

Title: Different toys elicit different problem-solving skills in children with mild or significant motor delays

Authors: Rebecca M. Molinini, Ketaki Inamdar, Regina T. Harbourne, Michele A. Lobo, Sarah W. McCoy, James A. Bovaird, Stacey C. Dusing.

Purpose/Hypothesis: Problem-solving (PS) is a multi-dimensional construct in which children use motor skills to acquire and express understanding of cognitive constructs. Clinicians use toys to advance and quantify children's PS, but it is unclear how different toys afford opportunities to advance PS, if PS performance is consistent between toys, and if this relationship is moderated by degree of motor delay (MD). The purpose of this analysis was to quantify the trajectory of PS within and between toys in children with MD's.

Subjects: Data were drawn from 134 participants (mean baseline age: 10.7mos), 50.7% had mild and 49.3% had significant MD. Children were assessed up to 5 times; baseline, 1.5, 3, 6, and 12mo post baseline.

Material/Methods: Participants were videotaped interacting with three toys, a pop-up toy, nesting cups, and tower/balls, each for two minutes. Videos were behaviorally coded (Datavyu) to record the frequency of hierarchical PS skills, ranging from exploring the toy for perceptual input (Simple Explore, ES), to trying unsuccessfully to execute a function of the toy (Complex Explore, EC), to performing a function of the toy (Function, F). Linear mixed modeling with random effects compared ES, EC, and F scores overtime within and between each toy.

Results: Due to significant variability between MD groups, results are only presented stratified by group. Pop-up: Children with mild MD had a significant 12mo decrease in ES ($p < .00$) and increase in EC and F (p 's $< .01$). Children with significant MD did not change in ES or F (p 's = 1.0) but had a significant 12mo increase in EC ($p = .01$). Cups: The mild MD group did not change ES over 12mo ($p = .16$) but had significant 12mo increases in EC and F (p 's = .01). The significant MD group did not change ES, EC, or F (p 's $< .08$) over 12mo. Tower/balls: The mild MD group had a significant decrease in ES ($p < .01$) and significant increase in EC (p 's $< .02$) and F (p 's $< .001$) over 12mo's. The significant MD group did not change in ES ($p = .73$) but had a significant 12mo increase in EC and F (p 's $< .01$). When comparing between toys, both the mild and significant MD groups had the most ES with cups and most F with tower/balls. Children with mild MD performed the most EC with pop-up and there was no difference between toys for EC in children with significant MD.

Conclusions: Results highlight that different toys elicit different hierarchical PS skills, possibly due to different motor and cognitive demands of each toy. Using multiple toys to assess and track PS in measures such as the Assessment of Problem-Solving in Play may provide a more accurate reflection of children's robust PS skills than a single toy alone. Additionally, comparison of PS performance should not be made among children or across time when there is a lack of consistency in the toys used.

Clinical relevance: Toy selection during intervention or assessment depends on the type of skill being elicited and children's motor abilities. While a toy may afford multiple forms of PS, the interaction between children's motor and cognitive ability as well as the motor demands of the toy may limit the demonstration of children's repertoire of PS abilities.