Title: A Preliminary Examination of Prospective Memory in Children with Down syndrome

Authors: Mary Godfrey, Moshe Maiman, Taralee Hamner, Manisha Udhanani, Megan Perez, Nancy Raitano Lee

Introduction: Prospective memory (PM) requires remembering information to carry out a planned action in the future (Ceci, Baker, & Bronfenbrenner, 1988). It is believed to require both associative memory and executive functioning skills (e.g., working memory) and to be important for real world functioning (Kliegel, Mackinlay, & Jager, 2008; Kliegel et al., 2002; Kretschmer, Voigt, Friedrich, Pfeiffer, & Kliegel, 2014). Thus, further investigation of PM abilities in children with intellectual disabilities (ID) could lead to targeted interventions to improve memory abilities and consequently improve daily living skills and increase independence. However, research regarding PM abilities in children with ID remains very limited, and no studies have examined PM abilities of youth with Down Syndrome (DS), the most prevalent genetic disorder associated with ID (Parker et al., 2010). Consequently, the current study sought to (a) evaluate the utility of two preschool PM tasks for youth with DS, (b) provide a preliminary examination of PM performance relative to mental age (MA) matched typically developing (TD) youth, and (c) examine relations between PM performance and working memory.

Method: The current study included 19 children with DS (CA M=10.84 (3.54)) and 7 TD children (CA M= 5.14 (0.85)) who were a part of a larger study conducted at Drexel University for which data collection is ongoing. Participants were matched based on mental age, which was estimated by the Kaufman Brief Intelligence Test (KBIT-2; DS MA M=5.50(1.32); TD MA M=6.87(1.17)). Participants completed PM tasks that included one short-delay task and one long-delay task. The short-delay task, adapted from Kleigel and Jäger’s (2007)s PM card game task for preschoolers, required participants to name the animals presented on a card, and to remember to give the card back to the examiner if the card had a gold sticker. The delay between instructions and the presentation of the first target card was approximately one minute and the outcome of interest was frequency of remembering the PM task. The long-delay task was adapted from Causey and Bjorklund’s (2014) PM task used for TD preschoolers, and consisted of instructing participants, 20 minutes prior, to put materials away in a specific location, and to give the examiner a set of keys. The outcome variable of interest was recall of and completion of the PM task. Prior to completing PM tasks, participants had to demonstrate understanding by completing practice items. Lastly, participants completed a working memory measure, the Missing Scan Task (adapted from Roman, Pisoni, & Kronenberger, 2014), in which they were presented with a series of toy animals which were hidden from view for 2-3 seconds. All but one animal was returned and the participant was required to identify the missing animal.

Results: When examining the utility of the PM tasks within the DS group, we found that 100% of participants demonstrated understanding of the task. However, 47% participants with DS performed at floor-level on the short-delay PM task and 26% performed at floor on the long-delay task. In order to examine diagnostic group differences on the PM tasks, a 2x2 mixed model ANOVA with one between subjects factor (group) and one within subjects factor (PM task: long-delay, short-delay) was performed. Results revealed a significant group x domain interaction (F(1, 24)=5.98, p<.05), such that the TD group had significantly higher scores (M=7.71) than the DS group (M=3.84) on the short-delay PM task but not on the long-delay PM task (TD M=3.29; DS M=3.26). Lastly to examine the cognitive correlates of these PM tasks within the DS group, Pearson correlations between both the short- and long-delay tasks and the Missing Scan task were run. Working memory performance of children with DS was not associated with the long-delay PM task (r=.04, p>.05), but was significantly related to the short-delay PM task (r = .52, p<.05).

Discussion: This preliminary investigation of PM performance within children with DS revealed that children demonstrated understanding of PM tasks traditionally used with TD preschoolers. However, these early data suggest a dissociation in performance based on task demands. Although children with DS demonstrated comparable performance to TD children on the long delay PM task, they performed significantly worse on the short-delay PM task. This type of PM task may be impaired due to its strong correlation with working memory, which is a known weakness associated with DS (Kliegel et al., 2002; Lanfranchi, Jerman, & Vianello, 2009). Due to the impact of PM abilities on adaptive functioning and independence skills, future research should examine the most effective ways to assess PM skills of children with ID and further characterize PM abilities of this population.
References/Citations: