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Impact of Task Format on Preschoolers' Cognitive Flexibility Performance

Problem: Children process and respond to stimuli differently: some might be more adept when engaging in computerized tasks whereas others may be more adroit on a hard copy version of the same task. The Dimensional Change Card Sort Task (DCCST), a measure of cognitive flexibility, consists of three trial sets; Pre-switch (color match); Post-switch (shape match); and Mixed trials (color and shape match). In years past, the DCCST was exclusively administered via hard copy (Fuhs, et al., 2015); however, more recently the computerized administration has become commonplace (Zelazo et al., 2013). Currently, there exists a lack of clarity as to whether children who do not complete the computerized version of the DCCST exhibit a deficit in cognitive flexibility, or if their difficulty is an artifact of the task format. Two studies compare children's performance on the computerized version of the DCCST to performance on the hard copy DCCST when they failed to meet continuance criteria on the iPad. In the second year, the DCCST was used to measure the impact of mindfulness training using the Kindness Curriculum on children's cognitive flexibility skills.

Methods: Preschool children (3-5 years) participated. The first study of 21 children are summarized here; the second study of 253 (74.5% low income; 44% White) children will be complete in spring. Data were gathered in Fall and Spring of two consecutive academic years.

At pre-testing, $N = 21$: 6 children completed the computerized pre-switch and the rest in hard copy (i.e., did not make it to the computerized post-switch); 10 completed the post-switch and hard copy (i.e., did not make it to the computerized mixed trials); and 5 completed the entire task on the iPad. At post-testing, one child completed the pre-switch and hard copy; 6 completed the post-switch and hard copy; and 14 completed the entire task on the iPad.

Results: Importantly, as shown in Figure 1, although only 23.8% of children met the continuance criterion on the iPad at pretest, the groups completing *hard copy mixed trials*, did not differ significantly on the mixed trials from those completing them on the iPad ($F(2, 17) = 3.38, p = .06$). Post-switch trial performance improved significantly from pre- to post-test ($M = 2.20, SD = 1.78$; $M = 4.33, SD = .90$, respectively, $t(14) = -4.30, p < .01$) while overall response time decreased between pre- and post-test ($M = 3.56, SD = 2.51$; $M = 2.23, SD = 1.22$, respectively, $t(19) = 2.61, p < .05$). On the *mixed trials*, there were no significant response time group x pre-posttest interaction effects.

Conclusions: The computerized DCCST might not best reflect the cognitive flexibility skills of preschoolers. Though children who failed to meet the continuance criterion on the iPad would be expected to perform worse on the *mixed trials*, considered the best proxy for cognitive flexibility, we found no significant differences in their performance compared to those who did the computerized *mixed trials*. The children who failed to meet continuance criteria made more mistakes on pre- or post-switch trials, and tended to respond more slowly. However, even at pre-testing their performance on the *mixed trials*, was comparable to those completing the

computerized task. Also, by post-testing, response time and accuracy differences had all but disappeared suggesting that performance on the hard copy version and the iPad version are comparable, but the hard copy version more accurately captures children’s cognitive flexibility when they fail to meet continuance criteria. Consequently, children participating in the Kindness Project were always allowed to finish the task (which they called the matching game!) in hard copy if the iPad version was challenging for them.

