

Head-Toes-Knees-Shoulders Task: Predicting Academic Success in Early Childhood Education

Megan M. McClelland, Claire E. Cameron, Robert Duncan, Ryan P. Bowles, Alan C. Acock, Alicia Miao, and Megan E. Pratt, with Jacob Bleasdale

The study examined the Head-Toes-Knees-Shoulders (HTKS) task—a five to seven-minute activity measuring behavioral self-regulation and executive function (EF)—as a predictor of academic achievement over the transition to formal schooling. Compared to other measures of individual aspects of EF, the HTKS task is a practical and efficient predictor of academic growth and school readiness in children transitioning from prekindergarten to kindergarten.

Both executive function (EF) and behavioral self-regulation are valid predictors of academic growth and achievement, especially among prekindergarten and kindergarten children.

Within previous research, behavioral aspects of self-regulation are associated with school readiness and a child's academic success because of the multiple mechanisms involved with being able to regulate one's attention and behavior.

Executive function is a set of cognitive functions that help an individual execute tasks, and include the following 3 aspects:

1. **Cognitive Flexibility:** Allows an individual to shift attention from one idea to another while ignoring distractions from the outside.
2. **Working Memory:** Allows an individual to remember directions which help him/her plan solutions to a problem.
3. **Inhibitory Control:** Helps one stop a response in favor of a better approach to a problem.

Because of these multiple, complex mechanisms, measuring skills pertaining to the behavioral aspects of self-regulation has proven challenging among researchers, with few tests that are valid and reliable over multiple years in early childhood. The Head-Toes-Knees-Shoulders (HTKS) is a structured observational task to address this issue. Goals of this study were to further establish the task as practical and effective

that can be used longitudinally among prekindergarten and kindergarten children, and to compare it with similar tasks.

The Study:

The study included 208 prekindergarten/ kindergarten aged children (61% White, 18% Latino, 0.5% African American, 1% Middle Eastern, 13% multiracial) from the Pacific Northwest U. S. who were recruited through letters in enrollment packets before they began preschool. Consented children were assessed in the fall and spring of prekindergarten and kindergarten in sessions approximately 10-15 minutes long. During each session, a child performed the HTKS, and 3 aspects of their EF (see pullout box #1) was assessed using the following tasks: Three-Dimensional Change Card Sort (DCCS), Day-Night Stroop task, Simon Says, and the Auditory Working Memory subtest from a published battery (see pullout box #2). The child's academic skills were also assessed with regards to literacy, vocabulary, and mathematics. Parents also completed a demographic survey. Families were compensated with \$20 gift cards which were given at each wave of the study.

During the HTKS task, children were given the following rules: "touch your head" and "touch your toes;" "touch your shoulders" and touch your knees." First they were asked to follow the rules, and then instructed to switch and respond opposite to what they

were told. The task gets harder, with Part 1 requiring 1 rule pairing and switch (e.g., “touch your head if I say ‘touch your toes’; Part 2 requiring 2 rule pairs and switches; and Part 3 switching the Part 2 rules.

The HTKS task therefore integrates three EF aspects into one task/game: paying attention, remembering rules, and inhibiting an automatic response to do the opposite. The additional EF tasks were used to assess the construct validity of HTKS, in other words does the HTKS measure the three EF

Tasks assessing executive function included:

DCCS: Assessed a child’s cognitive flexibility. The task presented children with cards differing by shape, color, and size and were directed to sort the cards based upon the three categories.

Day-Night Stroop Task: Assessed a child’s inhibitory control. The Task presents children with pictures of a sun or moon and they are asked to say the opposite of what they see.

Simon Says: Assessed a child’s inhibitory control without activation. The task asks children to perform an act only if “Simon says” is stated beforehand.

Auditory Working Memory Subtest: Assessed a child’s working memory. The task asked children to remember information and to later manipulate this information.

aspects that previous work suggests; while tests pertaining to academic skills were used to assess its predictive validity, in other words, do children who do well on the HTKS also have higher achievement. Researchers predicted that the HTKS task would positively relate to measures of EFs and would be a strong predictor of academic achievement and growth.

Results:

Data were analyzed for validity through studying correlations between the HTKS and

the four EF measures. The HTKS was moderately and positively associated with the other assessments of EF, therefore suggesting construct validity as the HTKS task accurately assessed for cognitive flexibility, working memory, and inhibitory control. Overall, EF measures were independently related to the HTKS task and the strength of EF-HTKS relations differed from time point to time point. Specifically, prekindergarten-aged children who performed better on the HTKS task had relatively stronger cognitive flexibility and inhibitory control, whereas kindergarten-aged children who performed better on HTKS had stronger working memory skills.

Further analyzing the data revealed that the HTKS task was a strong predictor for academic growth over time, especially early mathematical skills among kindergarteners. In addition, children who scored higher on the HTKS task also scored higher on the individual EF measures.

Researchers concluded that the HTKS task was the strongest predictor of academic achievement among kindergarten –aged children rather than prekindergarten-aged children, especially with regards to mathematical skills. The HTKS task was the only predictor of kindergarten literacy skills as well, while the HTKS, DCCS, and Day-Night Stroop tasks all predicted academic growth between prekindergarten and kindergarten.

Conclusion:

Researchers found that the HTKS task was effective at measuring academic achievement and school-readiness among both prekindergarten and kindergarten-aged children in relation to multiple aspects of EF, and is a practical tool to predict academic achievement as children transition from prekindergarten to kindergarten.

Research brief based on the following article:

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