Title: The Effects of Augmentative Assisted Language Matrix-Training for Young Children with Down Syndrome

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Introduction: Down syndrome (DS) is an intellectual disability (ID) characterized by a distinct phenotypic profile associated with delays across several developmental domains as well as unique learning related challenges (Fidler, 2009). Expressive language is a critical domain that is typically impaired in this population (Abbeduto et al., 2007). Limited speech intelligibility, resistance to participating in non-preferred or difficult tasks (e.g., tantruming, verbal refusal, elopement, crying), and difficulties with auditory processing also characterize many children in this population (Fidler et al., 2005; Kent & Vorperian, 2003; Stoel-Gammon, 2001). Children with DS also have unique strengths that may support their language learning, including relative strengths in visual short-term memory and visual motor performance (Fidler, 2005). There is a substantive body of literature demonstrating the effects of early language and communication interventions on linguistic outcomes for children with DS. On average, results from existing studies examining language outcome for children with DS and other ID are positive, however, an examination of results from studies examining the differential effect of existing interventions for children with DS compared to other children with ID indicates that children with DS may have less positive results for language related outcomes (Windsor & Kaiser, 2015). The overall lower performance of children with DS in existing language interventions and the increased risk of severe, long-term language and communication impairments in the absence of effective intervention (Fidler, 2005; 2009) indicates a need for innovative intervention approaches that provide support for the unique challenges associated with early language learning. These new approaches to intervention should be: (a) designed to promote rapid skill acquisition; (b) target pivotal language skills; (c) minimize difficulties with language learning; and (d) capitalize on relative strengths in this population.

Language matrix-training has been shown to be an effective method for teaching pivotal language skills to children with DS (e.g., Goldstein et al., 1987). The goal of language matrix-training is to systematically teach specific language skills (e.g., producing noun+verb combinations) until the child is able to spontaneously identify new examples of that skill, indicating that generalization has occurred (Goldstein, 1983; 1985). The purpose of the current study was to examine the effects of a language matrix-training intervention on the production of early word combinations (given the overall slow pattern of syntactic growth that is characteristic of children with DS; Berglund et al., 2001) on one child with DS. The primary research questions guiding this study were: (1) Does systematic direct teaching using an augmented language matrix-training approach result in increases in the production of target agent-action combinations? and (2) Does systematic direct teaching using an augmented language matrix-training approach result in generalization to generative word combinations?

Method: This study used a multiple probe single case research design (Ledford & Gast, 2018) across behaviors (agent+action word combinations) conducted with one child (43 months) with DS who had a relatively large productive vocabulary (159 productive words; 17 agents, 44 action verbs), but was not yet producing agent+action word combinations.

Intervention was conducted four times a week; sessions consisted of 10-25 massed teaching trials. A speech generating device (SGD; an iPad programmed with Proloquo2go™ software with visual display and auditory output) was used as a visual aid and augmentative support (given overall limited speech intelligibility and relative strengths in visual processing noted in this population; Kent & Vorperian, 2003) during teaching sessions. A constant time delay prompting procedure (Wolery, Ault, & Doyle, 1992) was used to teach children to produce agent+action combinations.

The primary dependent measure was previously trained agent+action combinations (defined as combinations that were learned to criterion during teaching sessions). The second dependent measure was a probe of untrained agent+action combinations (to assess generative learning).

Results: Visual analysis indicated a clear functional relation for previously trained combinations, with an increase in level and trend upon the introduction of intervention across all three tiers. Additionally, generalization measures to untrained combinations across all three tiers of intervention indicated that generative learning occurred over time.

Discussion: Results from this participant indicate that language-matrix training may be effective for teaching children with DS with relatively large productive vocabularies to produce agent+action combinations. Generalization to untrained combinations indicated that children learned the rule for combining nouns and verbs together. This generalization, in addition to the unique
difficulties that many children with DS have transitioning from single to multi-word utterances as well as the importance of early agent-action combinations in the development of complex syntax (Berglund et al., 2001; Rispoli & Hadley, 2011) indicate that language matrix training using augmentative supports is a promising intervention for accelerating language growth for young children in this population. Research is currently being conducted with two additional participants to replicate these findings.

References/Citations: