the proportion of C-units containing any mental state language, and diversity—the number of different mental state terms used. Nonverbal cognition (IQ, $M = 60.06, SD = 8.96$) was measured with the Leiter-3 (Roid & Miller, 2013). Two measures of expressive language were included: syntax—mean length of C-unit in morphemes (MLU) during the narrative task, and vocabulary—standard score on the Expressive Vocabulary Test (EVT-2; Williams, 2007). Emotion knowledge (i.e., ability to recognize others’ emotions from dynamic facial expressions and/or the social context) was measured nonverbally with the Emotion Judgment Task (EJT; Channell et al., 2014).

**Results:** Across the sample, we observed the emergence of mental state language use. Density ranged from 0% to 24% of children’s C-units ($M = 9%, SD = 7%$), and diversity ranged from 0 to 17 unique mental state terms ($M = 4.11, SD = 4.21$). We used linear regression principles to cross-sectionally map the growth of mental state language use against key developmental factors. Growth in expressive vocabulary significantly predicted growth in mental state language use (Density: $F[1,30] = 6.58, p = .02, R^2 = .18$; Diversity: $F[1,30] = 15.06, p < .001, R^2 = .33$), as did syntactic growth (Density: $F[1,32] = 25.92, p < .001, R^2 = .45$; Diversity: $F[1,32] = 53.72, p < .001, R^2 = .62$). Growth in emotion knowledge significantly predicted mental state language diversity ($F[1,30] = 6.63, p = .02, R^2 = .18$), but not density ($F[1,30] = 2.20, p = .15, R^2 = .07$). Nonverbal IQ and age were not significantly associated with mental state language density ($p = .48, R^2 = .02; p = .66, R^2 = .01$) or diversity ($p = .80, R^2 = .002; p = .13, R^2 = .07$).

**Discussion:** We identified three factors that are important to mental state language use in school-age children with DS: general vocabulary learning assessed by a standardized measure, syntactic growth within the context of narrative storytelling, and nonverbal emotion knowledge. These data represent the first comprehensive examination of mental state language use in the context of narrative storytelling by individuals with DS and are intended to advance our understanding of the organismic factors associated with its emergence in this population. Future directions include teasing apart the relative contributions of each factor to mental state language development in DS. By better understanding how individuals with DS use their cognitive, linguistic, and social-emotional abilities in common social communicative contexts, such as narrative storytelling, we can identify the appropriate targets in interventions to promote expressive language and communicative competence in this population.

**Key References/Citations:**


**Paper 3 of 4**

**Paper Title:** Peer Victimization in Adolescents with Down Syndrome

**Authors:** Jenna Reardanz³, Frances A. Conners³, & Kristina L. McDonald³

**Introduction:** While it is known among typically developing (TD) children and adolescents that victimization, or being the victim of “others’ harassment, ridicule, and aggression,” is at a particular high during adolescence (Troop-Gordon & Unhjem, 2018), little is known about the social experience of those with Down syndrome (DS). Specifically, it is relatively unknown if victimization

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occurs to those with DS, and if so, at what rates. Research among TD children and adolescents has established two main forms, overt victimization, like hitting or name calling, and relational victimization, like exclusion. Additionally, being the recipient of more prosocial actions is commonly an indicator of less victimization (Crick & Grotpeter, 1996). Research has shown that those with intellectual disability are at a higher risk to be victimized (Fink, et al., 2015). However, it is unknown the manner and magnitude of victimization in those with DS. Therefore, this study aimed to investigate this question and gather data to help establish the type and frequency of victimization faced by adolescents with DS.

Methods: 23 adolescents with DS between the ages of 11 and 18 years (M<sub>age</sub> = 14.13; SD = 2.46; PPVT-4 M<sub>functioning</sub> = 5.29; SD = 1.49; 91.3% White Non-Hispanic; 56.6% female) completed several measures including modified versions of the Children’s Social Experience Questionnaire (CSEQ; Crick & Grotpeter, 1996), which measures peer victimization and includes subscales of covert and relational victimization and receiving prosocial acts. Responses of adolescents with DS were compared to a large sample of TD adolescents from Crick and Grotpeter (1996; N = 474) who completed the CSEQ measure.

Results: This study revealed that participants with DS reported being victimized essentially the same amount when compared to the TD sample (t(22) = .919; p > .05). However, when the subscales of victimization in this measure (relational and overt victimization and receiving prosocial actions) were broken down, some differences between the samples were revealed. Relational victimization was approximately equal between the DS and TD group (TD M = 2.27; DS M = 2.17; t(22) = .818; p > .05). However, adolescents with DS reported being overtly victimized significantly less than the TD comparison sample (TD M = 2.23; DS M = 1.88; t(22) = -2.40; p < .05). Finally, adolescents with DS reported being the recipient of prosocial acts significantly less than the TD sample (TD M = 3.32; DS M = 2.42; t(22) = -5.88; p < .05).

Discussion: These results suggest that overall, victimization happens to adolescents with DS at a similar rate to TD adolescents, at least in this sample. However, it seems that more observable victimization, like hitting, hair pulling, or name calling, is reported as happening significantly less often to those with DS, although receiving prosocial acts also reportedly happened less often. It is possible that these results are due to adolescents with DS being ignored by peers or being more excluded, although more work is needed to confirm this. Also, because the CSEQ is an older measure, the TD comparison data came from a different cohort, so future work should add a more modern TD comparison group. These initial data indicate that a fuller examination into peer relationships in adolescents with DS is warranted and highlight the importance of continuing to examine social functioning and social interactions through adolescence in this population.

References/Citations:


Paper Title: Post-High School Transitioning Outcomes for Young Adults with Down Syndrome

Authors: Susan Loveall¹, Marie Moore Channell², Meghan Burke²

Introduction: Many young adults with Down syndrome (DS) have reported a strong desire for more independence, especially in employment and residential arrangements (Scott et al., 2013). Despite some initial evidence that individuals with DS may face barriers when transitioning out of high school and into early adulthood and community-based, independent settings, there is little research regarding functional outcomes (see Moore & Loveall, 2018). Therefore, the aims of this study were to: 1) characterize post high-school transitioning outcomes relative to employment, community-based living, and leisure

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activities/community engagement for young adults with DS, and 2) examine possible individual and family factors associated with these outcomes.

**Methods:** Participants included 82 parents and primary caregivers (majority mothers = 91%) of young adults with DS (44 males, 38 females) from 20 states across the U.S. who have exited high school within the past 5 years (M age = 22.53 years; SD = 2.03). Approximately half of the individuals with DS graduated high school with a diploma (n = 38, 46%), and another 43% (n = 35) graduated with a certificate of completion. Participants completed an online survey examining post-high school outcomes, including employment/vocational status, residential setting, and community engagement (modified Community Integration Scale, CIS; Heller & Factor, 1991). The survey also included questions pertaining to daily living supports (Waisman Activities of Daily Living Scale, W-ADL; Maenner et al., 2013), parent involvement in transition (PIT, adapted from Kraemer, & Blacher, 2001), and parent perceived support (Multidimensional Scale of Perceived Social Support, MSPSS; Zimet et al., 1988), representing potential individual and family factors associated with post-high school outcomes. Descriptive statistics, independent samples t-tests, and regression analyses were used to describe and compare outcomes and to examine possible factors associated with outcomes.

**Results:** Regarding employment, 49% (n = 40) of individuals with DS were currently working in some capacity, with (18%, n = 15) or without (17%, n = 14) supports and/or in sheltered vocational settings in the community (16%, n = 13). A large number of individuals with DS (49%, n = 40) were also reported to be volunteering in their communities, some of whom were both working and volunteering. Only 12% (n = 10) reported no involvement in any vocational or volunteer activities. Only one participant reported that their child with DS had enrolled in a postsecondary, degree-seeking educational program after exiting high school, but an additional 42 reported their child had sought some type of additional training after high school (non-degree seeking coursework, 22%, n = 18; vocational or technical training, 21%, n = 17; other, 8.5%, n = 7). As for community-based living, a majority of participants reported that the individual with DS was still living at home with parents/primary caregivers (91%, n = 75). However, most individuals with DS were reported to only need moderate (65%, n = 53) or minimal (27%, n = 22) non-financial support with daily living activities. For leisure activities and community engagement, average scores from the CIS were 1.48 (SD = .43), indicating that most individuals with DS were engaging with the community, on average, somewhere between 1-3 times per month (score of 1) to weekly (score of 2).

To examine factors associated with employment, responses from caregivers who reported their children were currently working (n = 40) were compared to responses from caregivers who reported their children were not currently working nor currently involved in post-secondary training programs (n = 27) on their child’s daily living skills (W-ADL), parent involvement in transitioning (PIT), and parents’ feelings of social support (MSPSS). Independent samples t-tests revealed statistically significant differences between groups on the W-ADL (p = .009) but not on the PIT or MSPSS (p’s > .05). Those individuals with DS who were employed (M = 24.65, SD = 4.78) were reported to have stronger daily living skills than those not employed (M = 20.48; SD = 6.88). For leisure activities/community engagement (CIS), multiple linear regression was used to examine the same individual and family factors as predictors of CIS. Again, the only factor to reach significance was the W-ADL, which explained approximately 14% of the variance (p < .001) in the full model, F (3, 78) = 8.54, p < .001. More details will be discussed relevant to each outcome (e.g. hours employed per week, how individuals with DS find employment).

**Discussion:** These data suggest that approximately half of individuals with DS find employment after high school, a majority are living at home with caregivers, and many are remaining active in their communities, at least within 5 years of exiting high school. When examining possible individual and family factors associated with employment and leisure/community outcomes, the only factor to reach significance was daily living skills of individuals with DS via the W-ADL, suggesting this may be a particularly important skill to begin targeting early in development. More research is needed to fully capture post-high school transitioning outcomes and to better understand the scope of developmental and environmental factors that contribute to long-term success. However, these results are an important first step towards capturing post high-school transitioning in DS.

**Key References/Citations:**
